A PHONETIC AND PHONOLOGICAL INVESTIGATION OF GEMINATES AND GEMINATION IN SOME INDIC LANGUAGES

Thesis submitted to Jawaharlal Nehru University

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DOCTOR OF PHILOSOPHY

BY

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DECLARATION BY THE CANDIDATE

This thesis titled **"A phonetic and phonological investigation of Geminates and Gemination in some Indic Languages"** submitted by me for the award of the degree of Doctor of Philosophy, is an original work and has not been submitted so far in part or in full, for any other degree or diploma of any University or Institution.

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CERTIFICATE

This thesis titled **"A PHONETIC AND PHONOLOGICAL INVESTIGATION OF GEMINATES AND GEMINATION IN SOME INDIC LANGUAGES"** submitted by Mr. **HIFZUR RAHMAN ANSARY**, Centre for Linguistics, School of Language, Literature & Culture Studies, Jawaharlal Nehru University, New Delhi, for the award of the degree of Doctor of Philosophy, is an original work and has not been submitted so far in part or in full, for any other degree or diploma of any University or Institution.

This may be placed before the examiners for evaluation for the award of the degree of Doctor of Philosophy.

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SYMBOLS AND ABBREVIATIONS USED IN THIS THESIS

CONSONANTS

/p/ : Voiceless bilabial plosive

/pʰ/ : Voiceless aspirated plosive

/b/: Voiced bilabial plosive

/bʰ/ : Voiced bilabial plosive

/t̪/ : Voiceless dental plosive

/t̪ʰ/ : Voiceless dental aspirated plosive

/d̪/ : Voiced dental plosive

/d̪ʰ/ : Voiced dental aspirated plosive

/ʈ/ : Voiceless retroflex plosive

/ʈʰ/ : Voiced retroflex aspirated plosive

/ɖ/ : Voiced retroflex plosive

/ɖʰ/ : Voiced retroflex aspirated plosive

/c/ : Voiceless palatal plosive

/cʰ/ : Voiceless palatal aspirated plosive

/ɟ/ : Voiced palatal plosive

/ɟʰ/ : Voiced palatal aspirated plosive

/k/ : Voiceless Velar plosive

/kʰ/ : Voiced velar plosive

/g/ : Voiced velar plosive

/gʰ/ : Voiced velar aspirated plosive

/ʔ/ : Voiceless glottal stop

/χ/ : Voiceless uvular plosive

/ɣ/ : Voiced uvular plosive

/q/ : Voiceless uvular plosive

/ɢ/ : Voiced uvular plosive

/m/: Voiceless bilabial nasal

/n/ : Voiced alveolar nasal

/ɳ/ : Voiced retroflex nasal

/ɲ/ : Voiced palatal nasal

/ŋ/ : Voiced velar nasal

/ts/ : Voiceless alveolar affricate

/dz/ : Voiced alveolar affricate

/tʃ/ : Voiceless palato alveolar affricate

/dʒ/ : Voiced palato alveolar affricate

/ɸ/ : Voiceless bilabial fricative

/β/ : Voiced bilabial fricative

/f/ : Voiceless labio-dental fricative

/v/ : Voiced labio-dental fricative

/θ/ : Voiceless dental fricative

/ð/ : Voiced dental fricative

/s/ : Voiceless alveolar fricative

/z/ : Voiced alveolar fricative

/ʃ/ : Voiceless post-alveolar fricative

/ʒ/ : Voiced palato-alveolar fricative

/ʂ/ : Voiceless retroflex fricative

/ʐ/ : Voiced retroflex fricative

/x/ : Voiceless velar fricative

/h/ : Voiceless glottal fricative

/r/ : Voiced alveolar trill

/ɾ/ : Voiced alveolar tap

/ɽ/ : Voiced retroflex tap

/lʷ/ : Voiceless labial lateral

/l/ : Voiced alveolar lateral approximant

/ɭ/ : Voiced retroflex lateral approximant

/ɻ/ : Voiced retroflex approximant

/ʋ/ : Voiced labio-dental approximant

/w/ : Voiced labio-velar semi-vowel

/j/ : Voiced palatal semi-vowel

VOWELS

/i:/ : Front close long unrounded vowel

/i/ : Centralised front, between close and half-close, un-rounded vowel

/e:/ : Front, between half close and half open, unrounded vowel

/e/ : Front, between half close and half open, un-rounded vowel

/ɛ/ : Front half-open un-rounded vowel

/æ/ : Front between half-open and open un-rounded vowel

/a/ : Between front and back, open un-rounded vowel

/a:/ : Between front and back, open, long unrounded vowel

/ɑ/ : Back, open unrounded vowel

/ɔ/ : Back, between half open and open, rounded vowel

/o/ : Back, between half close and half open, rounded vowel

/ɨ/ : Central, close un-rounded vowel

/ʉ/ : Centralised back between half close and close, rounded vowel

/ʉ:/ : Back close rounded vowel

/ə/ : Central between half close and half open, unrounded vowel

/ʌ/ : Central half open unrounded vowel

DIACRITIC MARKS

/˜/: Nasalized articulation /õ/

/ː/ : Lengthened segment

/./: Syllabic break

/*/ : Not acceptable

/̪/ : Dental articulation /t̪/

/ʰ/ : Aspirated articulation /tʰ/

ABBREVIATION

CIEFL : Central Institute of English and Foreign Languages

EFLU : The English and Foreign Languages University

IE : Indian English

L1 : First Language

L2 : Second Language

ME : Malayalam English

NB : New Borrowing

NIA : North Indo Aryan

OB : Other Borrowing

OT : Optimality Theory

RP : Received Pronunciation

SB: Sanskrit Borrowing

TE : Tamil English

TE : Telugu English

UG : Universal Grammar

UK : United Kingdom

USA : United States of America

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Read: In the name of thy Lord who

createth, createth man from a clot.

Read: And thy Lord is the Most Bounteous,

who teacheth by the Pen,

teacheth man that which he knew not.

The Holy Quran 96: 1-5

To My Strength:

Ma abong Baba

Md. Juned Ansary & Maryam Bibi

For their Constant Support

Affection and Encouragement.

With all my Love

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This thesis would never have been written without your love and support.

- Hifzur Rahman Ansary

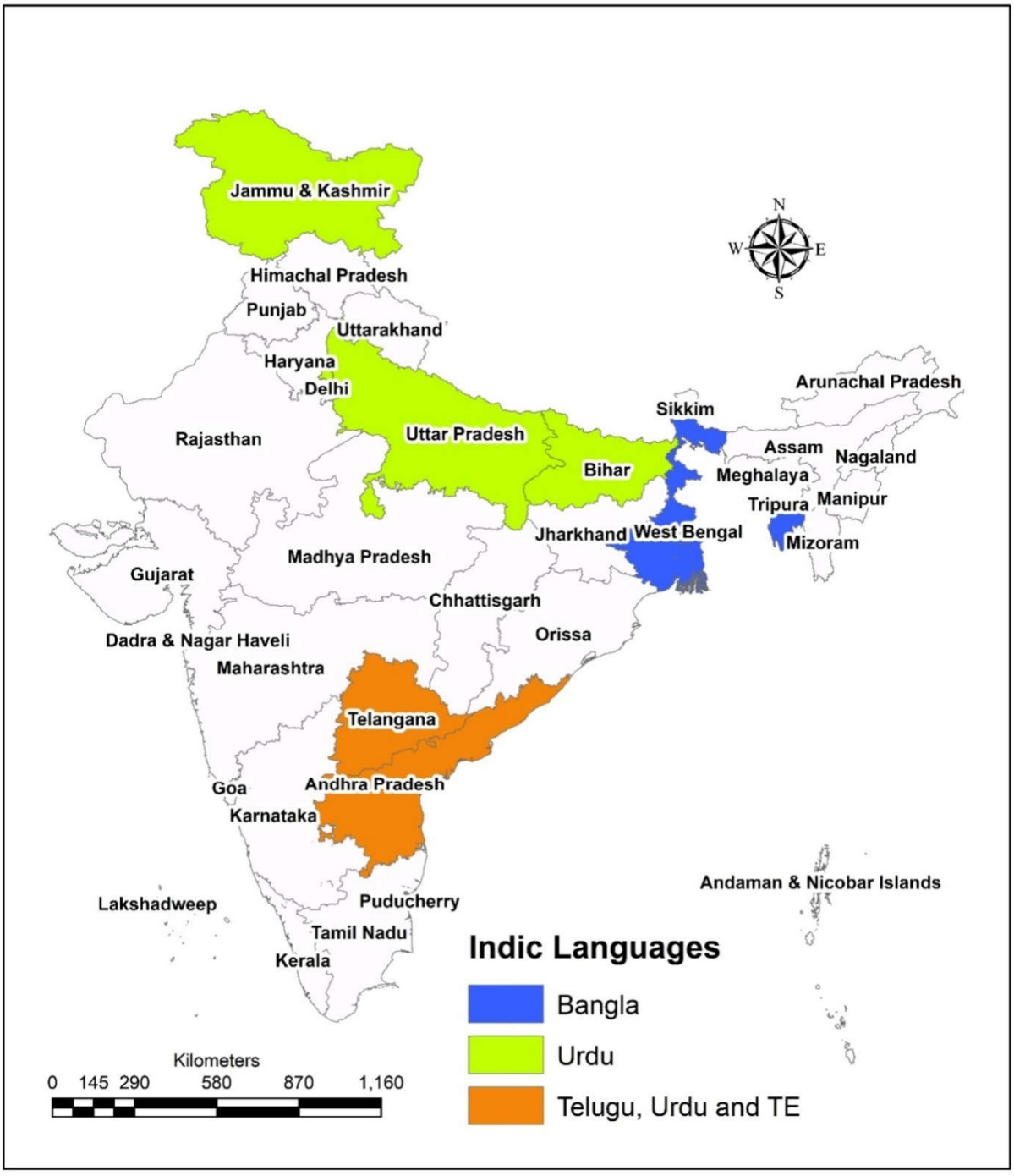

Figure 1: Bangla, Urdu, Telugu and Telugu-English Areas

CHAPTER I

INTRODUCTION

The present study reports a detailed investigation of phonetics and phonological investigations of geminates and gemination in some Indic languages. This work presents the results of a cross-linguistic investigation of word-medial geminate consonants. The investigation of their behaviour in a variety of languages postulates that the word-medial sounds are true geminate consonants, especially in that they exhibit typical dichotomous geminate behaviour. Here dichotomous means that geminates behave both as a unit and as a consonant cluster. Furthermore, the phonetic issues relevant to medial geminates are discussed, and the preliminary data pertaining to these issues are presented. The study also explains how gemination processes present in Indic Languages are transferred to Indian English.

Gemination is a phonological process which is very prevalent in Indian languages. And this feature is quite common in Indian English (I.E.). It is found word internally in Indian English (Punjabi English, Bangla English, Hindi English, Urdu English, Telugu English, Tamilian English etc). English does not register geminates within the word but Indian English allows geminate consonants. A marked feature of Indian English which reflects the strong pull of the mother tongue influence and which is untypical of native English is the phenomenon of gemination in speech. The present section explains how gemination processes present in Indian Languages are transferred to Indian English. There are various reasons for the geminating of consonants in I.E.

1.1 Scope & Objective

The aim of my study is to present a detailed account on phonetic and phonological investigations of geminates and gemination in the following languages- Bangla, Urdu, Telugu and some varieties of Indian English. Geminates (also known as 'long consonants') are consonants that have distinctively longer duration than singleton consonants. The term 'geminate' here applies to consonants in the underlying representation. Gemination is the process whereby singleton consonants are geminated in the output or surface representation.

Geminates are distributed predominantly in the word-medial position, although they are found to occasionally occur also in word-initial (e.g. Didayi and Lahndi) and word-final positions e.g. Lamani and Punjabi (Pandey, 2014). The present work will take up for investigation the distinctive phonetic cues of word-medial geminates in comparison with their singleton counterparts.

1.2 Motivation of the study

There are a number of reasons motivating the study of medial geminates.

i. First and most simply, it is evident that while these segments are found in a substantial number of languages throughout the world, they have not yet been the subject of a detailed, cross-linguistic investigation. Only few individual languages have been the focus of studies on geminates consonants in previous works (such as Lahiri and Henkamer 1988, Kar 2008 on Bangla , Ohala 2011 on Hindi, Lisker 1985 on Marathi, Local and Simpson 1999 on Malayalam, Nagarjan 1985 on Tamil). Since the behaviour of medial geminates may differ according to language specific parameters there is need to at the phenomena in more than languages.

ii. Different representational framework treat medial geminates differently, especially in comparison to consonant cluster. There is need to look the phenomena within a single framework for their wholesome understanding .

iii. The variety of languages studied will give us a better understanding of the phonetic properties of geminates. It has long been held that the primary phonetic correlate of phonological length is the duration of articulation. However, the duration may be difficult to implement or detect in the word-medial position, as will be discussed in greater depth in chapter four. Hence, the study of the perception and production of medial geminates warrants a deeper understanding of how listeners and speakers use phonetic cues to employ phonological distinction.

1.3 Research Questions/Hypotheses

On the basis of (tendencies reported in the typological literature) data collected from the secondary sources the following hypotheses have been proposed.

i. What are the main perceptual cues for geminates in the variety of languages investigated in the study?
ii. What factors play a role in the word-medial distribution of geminates and geminationn?
iii. What factors determine the natural classes of geminates (such as sonorants or voiceless obstruents)?
iv. What is the relation between geminates in the first languages of the speakers and in their Indian English varieties?

1.4 Background on geminates

In some languages geminates (or long consonants) phonologically contrast with singletons (or short consonants). Phonetically, this opposition is expressed mainly as a different duration or length: geminates are acoustically longer than singletons. Geminate consonants are sometimes referred to as double consonants although this definition is more closely related to the traditional spelling by using the two identical grapheme to imply a geminate.

Durational increase is indicated in the definition of geminate consonants, the degree of lengthening differs across languages. For example, Ladefoged and Maddieson (1996) report that geminate stops can be between one and a half to three times longer than singletons, in careful speech.

Geminates are not uncommon in the inventories of Urdu, Hindi, Bangla, Odiya, Marathi, Dogri, Tamil, Telugu, Kannada, Singhalese and Santhali, among others. Example 1. shows a geminate-singleton minimal pair in Urdu.

(1) Urdu: /paṭa/ 'address' - /paṭṭa/ 'leaf'

Plain short consonants are clearly more wide-spread than geminates which suggest their unmarked nature compared to singletons: Maddieson (1984) reports 11 languages with consonants length contrast in a database of 317 languages. This imbalance is likely to find an explanation in an articulatory effort-based approach. For example, geminates are ranked lower than singletons in Kircher (1998)'s effort-based hierarchy of segments.

1.5 True and fake geminates

Geminates are traditionally divided into three categories, i.e. lexical (underlying, "true") geminates into which assimilated geminates, resulting from a total assimilation in consonantal clusters, are typically included, and concatenated ("fake") geminates -

formed/constituted as a combination of two identical consonants at the juncture of morphemes or words. Examples of underlying, concatenated, and assimilated geminates in Bengali are shown in 2 - 4 (extracted from Lahiri and Hankamer, 1988).

(2) Underlying: /paṯ̪ta/ [paṯ̪ta] "whereabouts"

(3) Concatenated: /paṯ̪ +ṯ̪e/ [paṯ̪ + ṯ̪e] "spread out" (infinitive)

(4) Assimilated: /kor + ṯ̪e/ [koṯ̪ + ṯ̪e] "do" (infinitive)

1.6 Geminate Inventories

Vowel-length contrasts are more common cross-linguistically than consonant-length contrast, it is reasonable to speculate as to whether there are any implicational relationships relating to sonority which hold of geminates. Some languages have only geminate sonorants. For example, Gilbertese and Manam have only geminate nasals. There are languages which have only geminate obstruents. These include Nhanda, Djinang, and Ojibwe. In Nhanda geminates are the result of sonorant fortition followed by assimilation. As a consequence, there are no geminate sonorants in the language. In Ojibwe, where geminates are the result of historical assimilation of earlier laryngeal-obstruent clusters, the length contrast is also limited to obstruents (Bloomfield 1946). A case parallel to Ojibwa, where voiceless geminates are the reflex of earlier hC and ʔC cluster, is proposed for Anejom, a language of Vanuatu (Lynch 2000: 24).

The tendency for geminate oral stops to be voiceless as opposed to voiced is noted by Klingenheben (1927), and has been argued to follow from the aerodynamic properties of stop produced (Jaeger 1978; Ohala 1983a). The general argument is that, the longer the stop closure, the more difficult it is to sustain voicing. Supraglottal air pressure build up will reduce vocal-fold vibration unless some active step is taken to increase the volume of the supra-glottal cavity.[i]

This phonetic explanation accounts straightforwardly not only for the general rarity of voiced geminate stops, but also in place-based restrictions within the set of voiced stops. For example, in Nubian (Bell 1971), a case of boundary lengthening leads to gemination of all consonants with the exception of /d, ʤ, g/ which devoice in the same context. Under the boundary lengthening, however, /b/ is realized as [b:]. Because labial stops create larger

supraglottal cavities than other stops produced further back, voicing can be maintained longer (Ohala 1983a).

Other problems occur with other segment- or feature-specific constraints on geminates. Although there are languages like Hebrew and Tiger where geminate guttural are prohibited, there are others, like Ge'ez, with contrastive gemination for the same gutturals. And while geminate /h/ is not found in Hindi, Punjabi, Bangla or Amharic, it does occur in Taba and Marshallese. Geminate glides /y, w/ are the only consonants left out of the geminate contrast in Meidob Nubian and they are also not found geminated in Toba, but geminate glides occur in Marshallese and Dobel, and Dobel also has a contrast between long and short glottal stop. Podesva (2002) proposes a constraint *SS which prohibits geminate voiceless fricatives,[ii] based on a claim that geminate fricatives require greater articulatory precision than geminate stop. However, there is no evidence that this constraint plays a general role in restricting geminate inventories. Of the 52 languages listed in Podesva's investigation of this feature, only three, Gilbertese, Chaha and Wolof lack geminate voiceless fricatives.

Some languages like Totonac, Erromangan, and Yurok do not have a phonological length contrast for consonants, while others like Gooniyandi, Marshallese, and Dobel show length contrasts for all non-vocalic segments. Between these two extremes, there is great range of systems, with no clear instantiation of universal phonological constraints on geminate inventories. In many cases, geminate inventories appear to be a direct reflection of specific instances of geminate evolution, or combinations of them, and nothing more (Blevins 2004).

1.7 Geminate distribution

In Pattani Malay, length contrasts in word-initial position is found for all consonants, including the voiceless unaspirated stops (Abramson 1986: 6). Abramson (1986) observes that the longer geminate closure/constriction durations for sonorants, fricatives, and voiced stops may be cued by intrinsic features of these sounds, however, the same is not true for the voiceless unaspirated stops whose contrast is cued only by a shorter versus longer medial silent gap when these sounds are utterance-medial. Abramson's (1986) perceptual experiments show that speakers do not have difficulty distinguishing these pairs in running speech. He concludes that long versus short closure duration is a sufficient cue for the geminate/non-geminate contrast. This is not surprising since the mean duration of word-

initial and word-medial geminate stops in a carrier phrase was three times longer than their short counterparts (Abramson 1991). In isolation, however, where durational differences in the initial syllable. Other factors which may play a role in the initial position are intensity of burst, rate of formant transitions, and fundamental frequency contours.[iii]

In Taba (Bowden and Hajek 1999), which also shows word-initial geminate/ singleton contrasts, phrase-initial geminates show variation across the hyper-to-hypo articulation continuum. In careful speech, phrase initial geminates are realized "with a greater degree of tension and more articulatory force"; while in casual speech "they can be realized with the same reduced tension and articulatory force as singletons" (Bowden and Hajek 1999: 144). This sort of variation in phrase-initial position is expected, since it is precisely in initial position that the closure duration of a voiceless stop is difficult to perceive due to the absence of a cue for the onset of stop closure. In Swiss German, word-initial geminates are shortened, with neutralization of the length contrast, when a preceding word ends in an obstruent. However, phrase-initially and phrase-finally, the contrast in closure duration between singletons and geminates remains. In phrase-final position, release makes the closure duration audible, and there is no evidence of neutralization. In phrase-initial position, however, perceptual studies show that listeners, who rely on closure duration as the primary cue for this contrast, are unable to distinguish voiceless singleton and geminate stops in this environment (Kraehenmann 2001: 138).

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Blevins (2004) suggests that the phonetic variation and perceptual neutralization found in these case studies of initial geminates are two distinct sources for divergent pathways of geminate evolution. In careful speech, hyperarticulation of initial geminates can result in shifts from geminate consonants to fortis or aspirated consonants. In normal or casual speech, the geminate closure duration is produced, as in phrase-medial contexts, but insufficient perceptual cues result in a singleton percept, giving rise to the evolution of word-initial degemination. Many instances of each development are found in the historical record. In Tuvaluan, a Polynesian language (Milner 1958), unstressed vowel deletion gave rise to initial geminates which were subsequently reinterpreted as aspirated stops: **ke-k'emo >kk'emo >k^{h}'emo* 'blink'; **pu-p'uni >pp'uni >ph 'uni* '(be) shut, blocked'; **ta-t'aki >tt'aki >th 'aki* 'lead,' etc. in line with hyperarticulation. An instance of the second development is incipient in the Thurgovian dialect of Swiss German, and appears to have occurred in the Lac Simon dialect of Ojibwa, where medial geminates have undergone degemination word-initially (Hock 1991: 163–64).

The other position in which there is evidence for neutralization of geminate contrasts is word/phrase-finally. In this context, non-release gives rise to indistinguishable voiceless oral stop closures for the contrasting geminate and singleton, with resulting historical degemination with source in change. In dialects of Afar where some final vowels are lost, the geminate contrast has been lost as well. Compare *oob <*oobb* 'hear' in Eritrea and Wollo with *obbiy* in Shewa and Assab (Bliese 1981: 243). However, in the history of Balto-Finnic, final vowel loss has not resulted in degemination. In Estonian, Proto-Balto-Finnic medial geminates are continued as final geminates: **meekka >miikk* 'sword,' **hullu >hull* 'crazy'; **verkko >v-Irrkk* 'net'; **loppu>l-Ipp* 'end' where voiceless stops have audible release.[iv]Other languages with word-final geminate/non-geminate contrasts include Berber dialects (Louali and Puech 1994; Ouakrim 1995; Dell and Elmedlaoui 1985, 1996, 1997) and SaipanCarolinian (Jackson 1984a, b).

1.8 Schema of the chapters

The range of problems to be discussed in this dissertation falls into five main parts. The opening chapter demonstrates the basic pattern of geminates and gemination of Bangla, Urdu, Telugu and Indian English. It gives the phonetic inventory of the languages. The present chapter provides the types and explanation of geminates and gemination.

The second chapter delineates/contains a literature review of phonetic and phonological issues related to word-initial, word-medial geminates, with a focus on the production and perception of geminates. It also provides the information about the general methodology.

The third chapter presents the phonological system of Indic Languages and reexamines the surface morphophonological alternations that have been observed. It also gives phonological sketches of Bangla, Urdu, Telugu and Indian English. It tries to show how the patterns of gemination present in Indian Languages(L1) are transferred to Indian English.

The fourth chapter reports the discussion of phonology of geminates. Here the discussion of generative phonology, SPE (Sound pattern of English), CV Phonology, Autosegmental phonology and Inalterability, have been presented exhaustively. This chapter also presents detailed investigations on descriptive phonological processes in Bangla, Urdu and Telugu.

The fifth chapter deals with the phonetic study of geminates. It also presents the detailed discussion on singleton and geminate consonants of Bangla, Urdu, Telugu and Telugu variety of Indian English. It also describes the vowel lengthening of the preceding as well as following vowel lengths of the above mentioned languages. This chapter deals with consonant length. It is concerned with the description and interpretation of geminates within morpho-phonological processes.

The six chapter describes the conclusion and the implications of further studies in the field of medial geminates in Indic languages

1.9 Research Methods

1.9.1 Selection of Informants and Procedure

The study would require methods that involve fieldwork and evaluation of primary as well as secondary sources through phonemic and phonetic transcription. The primary data will mainly be collated & collected and crosschecked as much as possible from the informants utilizing the file methodology such as questionnaires, interviews, translations, examples and illustrations, and observations (Abbi 2001). The data will be collected from the concerned areas like Standard Telugu from Hyderabad (Telengana), Standard Urdu from Delhi and Standard Bangla from Purulia, Burdwan and Kolkata (West Bengal). The informants will be given a sheet where geminate plus non-geminate words will be written on it. An equal number of male and female participants will be included to examine whether gender influence in any way. The participants will be adult native speakers of the respective language. The informants will be chosen at random, in the sense that the researcher had no pre-conceived notion about their spoken language. The minimum qualification will be Graduation and the informants will be in the age group of 20-50 years. Ten speakers will be recorded. In selecting the speakers, their educational, regional and occupational backgrounds will be taken into consideration. But care will be taken to see that none of them had any formal training in phonetics.

Questionnaires prepared as typological tools for field linguistics developed by Department of Linguistics, Max Planck institute for Evaluationary Anthropology (MPI-EVA) that provides a framework for the description of a language has been taken into consideration in interviews. Certain improvisations and necessary modifications have been made to this questionnaire wherever demanded. Along with it, word list suggested by Abbi (2001) and word lists prepared by SIL have been used for data collection.

PRAAT software developed by Paul Boersma, University of Amsterdam, would be used for identification of the sound system.

1.9.2 The Text

The text will be used for all recorded specimens comprises three sections:

Section 1 : A word list comprising fourty geminated words.

Section 2 : Twenty noun phrase comprising gemination.

Section 3 : Twenty sentences.

Besides, each speaker will be asked to speak for a few minutes on any topic of his/her choice which will also be recorded. The same text will be given to all speakers in order to make a comparative study of the speakers.

1.9.3 Recording

The speakers will be recorded in quite surroundings. The recorder that will be used for recording all the speakers will be a Sonny Recorder. After the recording of data from one informant it will be played back to ensure that the recording was clear and audible.

1.9.4 The Materials Used

The Secondary data for the research will be collected from various secondary sources which include articles, grammar books, M.Phil & PhD dissertations, research journals, texts in Indic languages.

1.9.5 Data Analysis

The speech samples will be acoustically analysed to check the presence of gemination in specific environments. For acoustic analysis PRAAT (by Paul Boersma, University of Amsterdam), a standard software for instrumental analysis of speech sounds will be used.

The recording of each informants will be played on the recorder, will be carefully evaluated and examined to and transcribed phonetically. The speech samples of the informants will be transcribed and analyzed to assess the pattern and the duration of consonant length features.

CHAPTER II

LITERATURE REVIEW

2.0 Survey of the existing research literature in the area

In the following section We review some of the background literature on the lines of geminate consonants. The literature review will be organised into three major categories: phonetic, phonological and typological. In this study We consider evidence from all the major three areas of research.

Following the review of studies on geminates We present a number of explanations for geminate typology propounded in the previous literature.

2.1. Phonetic studies of geminates

Ham (2011) provides an overview of a number of phonetic studies of geminate and addresses that most of the studies are directed at establishing the acoustic correlates of gemination, agreeing for the most part that duration is the major phonetic cue to gemination. A perceptual component of these studies is usually focused on determining the perceptual boundary between singleton and geminate consonants, i.e. the durational value that corresponds to the categorical shift in perception. Another question frequently asked in the phonetic literature on geminates is whether any phonetic differences can be found between geminates of various origins: lexical, concatenated, and assimilated.

Here We briefly summarize several representative studies, although many more of a similar structure are available for a variety of languages.

Lahiri and Hankamer (1988) investigated the acoustic correlates of geminate consonants in Turkish and found that only duration played a crucial role in the perception of the consonants although both Voice Onset Time (VOT) and closure duration systematically varied with gemination. They also demonstrated the issue of possible phonetic differences between underlying, concatenated, and assimilated geminates using material from Bengali and concluded that such differences could not be determined.

Hankamer et al. (1989) examined the perception of consonant duration contrast in Turkish and Bengali. They established that if stimuli were created by shortening geminate consonants a perceptual shift from singleton to geminates was observed on average 8 ms earlier than for

stimuli created by lengthening singleton consonants. This effect was observed mainly in the medial duration range, where consonants were not obviously short or long and the durational cue was not very informative. They hypothesized that acoustic cues other than increased duration are involved in production and perception of geminate consonants. Listeners rely predominantly on the primary cue when its contribution is most revealing. While secondary cues affect perception of durational categories when duration of the target consonants is ambiguous. However, none of the eight additional acoustic measurements showed a correlation with the perceived geminacy.

Lisker (1985) observed a similar shift of the perceptual boundary between singletons and geminates, conditioned by the nature of experimental stimuli. Stimuli created on the basis of Marathi words with singletons were identified as long as a longer duration than stimuli created on the basis of words with geminates. This effect was observed only for the listener who was a native speaker of Marathi. It appears that only native speakers are sensitive to secondary cues to the phonological contrast present in their language.

Similar studies were conducted for the variety of languages with geminate consonants, including Hindi (Ohala, 2007; Samudravijiya, 2003), Malayalam (Local and Simpson, 1999), Swiss German (Kraehenmann, 2001; Kraehenmann and Lahiri, 2008), Kentani Malay (Hamzah, 2010), Pattani Malay (Abramson, 1986, 1987, 1991, 1999a,b, 2003), Cypriot Greek (Arvaniti, 1999, Arvaniti and Tserdanelis, 2000; Muller, 2001), Finnish (Doty et al., 2007), Italian (Esposito and Di Benedetto, 1999; Faluschi and Di Benedetto, 2001; Farnetani and Kori, 1986; Giovanardi and Di Benedetto, 1998; Mattei and Di Benedetto, 2000; Payne, 2005; Pickett et al., 1999)

2.2 Phonetic and Phonological Length

At the phonological level, languages are found to make common distinctions between short and long vowels or consonants, and more rarely, between short, long, and extra-long vowels or consonants. In languages with a phonological contrast between long and short consonants, the most salient acoustic correlate for stop consonant length is closure duration (Lahiri and Hankamer 1988; Hankamer et al. 1989; Cohn et al. 1999; Kraehenmann 2001).

In addition, some languages appear to require a distinction between "true" and "false" geminates. True geminates are phonetically long segments that contrast with phonetically short segments in a phonemic inventory. Fake geminnates are phonetically long segments that are not contrastive (Blevins 2004). As interesting as the Tashlhyit Berber results are,

they nonetheless conflict with those reported by Lahiri and Hankamer (1988), who found no preceding vowel duration differences for true and fake geminates in Bengali. The conflict results may, however, be due to a difference in the type of fake geminates that were examined in the two studies. Whereas Ridouane (2010) examined fake geminates that arose across a word boundary, Lahiri and Hankamer examined fake geminates that arose through affixation. The latter segments arise when morpheme concatenation results in a sequences of identical consonants, occur in many language which do not have true geminates. For example, in English, false geminates occur across word boundaries in compounds like rat-tail, cash-shortage etc. These are referred to as false geminates because consonant length is not distinctive in English. In English, there are no minimal pairs where consonantal length is involved. Word-internal assimilated fake geminnates were compared to word-internal concatenated fake geminates. Assimilated geminates arise in English with the Latinate prefix *in*-(e.g., *immoral*), where as concatenated geminates arise with the Germanic prefix *un*- (e.g., *unnamed*).

There are three types of geminates in the world's languages: Lexical, Assimilated and Concatenated (2011). **Lexical geminates** are given in the lexical and are part of the phonemic inventory (e.g. [pəkɑ] 'cook' vs. [pəkkɑ] 'firm' and [cuni] 'selected' vs.[cunnii] 'scarf' in Hindi and Punjabi). **Assimilated geminates** arise when one segment takes on the identity of the preceding or following segment at a word-internal morpheme boundary (e.g. [uʈ̪] 'excessive' + [likʰiʈ̪o] 'written' = /ullikʰiʈ̪o/ 'mentioned above' and [uʈ̪] 'excessive' + [lɑ:ʃ] 'a woman's dance' = /ullɑʃ/ 'joy'; kor + ʈ̪e = koʈ̪ʈ̪e 'do infinitive') in Bangla. **Concatenated geminates** arise from identical consonant sequences that span a morpheme boundary within a word or in a phrase (e.g. / baɖ̪+/ʈ̪ari:n/ →/baʈ̪ʈ̪ari:n/ 'worst'; /sac/ → /saccai/ 'truth' in Urdu; paʈ̪ + ʈ̪e → paʈ̪ʈ̪e 'spread infinitive' puʈ̪ +ʈ̪e → puʈ̪ʈ̪e 'burry infinitive' etc. in Bangla). Geminates can also arise through morphological derivation (e.g., Bangla). For example,[uʈ̪] + [likʰiʈ̪o] = /ullikʰiʈ̪o/ 'mentioned above' and [uʈ̪] + [lɑ:ʃ] = /ullɑʃ/ 'joy'. etc.

In phonological treatments it has been argued that morpheme-internal geminates and geminates which arise via assimilation are true geminates, and that in all languages with an underlying consonantal length contrast, true geminates contrast with non-geminate consonants (McCarthy 1981, 1986, Schein and Steriade 1986; Hayes 1986a, b).

Fake geminates are those which arise via morpheme concatenation (without obvious assimilation), and can occur in languages which lack underlying length contrasts.

2.3 Phonological studies of geminates

The two main approaches to geminate representation has been a debatable issues in the literature include the length analysis and the moraic analysis. The first one approach is that the geminates are linked to two slots on the skeletal tier (Leben, 1980, McCarthy, 1979), and the second one connects them to two root nodes (Selkeirk, 1991). This representation encompasses the length of geminates and allow their parts to behave independently under some phonological conditions.

Geminate integrity and inalterability (Hayes, 1986a, b; Kenstowicz, 2973; Kirchner, 2000; Schein and Steriade, 1986) supportes a multiply-linked representation of geminates adopted in the skeletal approach. **Integrity** refers to the resistance of geminate consonants to phonological processes that violate the unity of the segment, for example, epenthesis, supporting the view of geminates as single units on the segmental tier. In Arabic, vowel epenthesis affecting certain consonant cluster, including concatenated geminates, does not apply to underlying geminates (example in 5 from Palestinian Arabic, from Dmitrieva O 2012).

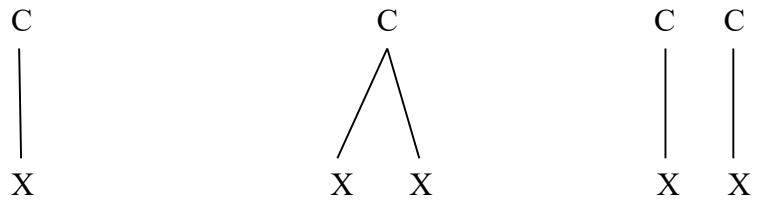
(1) /sitt/ * [sitit] "grandmother" (monomorphemic)

/fut+t/ [futit] "entered" 1 p.sg. (concatenated)

Languages with reported geminate integrity effects include Semitic languages (Palestinian Arabic, Tunisian Arabic, Classical Arabic, Moroccan Arabic, Tiberian Hebrew, Amharic), Berber languages, Pero (a Chadic language), and **Kolami (Central Dravidian).**

McCarthy (1979) and Leben (1980) establish an analysis of geminates based on Goldsmith's (1979) theory of *Autosegmental Phonology* known as CV Phonology. CV representations further divide the autosegmental feature matrices into two *tiers*; a melodic tier containing the feature matrices and a skeletal tier containing *timing slots*. The common form appears as shown in (6).

(2) a. singleton b. geminate c. cluster



2.3. 1 Inalterability

Inalterability refers lenition processes: voicing, spirantization, flapping, gliding or complete loss of a consonant. Geminate resistance to such processes is called geminate inalterability. In other words Inalterability of geminate is the tendency of geminates to escape rules whose application would modify one half of the geminate while leaving the other unchanged. For example, intervocalic alveolar fricatives become voiced but geminates resist this process in varieties of Italian spoken in the northern parts of the country, as shown in 7.

(3) casa /kasa/ [kaza] "house"
cassa /kassa/ [kassa] "cash register" (Dmitrieva O 2012)

The case of geminate inalterability is found in Tigrinya language (Kenstowicz 1982). In Tigrinya, the singleton velar /k/ spirantizes to [x] in post-vocalic position (cf. *ʕarat-ka* 'bed-2sg.masc,' *kətəma-xa* 'town-2sg.masc'), but this spirantization is blocked in geminates (*k'ətəl-na-kka* 'we have killed you').
Post-vocalic spirantization fails to apply in underlying geminates:

(4) [kʌlbi] "dog" -[ʔaxalɨb] "dogs"
but: [fʌkkʌrʌ] "he boasted" (Dmitrieva O 2012)

2.3.2 Degemination

Degemination is the phonological process (a form of lenition) in which a geminate consonant is reduced to a simple one. Degemination is common, for example, in the development of Sanskrit from Bangla: Bang. [put̪t̪ro] > Sans. /put̪ra/ 'son'; Bang. [pɔɖ̪.ɖ̪o] > Sans. /paɖ̪ma/ 'lotus'; Bang. [biʃʃaʃ] > Sans. /bis.ʋas/ 'faith/trust'.

This process is also found in Marathi and Tamil. For example,

Geminates, which always occur intervocalically in Marathi, become degeminated when a following vowel is deleted because of suffixation.

(5) i. gãmmaʈ̪-i-ne → gamʈ̪ine

joke-incr-inst jokingly

ii. hĩmmaʈ̪-i-ne → himʈ̪ine

courage-incr-inst courageously

iii. ʈ̪ippaʈ-i-ne → ʈ̪ipʈine

three times-incr-inst three times

(Pandharipande R.V 1997,p-570)

These instances demonstrate the nouns with suffix that harmonize C_2 of the noun and thus undergo degemination.

In Polish degemination applies to a monomorphemic stem-final geminate [l] and to a potential 'fake' geminates [s] that would be created across an affix boundary. What these two cases have in common is the fact that a geminate is blocked due to the presence of an adjacent following consonant. For example -

(6) Degemination preconsonantally

sɛvill-a 'Seville' sɛvil-ski 'Sevillian' *sɛvill-ski

Degemination also occurs word-finally. Stem-final geminates surface when followed by a vowel suffix, but degeminates when no (or zero) suffix is present on the stem. For instance, Degemination word-finally

(7) fɔntann-ɨ ‘fountains’ (Nom.) fɔntan (Gen.) *fɔntann

fɔtɨll-ɛ ‘fleets’ (Nom.) fɔtɨl (Gen.) *fɔtɨll

lass-a ‘lassoes’ (Nom.) las (Gen.) *lass

(Pajak 2009)

2.3.3 Antigemination

Antigemination refers to sound patterns where phonological syncope rules are sometimes blocked from applying if their output would create a sequence of adjacent identical consonants. This recurrent sound pattern was first introduced and analyzed by McCarthy (1986). McCarthy argues that antigemination is a consequence of the Obligatory Contour principle (OCP) which prohibits adjacent identical elements in phonological representation. Previously McCarthy extended a constrain on lexical representation, Obligatory Contour Principle (OCP) exert an active influence on the mapping between underlying and phonological surface forms.

Odden (1988) presents serious theoretical and empirical criticism of the OCP-based account of anti-gemination. First, he highlights weaknesses related to phonological representations and notions of adjacency. Within McCarthy's model, anti-gemination is predicted to apply to tautomorphemic derived CiCi sequences, but not to heteromorphemic sequences, since morphemes are claimed to define independent "tiers". Where anti-gemination is expected but not found morpheme-internally, McCarthy analyses the segments in question as long-distance geminates. Where anti-gemination is not expected but attested across morphemes, tier-conflation is claimed to apply prior to syncope. As Odden notes, the freedom to represent CiViCi sequences as long-distance geminates when necessary to allow syncope, combined with the freedom to order tier-conflation before syncope to derive intra-morphemic anti-gemination greatly weakens the predictive power of the model. An important empirical observation is that anti-gemination is not found in certain languages. Odden concludes that OCP is not a principle of Universal Grammar.

Blevins (2003, 2004) reviews all cases where anti-gemination is attributed to the OCP. A striking finding is that in nearly every case, the failure of regular syncope to apply between adjacent identical consonants can be attributed to paradigm internal anti-homophony effects. This is a welcome result, since there is no plausible phonetic explanation for the failure of syncope between identical consonants.

2.4 Typological studies of geminates

Phonetic and phonological studies works of patterns of geminate and gemination across languages are available where as typological works are not available focusing on evidence from individual languages. Jaegr (1978) established that voiceless obstruent geminates were

significantly more frequent than voiced ones and provided an explanation based on the aerodynamics of voicing. He also noticed/addressed that nasals constituted the most frequent class of geminate consonants across languages, with 16 languages that allowed only nasal geminates.

Taylor (1985) observed that the presence of geminate sonorants frequently implied a presence of geminate obstruents, with the addition that whenever sonorant consonants were found in the language they were quite likely to be allowed as geminates. He also noticed that voiceless obstruents geminates and stop geminates are more preferable than voiced obstruents geminates and fricative geminates. He concluded that medial geminates are the most common than word-final ones, while word-initial ones are categorically rare. Taylor also addressed that gemination could be triggered by stress (in Somali, Spanish, and Icelandic). He writes: "the probable explanation here is that phonetic length is often a correlate of stress and that length gets extended or transferred onto the following consonants".

Thurgood & Demenko (2001) demonstrate the phonetic realization of the three Polish geminate affricates /tsts/, /tɕtɕ/ and /ʧʧ/; the first two are morphologically derived, the third geminate is lexical. Their study shows that all the phonologically geminate affricates are phonetically manifested variably: sometimes by re-articulation of the affricate, sometimes by lengthening the duration of the stop closure component.

In the production of the phonologically geminate affricates /tɕtɕ/ and /ʤʤ/ Thurgood (2001) found two patterns; they were sometimes phonetically manifested as a singly articulated geminate and sometimes as a doubly articulated sequence. But the voiced geminate /ʤʤ/ showed the reverse pattern. Their present study goes beyond in a number of ways. First, their study is a production task involving reading. Second, they expanded the geminates studied to include all three of the Polish voiceless geminate affricates: /ʧʧ/, /tsts/ and /tɕtɕ/. Third, they found differences between the lexical geminate /ʧʧ/ and the derived geminates /tsts/ and /tɕtɕ/. Fourth, length was sometimes manifested in the fricative component. Their results substantiated Thurgood's (2001) earlier finding that Polish geminate affricates are sometimes marked by double articulation and sometimes by a long component in the stop closure. The experiment suggested that derived geminates are longer than lexical ones.

Podesva (2002) proposes a constraint *SS which prohibits geminate voiceless fricatives,[v] based on a claim that geminate fricatives require greater articulatory precision than geminate stop. However, there is no evidence that this constraint plays a general role in restricting

geminate inventories. Of the 52 languages listed in Podesva's investigation of this feature, only three, Gilbertese, Chaha and Wolof lack geminate voiceless fricatives.

Some languages like Totonac, Erromangan, and Yurok do not have a phonological length contrast for consonants, while others like Gooniyandi, Marshallese, and Dobel show length contrasts for all non-vocalic segments. Between these two extremes, there is great range of systems, with no clear instantiation of universal phonological constraints on geminate inventories. In many cases, geminate inventories appear to be a direct reflection of specific instances of geminate evolution, or combinations of them, and nothing more (Blevins 2004).

Muller (2001) explored on word-initial geminates and compiled a database of 29 languages with word-initial consonant length contrast. The survey demonstrated that the languages with initial geminates were not uncommon as previously thought. The survey also recorded languages with medial geminates, with only few exceptions (Ngada, Nhaneun, Pattani Malay, Sa'aban). He observed word-final appeared more common than word-initial gemination. Or as Taylor (1985) put it, word-final geminates are possibly avoided in conjunction with word-final geminates: "to avoid a difficult question of what to do when a word ending in a geminate is adjacent to a word beginning in the same or even another geminate".

Maddieson (2008) undertook a survey of 40 languages focusing on the type of geminate consonants. He agreed with Podesva (2002) that stops were commonly found as geminates. He also demonstrated that nasals were common, though Noon (Soukka 2000), excludes nasals from its inventory. Maddieson (2008) agreed with Podesva (2000) that stops and nasals were more frequent than fricatives, liquids, glides and [h].

The general patterns of gemiantes typology suggested by Podesva (2002) and Maddieson (2008) was supported by Taylor (1985). Stops and nasals were among the most common followed by liquids, fricatives, glides and affricates.

Thus, the picture shows that intervocalic geminates are more common pattern than geminates in all other environments, including word-final and word-initial. With respect to the differences between word-initial and word-final context, word-final geminates are reported to be more common than word-initial ones. In terms of nature of the consonant itself, the general pattern is that obstruents are more common than that of sonorants. Among stops

geminate more often than obstruent fricatives. Among stops voicing is avoided in geminates. Nasals are often geminated despite being sonorants and some languages limit their geminate inventories to nasals.

2.5. Explanation of typological patterns

2.5.1 Types of explanation

Good (2008) distinguished the three main approaches to explaining linguistic patterns: structural, historical and external. The structural approach explains universal patterns in linguistics to the universal properties of the grammar (Kiparsky, 2008b). The historical approach demonstrates linguistic patterns as a results of widely attested patterns of sound change (Blevins, 2004a). The external approach explores patterns in linguistics by referring to constraints on production and perception of speech, general properties of human cognition, physiology and psychology (Hayes et al., 2004; Ohala, 1981, 1983).

2.5.2 Geminate to singleton ratio

Geminate -singleton contrast depends on the degree of duration. It differs the ratio between the average singleton duration and the average geminate duration. Aoyam and Reid (2006) explored geminate consonants in Guinaang Botok, a language with geminate consonants of all manner of articulation. They proposed that glides with least frequent geminates, have the smallest duration ratio between average geminate and average singleton duration compared to stops and nasals.

Ridouane (2007) records data on the duration of geminates and singletons in Tashlhiyt Berben in a variety of contextual positions which can be used to calculate the corresponding ratios. His data establish that the duration ratio in this language is higher in word-initial and word-final than in intervocalic position: Intervocalic <Initial<Final (for fricatives) and Intervocalic < Final (for stops- not measured in word-initial position).

2.5.3 Allophonic duration

Allophonic duration is allophonic increase in segmental duration under certain conditions, such as lexical or emphatic stress, or prosodic boundary lengthening, can be geminated, resulting in cross-linguistic increase of geminate-singleton contrasts in certain contexts. Thurgood (1993) recorded duration as one of the most common correlates and attributes grmination in post-stress position to the general tendency for durational increase in stressed syllables. He also observed that stressed vowels preceding geminate consonants are often and

suggested that "in those instances, the stress is manifested in the consonantal rather than in the vowel quality".

Blevins (2004a) also demonstrates the tendency of segmental length allophonically under stress as a source of stress-related gemination: "the simplest explanation of lengthening under stress is that length is a direct phonetic manifestation of stress" and "length difference is stressed syllables are great enough to give rise to geminate/singleton contrast (Blevins, 2004a, p.173); "syllables are longer under stress, and the phonetic length of consonants is reinterpreted as contrastive".

2.5.4 Historical

According to Blevins (2004) there are at least seven identifiable pathways by which a single segment can be transformed into geminate consonant, resulting in the evolution of a consonantal length for a given language. She distinguishes seven paths in which geminates are believed to occur diachronically including

1. Assimilation in consonant clusters
2. Assimilation between consonants and adjacent vowels or glides
3. Vowel syncope
4. Lengthening under stress (including expressive lengthening)
5. Boundary lengthening
6. Reinterpretation of a voicing contrast (t --> [tt], d -- > [t])
7. Reanalysis of identical C+C sequences

2.5.4.1 Assimilation in CC cluster

Assimilation refers to the change of one sound into another sound because of the influence of neighbouring sound. Nida (1949:21) describes it as "a process by which phonemes are made similar". Crystal (1985: 25) defines it as "a term in phonetics which refers to the influence exercised by one sound segment upon the articulation of another, so that the sounds become more alike, or identical". **For example, in Bangla** [biʃɔrɟon] becomes /biʃɔʄʄon/ "sacrifice".
Several types of assimilation can be recognised. It may be partial or total. A phrase like ten bikes, in colloquial speech, would be pronounced as */tembaiks/* and not */ten baiks/*. In this case the assimilation has been partial. The alveolar consonant /n/ has become /m/ by adopting the bilabiality of /b/. It has, however, not adopted its plosiveness. Consider again a phrase

like that place pronounced as /*ðəpleɪs*/. Here the /t/ becomes identical with /p/ which influences it. In this case the assimilation is total.

Another classification of assimilation is in terms of whether the change of the sound involved is the result of the influence of an adjacent sound or of one further away. This is known as contiguous or "contact" assimilation. An example of non-contiguous or "distance" assimilation also known as vowel harmony would be an instance from Telugu, where [məniʃi+lu] becomes [mənuʃulu] "human beings". Here, the affected vowel (viz /i/) are not immediately followed by the affecting vowel (viz. /u/).

In Bangla, sonorant-obstruent sequences have undergone regressive assimilation and subsequently gives rise to geminate. For example, [ʃɔrgo] → /ʃɔggo/ 'heaven', and [d̪urbol] → /d̪ubbol/ 'weak' etc.

(8) Cluster assimilation with resulting geminate

$C_1\ C_2 > C_2\ C_2$

2.5.4.2 Assimilation in VC, GC

Luganda has a contrast between geminate and non-geminate consonants in initial and medial position. In Luganda inherited geminates are the result of historical assimilation between a consonant and a preceding super-high front vowel (Meeussen, 1967, 1980; Guthrie 1967–71): *-bba-* 'steal' <*-*jib-*, *-dduka-* 'run' <*-*jiduk-*, etc. In many Bantu languages thereconstructed super-high noisy vowels have been shown to be associatedwith the evolution of a noisy consonant or noisy consonant transition (Hyman 1998, 1999). From the series of historical developments recorded by Hyman (1999) it seems likely that the phonetic identify of the noisy vowel differed between a more vocalic sound and a syllabic sibilant or fricative vowel. The sound change reporting for Luganda geminates in (3) is similar to (2) except that the segment to which the consonant assimilates was once a vowel, constituting both a potential stress- and tone-bearing unit in the language.

(9) Assimilation to vowel with resulting geminate

$V^h\ C^2 > C^2\ C^2$ (where V^h is close high noisy vowel)

2.5.4.3. Vowel syncope between identical consonants

In many Austronesian languages vowel deletion between identical consonants has given rise to geminates (Blust 1990). Languages including Mussau of the St. Matthias Archipelago north of New Ireland, Tuvaluan, Kapingamarangi, and other Polynesian languages showing historical loss of vowels between identical consonants (Milner 1958; Biggs 1978). The same thing happens in Trukese and other Micronesian languages (Goodenough 1963). In Dobel, there is evidence that the sound change is still in progress: compare *k^w a-k^w 'asa, kk^w asa* 'crocodile,' *sa-sar, ssar* 'sandfly,' *tu-tun, ttun* 'mosquito,' etc (Blevins 2004). In all of these languages, historical CV-reduplication generates prosodic contexts where the loss of pre-tonic unstressed vowels emerges limited to the reduplicative context. The general sound change is demonstrated in (4) where the consonant in parentheses is not part of the structural description, but is included for clarity.

(10) Vowel deletion with resulting geminate

$V > Ø / (C_i) \_ C_iV$

2.5.4.4 Lengthening under stress

In many languages, a stressed syllable is longer in duration than an unstressed syllable. Stressed syllable lengthening can take the form of tonic vowel lengthening, post-tonic consonant gemination, syllable-initial consonant lengthening, or any combination of these. In English, stressed syllables are longer than their unstressed counterparts (Lisker and Abramson 1967). In Rotuman, short stressed vowels are longer than their unstressed counterparts (Churchward 1940: 73). Consonants are long after short vowels in stressed position and short elsewhere in Swedish (Engstrand 1999: 141). In Hebrew, both vowels and consonants are longer in stressed syllables (Laufer 1999: 98). The simplest account of lengthening under stress is that length is a direct phonetic manifestation of stress. Perceptual studies support duration as a correlate of stress in many languages, including English (Fry 1958; Nakatani and Aston 1978) and Italian (Bertinetto 1980). In many languages duration under stress is non-contrastive, but length differences in stressed syllables are great enough to give rise to geminate/ singleton contrasts. Post-tonic lengthening under stress is the source of at least some non-inherited geminates in a range of Austronesian languages.

The general sound change involving post-tonic gemination is schematized in (5). Syllables are longer under stress, and the phonetic length of consonants is reinterpreted as contrastive.

(11) Post-tonic gemination
V CiV >VCiCiV

In many languages, post-tonic gemination is limited to cases, like the Austronesian example, where intrinsic properties of the stressed vowel are incompatible with lengthening. For example, in Southern Paiute, a Uto-Aztecan language, all obstruents occur as geminates after stressed voiceless vowels (Harms 1966, 1985), while in Norton-Sound Unaliq, an Eskimo language, a consonant following a stressed schwa in an open syllable is geminated (Jacobson 1985). Cases of the sound change in (5) then may be more common after intrinsically "weak" vowels than elsewhere.

Another case of lengthening under stress involves what might be referred to as expressive or emphatic lengthening. Syllable lengthening, including consonant gemination, is used for expressive or emphatic purpose in many languages. In West Greenlandic Eskimo, demonstrative showing emphatic gemination include: *'ikka* 'look yonder!' (non-exclamative /ika-/) and '*uvva* 'look here! (cf. /uva-ne/ 'here where I am pointing'). **Similar examples are also found in Bengali and Marathi: *aṭa* 'now' versus *aṭṭa* 'now!' (Masica 1989: 122)**

2.5.4.5 Boundary lengthening

In many languages, a phrase-final syllable is longer in duration than a segmentally identical phrase-medial syllable (Klatt 1975; Wightman et al. 1992). In addition, consonants which are initial within a prosodic domain typically involve greater articulatory amplitude or force, longer duration, and more rigid alignment of articulatory gestures than their non-initial counterparts (Fougeron and Keating 1997; Fougeron 1999). Given these automatic phonetic lengthening processes, it is not surprising to find that articulatory strengthening at the edges of prosodic domains is phonologized in certain languages where segmental lengthening is limited to constituent boundaries.

An interesting case of this kind occurs in Mokilese (Harrison 1976, 1984). In Mokilese, consonant gemination and vowel lengthening are triggered by encliticization. Vowel-initial clitics (e.g. -o 'that') trigger gemination of preceding consonants, while consonant-initial clitics (e.g. - ki 'with') trigger lengthening of a preceding vowel.

Instances of Mokilese boundary lengthening with gemination preceding the vowel-initial enclitic *o* 'that' (where = marks a clitic boundary) include: *wɔ**ll**o* /wɔl=o/ 'that man,' *wɔlkɔli**kk**o* /wɔl kɔlik=o/ 'that big man,' and *wɔlkɔlik rɔɔme**nn**o* /wɔl kɔlik rɔɔmen=o/ 'those two big men'. The absence of gemination in non-clitic environments is shown by examples like *wɔl ɛmɛn* /wɔl ɛmɛn/ 'one man (emphatic).

A similar example is reported for the Nobiin variety of Nubian, a Nilo-Saharan language, where cliticization of /-ɔn/ 'and' results in gemination of a stem-final consonant (Bell 1971). A general schema for this sound change is stated in (6), and may be related to phonetic phrase-final lengthening (Blevins 2004).

(12) Boundary lengthening

$VC_1] V > VC_1C_1] V$ where] is a phrase-boundary

2.5.4.6 Reinterpretation of an obstruent voicing contrast

In many languages voiceless obstruents are significantly longer than their voiced counterparts (Denes 1955; Lisker 1957; Catford 1977; Westbury 1979; Jaeger 1978, 1983). Given this, we might expect to find laryngeal contrasts subject to phonological reanalysis, with length replacing voicing as the contrastive feature distinguishing the two obstruent series. The sound change is schematized in (6).

(6) Voicing contrast reinterpreted as length contrast (T a voiceless obstruent, D a voiced obstruent)

Ti >TiTi

D >T

Voicing of the short consonant is interpreted as an automatic phonetic consequence of lenition, and is "undone," while the intrinsic duration of the voiceless segment is interpreted as underlying.

One case where a change of the kind found in (6) has been proposed is in the history of the **Dravidian languages**. Under the standard view, Proto- Dravidian contained a single laryngeal sequences of plain voiceless obstruents and voiced sonorants, and had a length contrast for both obstruents and sonorants directly inherited in Malayalam and Tamil (Steever 1998). A different position is taken by Emeneau (1967), where Proto-Dravidian is

reconstructed with a voicing contrast. Under Emeneau's account, the ancestral voiced/voiceless contrast is reflected as a geminate/singleton contrast in Malayalam and Tamil, while in most other languages, it is continued unchanged.

2.5.4.7 Reanalysis of identical C+C sequences

An obvious source for a geminate/non-geminate contrast is through lexicalization of former heteromorphemic sequences of adjacent identical consonants. In **Meiteilon**, a Tibeto-Burman language of Manipur, there are very few morpheme-internal geminates, but across morpheme boundaries, geminate are found . In Meiteilon, there is no contrast between singleton and geminate consonants. However, in Meiteilon, there is difference between the same words itself. The meaning is difference due to tone. For example,

(13)

i.	/pòkkəni/- will burn	/pokkəni/- will give birth
ii.	/k^{h}ùmmu/- give reply	/k^{h}ummu/- very black
iii.	/tànnəba/- to run after	/tannəba/- discuss
iv.	/sìllu/- arrange	/sillu/- change

McGregor (1990: 78–80) illustrates the phonetics of the geminate/ singleton contrast as follows:

Geminates are phonetically distinct from the corresponding single consonants, involving longer articulation in the case of stops nasals and laterals. For geminates of these manners, the articulation is initially weak (giving a lenis syllable final consonant), becoming stronger finally (where the syllable initial articulation is fortis.)

Though, for the most part, geminates in Gooniyandi are limited to transparent heteromorphemic sequences, McGregor (1990: 75) demonstrates that roots which are segmentable into historical formatives, or which are duplications of meaningless forms, show the cluster types found intermorphemically. An instance is /gligglig/ 'noise of an eagle' (cf. /gigig/ 'neigh of a horse'). If it has not taken place already, it appears to be only a matter of time before the source of geminates in some words becomes opaque, and true morpheme-internal geminates emerge. The development is shown in (7).

(14) False geminate reinterpreted as true geminates

Ci + Ci > CiCi

CHAPTER III

THE PHONOLOGICAL SYSTEM OF INDIC LANGUAGES

This chapter sets out a description of the phonological system of Bangla, Urdu, Telugu as well as Indian variety of English. It includes a presentation of the phonemes of the languages and an examination of the basic surfaces changes that the underlying segments undergo. We have attempted to state all relevant morphophonological rules of the languages.

This chapter examines the patterns of geminate and gemination and the behaviour of word-medial geminate consonants in Bangla, Urdu, Telugu and Indian varieties of English.

3.1 Bangla Language (Indo-Aryan)

Bangla (also known as Bengali) is typologically an agglutinative language mainly spoken in the Indian sub-continent. It is the national language of Bangladesh and official language (regional official) language of the Sate West Bengal, Tripura and Assam of the Republic of India. Bangla is spoken in many other states of India and a significant number of populations are in the USA, UK, Singapore, Nepal and several other countries (Gordon 2005). With more than 224 million speakers, Bangla secures the 6th position among the World's language in terms of together first and second language speakers (Comrie 2005, Katzner 2002, Weber 1997). The *bramhi* script used for orthography does not match with the pronunciation in the language. This is because the diacritic markers used for vowel sounds do not have a one to one correspondence to the sounds they represent. For example, the orthography distinguishes between long and short [+HIGH] vowels /i/ and /u/, although the language does not have contrastive vowel length distinction.

There are only four fricative sounds in Bangla, namely, /s/, /z/,/ʃ/ and /h/. However, some modern speakers also use the fricatives /f/ in their speech due to the influence of English and Hindi/Urdu. The distribution of the fricatives /s/ and /z/ are extremely restricted in Bangla. They always appear in complementary distribution with the post-alveolar fricative /ʃ/. There are two semivowels /j/ and /w/ which are vocalized only in intervocalic position. In other contexts, /j/ and /w/ have undergone fortition to /ɟ/ and /b/ respectively. In onset clusters, the semivowel deletes and results in consonant gemination in medial position and vowel change in initial position (Sanyal : 2010).

Bangla allows lexical geminates, geminates through derivational processes and gemination through borrowed words. Lahiri and Henkamer (1988) shows Bangla allows three types of geminates: underlying geminates, Concatenated and Assimilated. Excluding aspirated sounds and / ŋ f h s ɽ /, all consonants can be geminate within morphemes and are transcribed by doubling the sound [vi] . Bangla does not allow aspirated geminated consonants. Orthographically aspirated consonants get geminated .

3.1.1 Bangla Consonant Phonemes

	Bilabial	**Dental**	**Alveolar**	**Retroflex**	**Post-alveolar**	**Palatal**	**Velar**	**Glottal**
Plosive	p b pʰ bʰ	t̪ d̪ t̪ʰ d̪ʰ		ʈ ɖ ʈʰ ɖʰ			k g kʰ gʰ	
Nasal	m		n				ŋ	
Fricative			s z		ʃ			h
Lat Appr			l					
Flap/Tap			ɾ	ɽ				
Approx	w					j		
Frictione-less Cont			r					
Affricate						tʃ dʒ tʃʰ dʒʰ		

Table 1 Showing consonant phoneme in Bangla.

Geminations in Bangla always occur in Intervocalic Position. Intervocalic refers to a consonant sound used between two vowels, as in /n/ in *unnoti.* The phonetic characteristics of consonants in this position are often different from those in other positions, e.g. the amount of Voicing in a voiced consonant is likely to be greater. Here a list has been given to the possible lexical geminated words in Bangla :

E.g., /ʃa:st̪r/ 'learned book'; /st̪ri:/ 'woman'; /iskrim/ 'ice cream'

3.1.2 Distribution

Consonants occur in all positions. Geminates of consonants other than / ŋ h r/ occur inter-vocalically. Homorganic voiced and voiceless consonants do not occur adjacently.

3.1.3 Syllable Structure and Consonant clusters

Bangla permits/attests canonical syllable structure that allows (C)(C)(C)V(C). There are two types of consonant clusters. The first one is two-consonant clusters which allows initial, medial and final. The initial permits (i) S/N + r/l; (ii) s+S/n/r/l, medial is general and final one is nil. The second one is three-consonant clusters which allows initial, medial and final. The initial allows /str/, /skr/, the medial is general and the final one is nil.

Geminations in Bangla always occur in Intervocalic Position. Intervocalic refers to a consonant sound used between two vowels, as in /n/ in *unnoti.* The phonetic characteristics of consonants in this position are often different from those in other positions, e.g. the amount of Voicing in a voiced consonant is likely to be greater. Here a list has been given to the possible lexical geminated words in Bangla :

3.1.4 Lexical Geminates

Geminated Consonants	Meaning
/at̪t̪a/	'soul'
/bid̪d̪ai/	'in wisdom'
/bʰaggo/	'luck'
/bãcca/	'child'
/ʃoɟɟa/	'bed'
/biʃʃe/	'in the world'
/ʈ̪ullo/	'comparable'

In Bangla, the difference between the singleton and geminated consonants is contrastive.

3.1.5 Singleton and geminate contrast

Word	Gloss	Word	Gloss
/a̪ta/	'custard apple'	/a̪t̪t̪a/	'soul'
/bida̪i/	'farewell'	/bidd̪a̪i/	'knowledge'
/bãca/	'survive'	/bãcca/	'child'
/ʃoɹa/	'straight'	/ʃoɹɹa/	'bed'

3.1.6 Assimilation based on phonological processes

3.1.6.1 Assimilation

Assimilation is one of the phonological processes whereby one sound is influenced by the pronunciation of a neighbouring sound. This can either be within a word or between words. Assimilation is a productive process in Indic languages. A few instances of Assimilation in Bangla are given below. Directionality is an important concept in case of assimilation. As discussed by Katamba (1989:84), a sound may become more like either the sound that **precedes** it or the sound that **follows** it. In the feature geometry model, assimilation rules are characterised as the association (or 'spreading') of a feature or node F of segment A to a neighbouring segment B.

3.1.6.1.1 Progressive Assimilation

If a sound becomes more like the sound that precedes it, the process is called progressive assimilation.

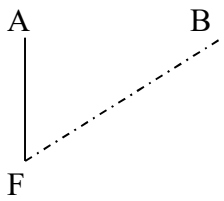
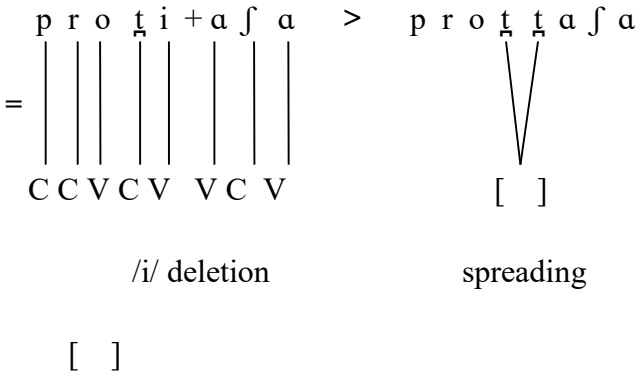


Figure 2. Progressive Assimilation Representation

F is a feature that is associated with the segment A. B is the segment having different features. In the case of progressive assimilation, the feature F spreads to the following segment B making B more like A.

/proʈi/ + /ɑʃɑ/ → [proʈʈɑʃɑ] 'early morning'



/moʃi/ + /adʰɑr/ → /moʃʃɑdʰɑr/ 'inkpot'

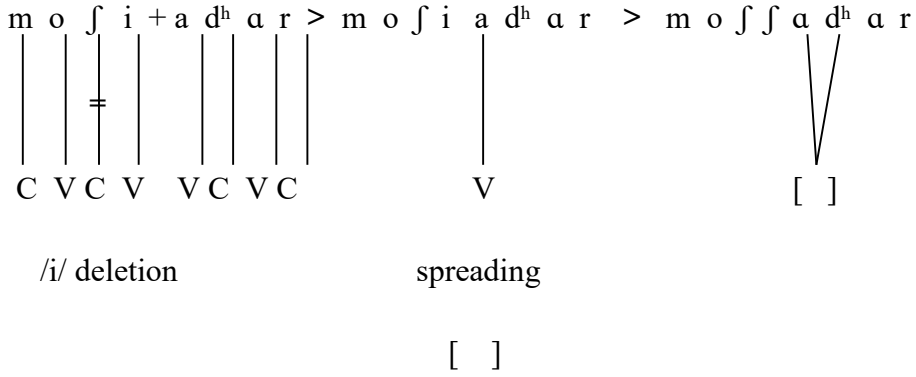


Figure 3. Spreading Rule for the word /moʃi/ + /adʰɑr/

In the above example, rule is that voiceless post alveolar fricative /ʃ/ gets geminated and the vowel /i/ gets deleted whenever preceded by any consonant.

3.1.6.1.2 Regressive Assimilation

If a sound is modified so that it becomes more like the sound that follows it, the process is called regressive assimilation. The change operates background.

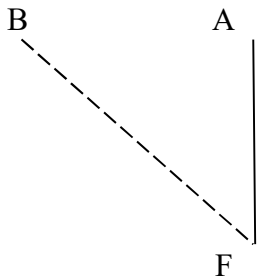


Figure 4. Regressive Assimilation Representation

F is feature that is associated with the segment A. B is the segment having different features. In the case of regressive assimilation, the feature F spreads to the preceding segment B making B more like A.

/t̪od̪/ + /likʰit̪o/ → [t̪ollikʰit̪o]

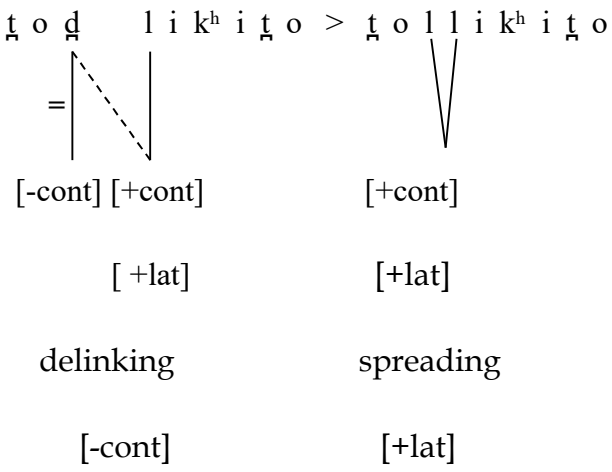


Figure 5. Spreading rule for the word *t̪ollikʰit̪o* 'your writing'

In the above example, rule is that voiced dental stop [d̪] assimilates to lateral approximant [l]. The segments are presented in terms of their distinctive features (Katamba 1989:54-55). Hence, the rule is [-continuant] gets delinked with its feature and assimilats with [+continuant][+lateral]. That is the feature [+cont][+lat] is spreading to the preceding segment making it similar to it.

It is the case of manner assimilation where dental plosive changes into lateral approximant. This is also feature-filling mode of assmilation.

3.2 Urdu Language (Indo-Aryan)

The word 'Urdu' is taken from the Persianized Turkish word 'ordu' which means 'the camp or army'. The language was originally spoken as a trading language between Hindi and Persian speakers in the military camps in Northern India. The name Urdu was solidified in the 18th century.

3.2.1 Origin of Urdu

Urdu was born in India. It is a pure Indian language. The origin of Urdu is an amalgamation of foreign languages with the native languages of India. According to Sharafi (1986:142) Urdu is a central Indo-Aryan language of the Indo-Iranian branch, belongs to the Indo-European family of languages. Urdu involves numerous elements of Arabic, Persian and

Turkish of Khariboli. It also derives some elements from Sanskrit. It was initially called Zaban-e-Ordu or language of the army and later just Urdu. It obtained its name from Urdu Bazar, i.e. encampment market, the market near Red Fort in the walled city of Delhi. Though urdu is not a very old language, it is a language full of charm, elegance and a language that holds literature so courtly.

3.2.2 History of Urdu

urdu mainly developed in Lucknow, India and began taking shape in the Indian subcontinent during the Delhi Sultanate and Mughal Empirer. The original language of the Mughal had been Turkish, and after their arrival in South Asia, they started adopting Persian and later Urdu.

There are nearly 60-80 million native speakers of standard Urdu. According to the CIL Ethnologue, Hindi/Urdu is the fifth most spoken language in the World. According to george Weber's article on top languages: "The World's 10 most influencial languages in language today", Hindi/Urdu is the fourth most spoeken language in the Worldm with 4.7% of the World's population, after Mandarine, English and Spanish.

3.2.3 Official Status

Urdu is placed in scheduled VIII of the Indian constitution. Urdu is one of the officvially recognized languages in India and has official language status in the Indian states of Andhra Pradesh, Bihar, Jammu-Kashmir and Utter Pradesh and the national capital, New Delhi. Urdu was also the lingua franca of the law courts of the British administration in Bengal, Bihar and the Northwest provinces.

Urdu is also the national and official language (Qaumi Zaban) of Pakistan and is spoken and understood throughout the country. It is used in education, literature, office, and business.

The importance of Urdu in Muslim world is visible in Holy cities of Mecca and Madinah, where most of the information signboards are written in Arabic, Urdu and English.

3.2.4 Dialects of Urdu

Urdu has four recognized dialects: Dakkhini, Punjabi, Rekhta and modern Vernacular Urdu (based on the Khariboli dialect of the Delhi origin). However, popularly two varieties are used nowadays in India.

Dakhini is spoken in Deccan region of Southern India. It is distinct by its mixture of vocabulary from Marathi, Kannada and Telugu languages, as well as some vocabulary from

Arabic, Persian and Turkish. Dakhini is widely spoken in all parts of Maharashtra, Karnataka, Andhra Pradesh and Tamil Nadu. In terms of pronunciation it is easy for the use.

Urdu spread in south with the Bahmani rulers and common people in early fourteenth century because of historical and political reasons. It flourished as a literary language popularly known as 'Dakhini' at the end of the seventeenth century. The development of Urdu reached its peak in the south whn Urdu was introduced as a medium of instruction at all levels in Osmania University in 1915. It was the first Indian language to be made a medium of instruction for higher studies. It remained as a medium of instruction till 1950. It was the official language of Hyderabad state for about sixty-five years till 1949, and then it was replaced with English. (Sharfuddin 2010).

Lucknowy Urdu is a nearly standard variety used by famous poets and popular in north India. It contains a variety of loan words from Persian, Arabic, tzurkish and Portuguese. This kind of dialect is spread mainly in Utter Pradesh, Madhya Pradesh, Delhi, Bihar and Jammu-Kashmir.

3.2.5 Script of Urdu

Urduis a member of the Indo-Aryan sub-branch of the Indo-Iranian of the Indo-European languages. Its birth-place is India. When speakers of different languages come into contact for extended periods of time, significant changes invariably result in one or both of the language systems involved. The script of the Urdu is *'Persu-Arabic'*.

The sound structure of Urdu and Hindi are close to each other. The phonemic system differs in the addition of a plosive and two fricatives among consonants. The vowel phonemic system is identical. There are greater differences in the allophonic systems.

3.2.6 Phonemic Inventory

The phonemic inventory of Urdu is as follows:

	Labial	Labio-dental	Dental	Alveolar	Post Alveolar	Retroflex	Palatal	Velar	Uvular	Glottal
Stop	p b pʰ bʰ		t̪ d̪ t̪ʰ d̪ʰ			ʈ ɖ ʈʰ ɖʰ		k g kʰ gʰ	q	
Nasal	m			n				(ŋ)		
Fricative		f v		s z	ʃ		ʃ	x ɣ		h
Lateral				l						
Nasal Flap						ɽ̃	(ɽʰ)			
Tap				ɾ						
Approx		ʋ					j			
Affricate							tʃ dʒ tʃʰ dʒʰ			

Table 2: Showing consonant phoneme in Urdu

Urdu exhibits gemination within the same word itself. All the unaspirated stops, fricatives, nasals, lateral, frictionless continuants and semi-vowel of Urdu can be geminated within a word when they occur intervocalically. This phenomenon of Urdu is evident from the following list of words :

3.2.7 Distribution

a. Consonants occur in all positions, with the following restrictions:

i. / ɽ̃ (ŋ)/ do not occur word-initially.

ii. /ŋ/ tends to occur with /g/.

b. Geminate consonants occur except for the following: [bʰ ʃ h j]. A sequence of a long vowel followed by a consonant has the lexical alternant of a short vowel followed by a geminate consonant, e.g., /d̪ərʊa:za:/ ~ /d̪ərʊəzza:/ 'door'.

c. In case of free variation between fricatives and stops in words of Perso-Arabic origin, Urdu speakers show a preference for the fricatives. (Pandey P. 2014)

3.2.8 Lexical geminates

i.	/mohabbaʇ/ محبت	'love'
ii.	/ɑkkɑs/ عکاس	'painter'
iii.	/ʈəkkɑr/ ٹکر	'striking'
iv.	/iʇʇeləh/ اطّلاع	'information'
v.	/iɖɖəʇ/عدت	'probationary period of four months and ten days'
vi.	/ʈɑməɖɖun/ تمدن	'civilization'
vii.	/ʈɑnəffur/تنفّر	'disgust'
viii.	/ʈɑləffuz/ تلفظ	'pronunciation'

In Urdu, the difference between the singleton and geminated consonants is contrastive.

3.2.9 Singleton and geminate consonants

i.	/bəcɑ/- بچا	to save	/bəccɑ/بچّہ	child
ii.	/bəlɑ/- بلا	disaster	/bəllɑ/بلّا	stick /baton
iii.	/gəɖɑ/گدا-	beggar	/gəɖɖɑ/ گدّا	quilt
iv.	/pəkaː/ پکا	'cook'	/pəkkaː/ پکّا	'ripe'
v.	/pəʈaː/پتہ	'address'	/pəʇʇaː/ پتّہ	'leaf'

3.2.10 Syllable structure and Consonant clusters

Urdu attests canonical syllable structure that allows (C) (C) (C) V (C) (C) (C) (C). For example, E.g., /ʃaːsʇr/ 'learned book'; /sʇriː/ 'woman'.

There are two types of consonant clusters. The first one is two-consonant cluster that allows initial, medial and final. The initial consonant cluster permits (i) C+L/G; (ii) s+C, the medial and final is general. The second one is three-consonant clusters which allows Initial, medial and final. The initial permits /spr str smr/, the medial is general and the final allows /str ntr ʂtr rdr/.

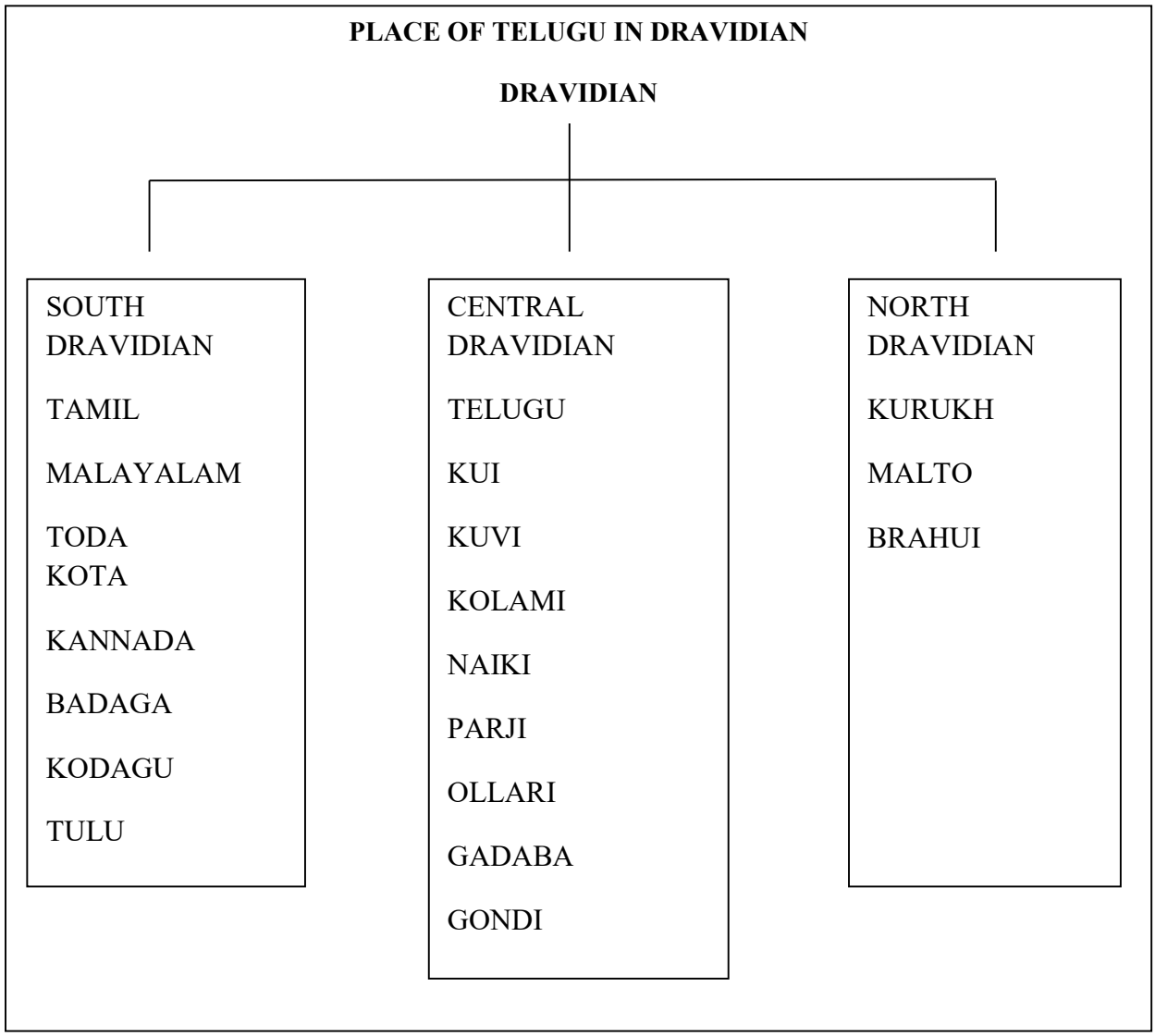
3.3 Telugu Language (dravidian)

Telugu is the state language of Andhra Pradesh and numerically is the biggest of the Dravidian languages in India. It is spoken by more than 75 million people according to the census 2001. Telugu is found recorded from the seventh century A.D. that it broke out into a literary language.

Telugu belongs to the Central Dravidian group, though sometimes it is included in South Dravidian since it is geographically contiguous to both the groups. Linguistically there is more evidence to put it with the Central Dravidian group, though it shares several phonological innovations exclusively with South Dravidian.

Four dialect areas are recognised based on occupational vocabulary[vii].

1. South : Cuddapah, Kurnool, Anantapur, Chitoor.



Tab. 3. Showing the Language family of Telugu.

In Modern Telugu, the speech of the educated classes of the central coastal districts of Andhra Pradesh (East and West Godavari, Krishna and Guntur) has come to be regarded as the prestige-bearing variety. Says Bh. Krishnamurthy while describing the regional dialects of Telugu : "... the central dialect was the home of modern standard Telugu which is based on **sistavyavaharika** --the speech of the educated middle class. It is also used extensively in modern poetry" (1979 b:16). The above region being naturally affluent, became a central of intellectual and cultural activity. Most writers of fiction and plays, and newspaper editors hailed from this area in the formative period of the standard language. Over the years this variety has attained a high degree of uniformity and is promoted by the government for use in educational institutions, proceedings of the legislature and for use in newspapers and on

radio. As a result of its propagation by the mass media (particularly the cinema), the speech of this area has spread to other regions of Andhra like Telengana and Rayalaseema.

According to Krishnamurthy :

" Standard Telugu links up within a single network of communication all regional varieties through the spread of mass media, education and urbanization. Speakers of non-standard Telugu make conscious efforts to imitate and acquire it because it is prestigious to use it in speech and writing. As a frame of reference, speakers are aware of the distinction between what is standard usage and what is not, mainly in pronunciation, verbal and nominal influence, and the choice of certain lexical items" (ibid. : 17).

3.3.1 Consonant Phonemes

	Labial	**Labio-Dental**	**Dental**	**Alveolar**	**Post-Alv**	**Retroflex**	**Palatal**	**Velar**	**Glottal**
Stop	p b pʰ bʰ		t̪ d̪ t̪ʰ d̪ʰ			ʈ ɖ ʈʰ ɖʰ		k g kʰ gʰ	
Nasal	m		n			ɳ			
Trill				r					
Fricati		f		s	ʃ	ʂ			h
LatApp				l		ɭ			
Approx	w						j		
Affricate							tʃ dʒ tʃʰ dʒʰ		

Table 4 Showing consonant phoneme in Telugu

3.3.2 Distribution

a. Consonants occur in all positions, with the fosllowing restrictions:

i. Only /m w j/ occur word-finally.

ii. /l̩ ɳ̩/ do not occur word-finally.

b. Geminate consonants occur inter-vocalically, except for the following:

/pʰ bʰ dʰ ʈʰ ɖʰ tʃʰ dʒʰ kʰ gʰ ʂ h/.

3.3.3 Lexical geminates

	Geminate Consonants	Gloss
	/appu/	debt
	/aṯṯa/	mother in law
	/aʈʈa/	cover
	/accu/	vowel
	/akka/	elder sister

In Telugu, the difference between the singleton and geminated consonants is contrastive.

3.3.4 Singleton and geminate consonant

	Words	Words
i.	/koni/ 'to buy'	/konni/ 'some'
ii.	/aɽa/ 'there'	/aʈʈa/ 'cover'
iii.	/aɖa/ 'measure'	/aɖɖa/ 'a lump'
iv.	/boma/ 'eyebrow'	/bomma/ 'toy'
v.	/mona/ 'tip'	/monna/ 'day before yesterday'
vi.	/mola/ 'waist'	/molla/ 'jasmine'

3.3.5 Morpho-phonemic processes

The following bases take the suffix ***ana*** to form noun

ṯella	white	ṯellana	whiteness

pacca	green	paccana	greenish
erra	red	errana	redness
nalla	black	nallana	blackness
pulla	sour	pullana	sourness
cappa	tasteless	cappana	tastelessness
sanna	thin	sannani	thinness

Bases of type (C)VCCV ending in ***ccu*** drop their final ***ccu*** and take ***ppu***.

accu	to pay	appu	loan
meccu	to praise	meppu	pleasing
heccu	to increase	heppu	extra

The following bases take ***ena***. In the base ***nilcu*** the medial ***l*** get assimilated with ***c*** before taking the suffix .

duvvu	to comb	duvvena	comb
nilcu	to stand	niccena	ladder

Derived by the gemination of the penultimate consonant.

kanu	to see	kannu	eye
manu	to live	mannu	earth

The following bases ending in ***ru***. Here '***r***' is turned into geminated '***ɭ***' to form plural marker.

uru	~	uɭɭu	villages
kuɖuru	~	kuɖuɭɭu	portable furnaces
goːru	~	goːɭɭu	nails
niːru	~	niːɭɭu	water(pl)
niɖuru	~	niɖuɭɭu	foreheads

no:ru	~	no:l̪u	mouths
ve:ru	~	ve:l̪u	roots
veɖuru	~	veɖul̪u	bamboos
kaɖuru	~	kaɖul̪u	spindles

The following bases ending in ***lu.*** Here '***l***' is turned into geminated '***l̪***' to form plural marker

ṯa:be:lu	~	ṯa:be:l̪u	tortoises
ṯo:ɖe:lu	~	ṯo:ɖe:l̪u	wolves
ki:lu	~	ki:l̪u	joints
kunɖe:lu	~	kunɖe:l̪u	rabbits
ve:lu	~	ve:l̪u	fingers
me:lu	~	me:l̪u	benefits

The following bases ending in ***li.*** Here '***l***' is turned into geminated '***l̪***' and '***i***' turned into '***u***' to form plural marker:

tiragali	~	tiragal̪u	hand mills
ca:kali	~	ca:kal̪u	washer men
goɖɖali	~	goɖɖal̪u	axes
na:gali	~	na:gal̪u	ploughs
mangali	~	mangal̪u	barbers
mosali	~	mosal̪i	crocodiles
ro:kali	~	ro:kal̪u	pestles
va:kili	~	va:kil̪u	front yards
mungili	~	mungil̪u	front yards
a:kali	~	a:kal̪u	hungers

cekkili	~	cekki|u	cheeks
lo:gili	~	lo:gi|u	spaces inside a house

The following bases ending in ***ɖi***. Here '***ɖ***' is turned into geminated '***ɭ***' and '***i***' into '***u***' to form plural marker.

paccaɖi	~	paccaɭu	chutneys
banɖi	~	baɭu	carts
baɖi	~	baɭu	schools
tinɖi	~	tiɭu	eatables
calividi	~	caliviɭu	sweet cakes
ma:miɖi	~	ma:miɭu	mangoes
gummaɖi	~	gummaɭu	pumpkins
muɖi	~	muɭu	knots
maɖi	~	maɭu	pieces of land
ko:ɖi	~	ko:ɭu	hens
poɖi	~	poɭu	diamonds
guɖi	~	guɭu	temples

The following bases ending in ***nɖu***. Here '***nɖ***' is turned into geminated '***ɭ***' to form plural marker:

panɖu	~	paɭu	fruits
gunɖu	~	guɭu	balls
renɖu	~	reɭu	twos

The following bases ending in ***ɖu***. Here '***ɖ***' is turned into geminated '***ɭ***' to form plural marker.

gu:ɖu	~	guɭu	nests

kuːɖu	~	kuɭlu	meals
muːɖu	~	muɭlu	threes
eːɖu	~	eːɭlu	years
naːɖu	~	naːɭlu	days
peraɖu	~	peraɭlu	backyards
beraɖu	~	beraɭlu	barks
vaːɖu	~	vaːɭlu	they (remote)
viːɖu	~	viːɭlu	they (proximate)

The following bases ending in***nnu***.

kannu	~	kaɭlu	eyes
pannu	~	paɭlu	teeth

Bases ending in ***'ti'*** optionally drop their final '***i'*** before the sociative suffix ***to***:

ceːti + toː	~	ceːttoː	with the hand
raːti +toː	~	raːttoː	with the stone

3.3.6 Vowel length is contrastive in Telugu

In Telugu, the difference between two vowels is contrastive.

(a) Quality-short vowels:

/a/ ~/ə/	/kaʈlu/ 'ties'	/kəʈlu/ 'bundles'
/iː/ ~/ɪ/	/piːʈlu/ 'to split'	/pɪʈlu/ 'birds'
/uː/~/u/	/cuːʈlu/ 'silver rings'	/cuʈlu/ 'cigars'
/o/ ~/ɔ/	/mokkaː/ 'Is it an oath?'	/mɔkkaː/ 'Is it a plant?'
/u/~/o/	/uppu/ 'salt'	/oppu/ 'to agree'

(b) Quality-long vowels:

/aː/ ~/əː/	/paːʈlu/ 'difficulties'	/pəːʈlu/ 'songs'
/iː/~/ɪː/	/miːraː/ 'are you?'	/mɪːraː/ 'Is she Mira ?'
/oː/~/ɔː/	/koːʈlu/ 'crores'	/kɔːʈlu/ 'forts'

(c) Quantity

/a/~/aː/	/aɖu/'to press'	/aːɖu/ 'to play'
/i/~/iː/	/iɖu/ 'to put'	/iːɖu/ 'age'
/u/~/uː/	/uɖu/ 'to plant'	/uːɖu/ 'to come out'
/o/~/oː/	/ʈoli/ ' in the beginning'	/ʈoːli/ 'having sent'
/e/~/eː/	/ʋeli/ 'outside'	/ʋeːli/ 'of the finger'
/ə/~/əː/	/ɻəɖa/ 'plait'	/ɻəːɖa/ 'way'
/u/~/uː/	/puʈa/ 'page'	/puːʈa/ 'half day'
/ɔ/~/ɔː/	/kɔna/'tip'	/kɔːna/ 'a village'
/ɪ/~/ɪː/	/ɪka/ 'hereafter'	/ɪːka/ 'feather'
/æ/~/æː/	/mæɖa/ 'neck'	/mæːɖa/ 'palace'

3.3.7 Syllable Structure and Consonant cluster

Urdu attests canonical syllable structure that allows (C) (L/G) V (N) (C). There are two types of consonant clusters. The first one is two-consonant cluster that allows initial, medial and final. The initial consonant cluster permits C+L/G (limited to loan-words from Sanskrit and English), the medial one is general and the final one is nil. The second one is three-consonant clusters which allow only medial that is general (More commonly with a nasal). In Telugu, two consonant clusters are very common and can occur initially and medially. Consonant clusters cannot occur word-finally in Telugu.

3.4 Telugu variety of English

The alternate names of India English are names of non-standard varieties of English spoken in India include Babu English, Butler English and Hinglish or Benglish. The variety being described is an educated variety of English in India. The main region is W.B, U.P, Bihar, Chattisgarh, Jharkhand, Delhi, A.P, Maharashtra, Kerala and Tamil Nadu.

This is a variant of General Indian English, spoken by Second Language users of English with Hindi or Kerala as their mother tongue. The term 'general Indian English' was first used by Bansal (1974) as the standard variety devoid of regional features, and based on the output of standard pronunciations of English across the country. The term is controversial in its present use.

3.4.1 World English

English has been considered and recognised the status of Global language for a long time and considered as a language of power and politics by the people of different nationalities. The initialization of this process dates back to the time of colonization when the colonizers were awestruck at the language of their masters. The process enhanced when the colonizers imposed their language and carved its status when people of different tongues tried to learn the new language. English, hence was tamed by a large number of people from different countries for different purposes through various methods and strategies, giving rise to various marked linguistics features.

3.4.2 Varieties of English

There are a number of varieties in English all over the World, depending upon the speaker's first language or mother tongue. People of the different varieties has come through a number of methods. Some people by listening or imitating or other by communicating in broken English and may others by formal education in schools and colleges. English, around the World, has distinct features that points to the speaker's first language. No matter how well trained a second language learner is, he/she still exhibits some features of their first language in terms of accent, phonetics, phonological or prosodic features. By their accent or pronunciation we can see marked differences. For example, English spoken in America is different from the English spoken in British English, which is different from the Australian English or Arab or African varieties. The works done on World English also state that the pronunciation pattern of English also varies within a country. English spoken in Canada in North America varies from that of Brazil in South America.

3.4.3 Dialects of English

English has different dialects. English spoken in America is different from British English, which is different from the Australian English or the African variety of English. The studies done on World-English also demonstrates that the pronunciation pattern of English also varies within a country. English spoken in North America varies from that of the South.

3.4.4 Varieties of English in India

English came into being in Indian through missionaries, traders and then showed its valour after the British colonizers. According to Kachru (1983), English has been indianized in India like other countries. Though English paved its path to India in 600, by the establishment of the East India Company, the English language was introduced into the Indian educational system in 1857 by the establishment of Bombay, Madras and Calcutta Universities. Introduction of English (1956) into the curriculum of schools and universities gave a different status to English. A lot of Indians, who had access to education, started to learn English in a formal setting, which also made them capable of mixing and switching the language.

3.4.5 General Indian English (GIE)

English penetrated into the Indian culture so well that Indians gave a new face to it. Looking at Indian English in a large context will not be fair. In a pluralistic, multicultural country like India, we will have to step down further so as to understand what exactly are included under the umbrella term Indian English. India itself is a land of more than a thousand languages, belonging to four major language families, and each having its own varied features. One language may have various dialectal varieties which may or may not be throughly mutually intelligible. Enlish which include, vocabulary, accent, phonetic, phonemic, syntactic, semantic and pragmatic features. general Indian English (GIE) that is taken into consideration is the variety of English spoken by the educated mass of India.

The formula of reciprocity can be seen vividly that there are a number of words that are taken into English from the Indian languages. Similarly, a lot more words are included into the vocabulary of Indian languages and are adopted accordingly. Words like *avatar, bunglow, chutney, curry, hullabaloo, jungle, juggernaut, khaki, yoga* etc. are taken into the English Vocabulary from various Indian languages whereas *bus, tire, puncture, black board, school, college, University, office, battery, pencil, television* are some of the many words that are borrowed from English. This kind of borrowing, switching and mixing of languages, is not a simple act of communication but includes complex process of learning the new language,

adapting it and using it accordingly. So as to understand the above mentioned complexicities, one should have a basic understanding of Second Language (L2).

3.4.6 Second Language (L2)

What is a Second Language, L2? Why is the knowledge of Second Language important, in the context of India? there are many arguments associated with the status of second language. there are a few who believe that second language is one of the two languages in which the speaker is less fluent. There are some who support the idea that it is the second language that the individual has been introduced to. However, it is right to look at L2 as a language which is not native to the speaker to which he/she is introduced after their first language. According to Kapoor (1992) a second language, in the context of the "three-language formula, is what is introduced after the primary stage and has a pedagogical as well as a functional definition"[lviii]. It is also important to note that the speaker may or may not have a native like fluency. The question on the importance of second language in the Indian context is relevant due to several reasons, of which one has been stated earlier. That is, the multicultural and multilingual India ahs people coming from various cultural backgrounds, speaking different languages. It is impossible for one to stay back in his/her own village throughout their lifetime. One has to come out of their comfort zone, mingle with people from different backgrounds and of different languages to build up their social and economic life. That is facilitated only by a common language that is mutually intelligible, which quite often turns to be English. More importantly, English as a language of Science and Technology has taken the importance of English language learning to another level. Wherever many languages come together, and there is a difficulty in deciding which language to be considered, English always act as a bridge or a contact language. the official language status given to English by the Indian constitution makes this point clear. So as to use English appropriately in such situations, one has to know how to make proper use or communicate in English.

English is taught as a second language in all the schools in India. However, the situation in India is that English, a foreign language, is taught to the Indian students teachers who also learnt English as a second language. This, obviously, results in the Indianization of English or a nativized English which is embellished with quite a lot of Indian linguistic features. However, such interferences occur due to many other reasons too. As stated earlier, English

in India acts majorly as a contact language and is widely used as a tool for education. Most of the English is in the written form. The phonetic features acquired are distant from the native variety since the L2 learners' primarily source is the written texts rather than the speech form. It is only in the recent years that the exposure to the R.P of British English has been facilitated. Hence, majority of the Indian speakers of English associate the features of their native language to learn and use English.

As stated earlier, English spoken in each of the Indian states/regions is distinct and is nativised according to their native language/dialect. Second language phonology tries to analyze the pronunciation patterns of adult learners of a second language. The phonology of second languages is difficult from that of the first languages in umpteen ways. The differences can be understood in terms of the general characteristics of second languages, such as slower speech rate, lower proficiency/fluency than native speakers, and from the interaction between non-native speakers' first and second languages. This dissertation will look into the Second language phonetics and phonology of Telugu variety of English.

3.4.7 Consonant Phonemes

	Bilabial	**Labio Den**	**Dental**	**Alveo-Lar**	**Post-Alv**	**Retroflex**	**Palatal**	**Velar**	**Glottal**
Plosive	p b (bʰ)		t̪ʰ d̪			ʈ ɖ (ɖʰ)		k g (gʰ)	
Nasal	m			n				ŋ	
Tap				ɾ					
Fricative				s z	ʃ				h
Approx		ʋ				ɹ			
Lat Appr				l					
Affricate							tʃ dʒ		

Tab. 5. Showing consonant phoneme in Indian variety of English

a. The phoneme / ʋ / is phonetically different from the native English (NE) phoneme /v/ of which it is a substitute, but the / ʋ / is a new phoneme.

b. /z/ and /ʒ/ have merged into /z/, there being no post-alveolar voiced fricative in the Filter.

c. The following phonemes have different phonetic qualities from the segments in NE:

/ tʰ d̪ ʈ ɖ ɾ in place of /θ ð t d ɹ / respectively.

d. The following phonemes with restricted occurrence have been added without corresponding consonants in NE: / bʰ/ as in *abhor*, /ɖʰ/ as in *adhere*, *ad hoc*, *ad hominem*, /gʰ/ as in *ghost, ghastly, Ghana,ghibli, ghetto, gherao* etc. These consonants are based on the orthographic representations of the words in which they occur. (Pandey P. 2014)

3.4.8 Distribution

a. The consonant phonemes occur in all positions with the following restrictions:

i. / ɾ/ optionally does not occur before consonants and word-finally. The optional deletion of / ɾ/ is restricted to the word domain. If dropped finally, it does not surface, even when the following word begins with a vowel, e.g. /də ɾivə iz floiŋ/ The river is flowing.

ii. Word-medially, /ŋ/ always occurs with a following / g/, e.g. /siŋ/ sing, /riŋ/ ring, but

/ siŋgiŋ/, /riŋgiŋ/ singing, ringing.

b. Geminate consonants occur within morphemes, e.g. innate /inne:t/, happy /hæppi:/ , lucky /lʌkki/, very /verri/, ever /evvə/, anniversary /ænnivɜ:səri/. as well as across morphemes, e.g. illegal /illi:gəl/, unnoticed /ʌnnəutist/, unnatural /ənnætʃʊrəl/, irregular /irregjəlɑr/ and immovable /immu:vəbəl/ etc.

3.4.9 Syllable Structure and Consonant clusters

Indian variety of English attests canonical syllable structure that allows (C)(C)(C)V(C)(C)(C)(C). There are three types of consonant clusters. The first one is two-consonant cluster that allows initial ((i) C+L/G; (ii) s+C.), medial and final. The second onne is three-consonant clusters which allows initial(/spr str smr/), medial and final (C+C+s/z/t/d/ θ). The third one is four-consonant clusters which initial : Nil, medial : general and final: lf θs, -mpts, -kst/ θs (as in native English)

Trask (1996:154) asserts that "geminate consonants occur in English only at morpheme boundaries". For instance *night time*, *book case*, *solely*, *non-null*, *roommate* etc. The word *night time* is orthographic and it is fake geminate proposed by Alan S. Kaye. Even *book case* is also not a natural to him. (Alan S Kaye). **Roch and Hartman** (1997:522) transcribe all of the *un-* words with geminated [nn]: *un named*, *unnatural*, *unnecessary*, *unnavigable*, *unnerve* and *unnumerable* etc. It contains all the words found in Roach and Hartsmen (1997) except *pen knife* and *un known* have geminated [nn], where as **Abercrombie** (1967: 82) has this to say:

Double consonants must be distinguished from long consonants. A double consonant is one whose duration extends over two syllables, whereas the duration of a long consonant is confirmed to a single syllable. Double consonants are free frequently found in English, especially at word junction: wholly (as said by many), unknown, book case, this Sunday.

3.4.10 Characteristics of the varieties of Indian English

There are various reasons for the geminating of consonants in Indian English. Some of them are cited below:

3.4.10.1 Nativization

In Tamil, stops and fricative do not occur word finally and there is a tendency in present day colloquial Tamil to geminate the final consonant and insert the vowel [ɨ] word finally to form a separate syllable. This is carried over to Tamil English, too. Therefore, Gemination of final consonant is quite commonly heard in T.E (Nagarjan 1985). For instance,

(5)	Indian English	Received Pronunciation
i.	[bʌssi] - bus	/bʌs/
ii.	[bæʈʈi] - bat	/bæt/
iii.	[bukki] - book	/bʊk/
iv.	[waiffi] - wife	/waɪf/
v.	[mʌggi]-mug	/mʌg/

Exception :

i. [gʌnni] - gun /gʌn/

ii. [himmi]-hymn /hɪm/

3.4.10.2 Orthographic Shape

The reason for the 'doubling or gemination of intervocalic consonants in Indian English are the strong tendency to pronounce words according to their orthographic shape. Understandably, I. E. makes extensive use of spelling pronunciation. The Indian English speaker have a tendency to geminate the consonant represented in spelling by a double letter. This phenomenon leads to the gemination of intervocalic consonants which occur twice in spelling. This phenomenon is found in most of the Indian English speakers. The British pronunciation has also been given side by side. The instances are cited below:

(1)	**Indian English**	**Received Pronunciation**
	[bʌʈʈər] - 'butter'	/bʌtə(r)/
	[fulli] - 'fully'	/fʊli/
	[terrifik] - 'terrific'	/tərifik/
	[ækkɔːɖɪŋ] - according	/əkɔːdɪŋ/
	[ættempt]- attempt	/ətempt/
	[ɪlliːgl]- illegal	/iliːgl/
	[ɪrregular]- irregular	/iregjələr/
	[okkeʒn]-occasion	/əkeɪʒn/
	[hæppi] - 'happy'	/hæpɪ/
	[lʌkki] - 'lucky'	/lʌki/
	[ʃapplai] - 'supply'	/səplaɪ/
	[ʃupprim] 'supreme'	/suːpriːm/
	[ripplai] 'reply'	/rɪplaɪ/
	[baʈʈar] 'butter' (in Telugu English)	/bʌtə(r)/

[rabbar] 'rubber' (Telugu English) /rʌbə(r)/

[sʌmmʌɾ] 'summer' (Telugu English) /sʌmə/

[nʌt̪t̪iŋg] 'nothing' (Telugu English) /nʌθɪŋ/

[jesse] 'essay' (Telugu English) /eseɪ/

[ʌppo:ziʃən] 'opposition' (Telugu English) /ɒpəzɪʃn/

[ʋinnəɾ] 'winner' (Telugu English)[ix] /wɪnə(r)/

Krishnamurti (1978) points out that gemination is a typical feature of Indian English. He adds that it is caused mainly because of the English spelling. He lists a number of examples in order to prove his point:

(2) mellow, fully, error, burrow, buzzing, bitter, utter, giddy, muddy, bigger, beggar, kissing, fussy, puffing, stuffy, trimming, dinner, rubber, sipping, upper,

3.4.10.3 Transliteration

There is evidence for the gemination of these words in I.E. from the signboards also, which translate the English words into local orthography. For example, in Telugu newspapers it is found that the word 'combing' is incorrectly transliterated as /tʃekku/ instead of /tʃek/. If the press media use of the right orthography symbols of Telugu for the transliteration of English words it is not difficult for the readers to know the correct pronunciation of English. Perhaps the newspaper editors do not know the English pronunciation of the word 'check' is /tʃek/ and not /tʃekku/. And there are many other examples found in the newspapers, which misled the readers to pronounce gemination. For example,

(3) * /ro:ɖɖu/ instead of /ro:ɖ/

*/pressu/ " /pres/

*/ʈikkeʈʈu/ " /ʈʰikiʈ/

*/appar/ " /ʌpər/

3.4.10.4 Emphasis

One of the means of emphasizing in T.E. is by geminating a medial consonant because, at that place, there is no contrast between a single and a double consonant.

Examples:

(4) [ju: kæn ɡo: ennivæ:r]

You can go anywhere

[nevvar se: no:]

Never say no

[evverivʌn iz ɡuɖ]

Everyone is good

(Nagarjan 1985)

3.4.10.5 The influence of mother tongue

According to Jayaprakash (2005) if a word final consonant is preceded by a short vowel it is generally geminated by a Telugu speaker. As Telugu is a vowel ending language, the words ends with a vowel only and not with a consonant excepting the bilabial /m/. So there is a tendency in colloquial Telugu to geminate the final consonant and insert the vowel [u] word finally to form a separate syllable. This is carried over to Telugu English. Therefore, Gemination of final consonant is quite commonly heard in T.E. For example, /p/ in the word 'slip' is geminated and mispronounced */slippu/.

Likewise,

(6)	**Telugu English**	**Received Pronunciation**
	*/pennu/ 'pen'	/pen/
	*/kʌʈʈu/ 'cut'	/kʌt/
	*/bʌssu/ 'buss'	/bʌs/
	*/kʌppu/ 'cup	/kʌp/
	*/ʈikku/ 'tick'	/ʈɪk/

*/kikku/ 'kick'	/kɪk/
*/eggu/ 'egg'	/eg/
*/bʊkku/ 'book'	/bʊk/

and so on.

This is because of the influence of the mother tongue of the speaker when he/she speaks other languages.

3.5 Discussion

So it is evident from the above data that Indian English allows gemination. This is because of the influence of the mother tongue of the speaker when he speaks other languages. Kamoli Prakash (1991) says gemination is pan Indian feature. First of all strong influence of spelling is seen in geminate articulation of consonants. In words such as summer /sʌmmə/, happy /hæppi/, killing /killiŋg/, /biʈʈə/ or /bittə/, double articulation of the medial consonants is evident. This is also true of words that have two separate letters that could stand for the same sound such as *lucky*. Further, emphasis and exaggeration bring on double articulation - in *You will be utterly miserable, utterly* can have /tt/ in emphatic speech.

Another aspect related to spelling also prevails. Since a number of English words are merely heard (often mispronounced) and are not seen in printed form by a multitude of Indians, it is not uncommon to see misspellings in signs across the country. Some examples are *will* for *wheel*, *rashberry* for *raspberry* etc. This is true of educated Indians as well; students have such spellings as *wholistic, vocal chords, auxillary* etc. (Sailaja 2009).

3.6. Summary

The chapter discusses the pattern of geminate and gemination in Indic Languages. In the languages examined geminates commonly occur in the intervocalic position. The languages have geminate consonants as well as the singleton contrast. It is also reported that all the languages except Bangla have very few singleton-geminate contrast. In Bangla all geminate consonants contrast with singleton consonants. Geminate consonants occur except for the following: [bʰ ʃ h j] in Urdu. A sequence of a long vowel followed by a consonant has the lexical alternant of a short vowel followed by a geminate consonant, e.g., /ɖərʊa:za:/ ~ /ɖərʊəzza:/ 'door'. Urdu allows lexical geminates as well as singleton-geminate contrast.

There are two types of consonant clusters. The first one is two-consonant cluster that allows initial, medial and final. The initial consonant cluster permits (i) C+L/G; (ii) s+C, the medial and final is general. The second one is three-consonant clusters which allows Initial, medial and final. The initial permits /spr str smr/, the medial is general and the final allows /str ntr ʂtr rdr/. Geminate consonants occur inter-vocalically, except for the following: /pʰ bʰ dʰ ʈʰ ɖʰ tʃʰ dʒʰ kʰ gʰ ʂ h/ in Telugu. Telugu also permits lexical geminates as well as singleton-geminate contrast. Telugu allows morpho-phonemic processes resulting with geminates. The chapter also delineates the variety of Indian English with special reference to Telugu English (TE). There are various reasons for the geminating of consonants in Indian variety of English. The study also explains how gemination processes present in Indian Languages are transferred to Indian English.

CHAPTER IV

PHONOLOGY OF GEMINATES

4.0 Phonological studies of geminates

There are two main yet debatable approaches to geminate representation. The first one is the length analysis and the other is moraic analysis. The difference between the two is that in the former approach, the geminates are linked to two slots on the skeletal tier (Leben, 1980, McCarthy, 1979), whereas, later approach asks to connect them to two root nodes (Selkeirk, 1991). This representation takes into account the length of geminates and allow their parts to behave independently under some phonological conditions.

Further, two important phenomena are observed in geminates, which are called as Geminate integrity and inalterability (Hayes, 1986a, b; Kenstowicz, 2973; Kirchner, 2000; Schein and Steriade, 1986).

Integrity refers to the resistance to phonological processes by geminate consonants leading to violation the unity of the segment, such as, epenthesis. This phenomenon supports the view of geminates as single units on the segmental tier. For example, in Arabic, vowel epenthesis that affect certain consonant cluster, including concatenated geminates, is not applicable to underlying geminates (example in 1 from Palestinian Arabic, from Dmitrieva O 2012).

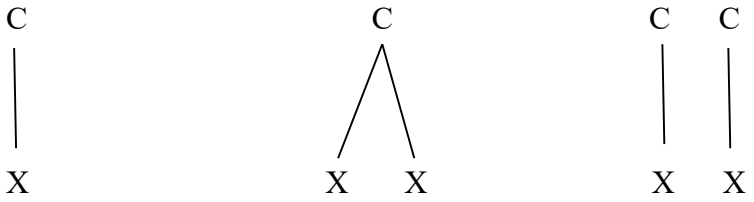
(1) /sitt/ * [sitit] "grandmother" (monomorphemic)

/fut+t/ [futit] "entered" 1 p.sg. (concatenated)

Languages with reported geminate integrity effects include Semitic languages (Palestinian Arabic, Tunisian Arabic, Classical Arabic, Moroccan Arabic, Tiberian Hebrew, Amharic), Berber languages, Pero (a Chadic language), and **Kolami (Central Dravidian).**

McCarthy (1979) and Leben (1980) establish an analysis of geminates based on Goldsmith's (1979) theory of *Autosegmental Phonology* known as CV Phonology. CV representations further divide the autosegmental feature matrices into two *tiers*; a melodic tier containing the feature matrices and a skeletal tier containing *timing slots*. The common form appears as shown in (2).

(2) a. singleton b. geminate c. cluster



4.1 Related works in phonology

4.1.1 Literature Review for Phonological Analysis

In this section, we will discuss the results of phonological studies of gemination occurring in a few languages in the world. Languages taken into the consideration are- Jordan Arabic, Lebanese Arabic, Sienese Italian, Cypriot Greek, Japanese, Wolof (a West Atlantic language), Bagla, and Farsi-English bilinguals who are staying in Canada.

4.1.1.1 Jordonian Arabic. (2011)

Abu Abbas et al. (2011) have focused specifically on the phonological status of the final geminates in Arabic spoken in Jordan from the perspective of the Optimality Theoretic account. In doing so, they have figured out that a ban on the trimoraic syllables leads to the reverse process of **de-gemination**. In addition, they have also provided a significant distinction between geminates on one hand and long consonants on the other hand based on moraicity.

A little explanation of the process of de-gemination is being given here. Geminates in JA are found either ‘true’ or ‘fake. As a true geminates, they are immune to epenthesis, wheras, as ‘fake’ they are usually be split by an epenthetic vowel. Now, when a true geminate happens in a monosyllabic word alog with a long vowel, it leads to activation of a degemination process as a result of a constraint against trimoraic syllables available in the language. Further, in case of a geminate followed by a word beginning with a consonant cluster, the CCC cluster is split between the first and second consonants due to the epenthetic vowel.

Authors found that Geminates in coda position do not violate *CM. This makes them behaving differently from their singleton, in the sense that, geminates are moraic word-finally while singletons are not. Among other observations, authors reported that the degemination doesn’t lead to a MAX violation. Therefroe, word-final geminates exhibit distinctiveness, thereby occur in minimal pairs with their singleton counterparts.

In a nutshell, authors finally concluded that geminates are moraic in nature whereas consonants are not.

4.1.1.2 Farsi-English. (2017)

Rafat et al. (2017) have demonstrated an acoustic study of geminate attrition spread across three generations of Farsi-English bilinguals who are staying in Canada. One of the primary objectives of this study is to figure out whether the geminate-singleton consonant length contrast attrites across three generations. The secondary objective is to determine the role of the universal phonetic factors on the very process of geminate-singleton length contrast attrition.

The impact of the voicing was examined as the predictors of geminate attrition in eight Farsi-English bilinguals. They are divided into three generation of categories: first generation, 1.5 generation and second generation. The second generation (1.5) differentiates children of Iranian immigrants who later had acquired Farsi as their first language. They came to Canada between the ages of 5-14 from the third category. So far as the methodology is concerned, the productions of the bilinguals were compared with the productions of three homeland variety controls. For this very purpose, the respondents were presented with a word-naming task which included 108 number of words. The PRAAT software was used to analyze acoustically for about 2398 tokens. Here, attrition was denied in terms of changes in mean duration of geminates relative to their singleton counterparts, percentage of geminate-singleton de-gemination, and category overlap. For the statistical analysis of Mean durations a 3-way,mixed-model, repeated-measures ANOVA was utilized.

In sum, authors have investigated phonological attrition of geminate-singleton consonant length attrition in a language contact situation across the three generations. They have found evidence of attrition of this phonological contrast and a gradual shift towards English in the production of our participants. Specifically, we found that generation is a predictor of the degree of phonological attrition, in which the degree of attrition increases in successive generations. While there was enough evidence to suggest that more marked geminate consonants were shorter than less marked ones, there was no evidence that either manner or voicing predicted the degree of attrition across generations. his might be due to a small sample size and we believe the effect of both universal phonetic factors and social factors in phonological attrition merits further investigation.

4.1.1.3 Sienese Italian (2004)

Stevens and Hajek (2004) have conducted a study on the role of pre-aspiration in voiced and voiceless geminates stops in Sienese Italian.

In their previous studies, authors had found unexpected variability in the articulation of long voiceless stops, showing frequent pre-aspiration & other glottal effects. To move further, in this study, they compared voiced & voiceless long stops with an objective to figure out whether voiced stops are subject to some kind of articulatory shift that might parallel pre-aspiration. Their investigation of long voiceless & voiced stops confirms that both categories are subject to acoustic variability, of different kinds. The long voiceless stops are often pre-aspirated (48%), whethreas, the voiced stops are subject to frequent partial devoicing (34%). Thus, their initial hypothesis that the presence of pre-aspiration is paralleled by devoicing gets confirmed, & leads to the support the a cross-linguistic correlation between the two phenomena. It was found evidently that devoicing of voiced stops develops with a time lag after pre-aspiration of voiceless stops.

Authors concluded that in the process of germination in Sienese Italian, long voiced stops are often partially. This suggests that pre-aspiration & devoicing are likely related. For this, they further offer an articulatory explanation supported by a number of observations. They recognized the conflict between increased speech rate & the reduced available time for articulatory gestures as it leads to articulatory reduction. Further, while articulating the pre-aspirated geminate stops, the period of closure is reduced, but the overall period of voicelessness remains maintained. It should be noted that pre-aspiration keeps voicing out of the transition from vowel to consonant in /VC:/ sequences. This is considered as a kind of perceptual enhancement. In this, even while the speakers produce [hp], the long period of voicelessness tends the listeners to interpret it as /pp/ and not as /p/ or /(b)b/.

4.1.1.4 Lebanese Arabic (2007)

Khattab (2007) has attempted a phonetic study of the germination in Lebanese Arabic on the temporal relationship between geminate consonants and vowel length.

This study is different from the previous studies in the sense that, focuses more on the effect of style on absolute and proportional durations with the elicited data, and not merely applying controlled data. For that matter, it utilized both word-lists and spontaneous speech corpus. The field work was performed in the Beirut region, and the voice of five female participants was recorded while asking them to read aloud. The speakers were provided the word-lists of

medial singleton and geminate consonants preceded by long and short vowels. For the speech corpus, the experiment was considered the instances of natural conversational contexts. Thereafter, suitably, acoustic and auditory analyses were made of medial consonants and of preceding and following vowels.

The author witnessed different observations for word-lists and speech corpus set studies. It was found that word-lists exhibit distinct distributions for singleton and geminate consonants and for short and long vowels. On one hand, Medial consonants and preceding vowels show proportional instead of absolute temporal compensation. On the other hand, in spontaneous speech corpus set in a natural context, the distributions for singleton and geminate consonants and for target short and long vowels show considerable overlapping. However, the target long vowels and geminate consonants overlap in duration with singleton targets in word-list style, but proportional durations still contribute to the percept of phonological length.

4.1.1.5 Cypriot Greek (2005)

Loukina (2005) has presented a study on the phonetics and phonology of Cypriot greek geminates in spontaneous speech. The study figures out considerable variability in duration of consonants. Consonants preserve a contrast in duration under the same phonological conditions. It may be considered as a phonological opposition and not the effect of phonetic factors. The argument that spontaneous Cypriot speech shows considerable influence from Standard Modern Greek has also been put forth. It may account for additional variation in the consonantal duration and articulation.

It should be noted that the so-called "geminates" are one of the most well studied subjects in Greek dialectology. Modern Greek dialects are sometimes divided in linguistic studies into two major groups: "geminating" and "non-geminating". Among geminating dialects are those of the South-eastern group, including Cypriot, Dodecanese, Chios and Greek dialects of Southern Italy. There seem to be no traces of gemination to the West of the Greek-speaking area, in the dialects of Santorini, Myconos, Euboia and in mainland Greece (Newton 1968: 18).

4.1.1.6 Japanese loanwords (2009)

Haruo Kubozono, Junko Itô*, Armin Mester*(2009) in their paper Consonant Gemination in Japanese Loanword Phonology,mentions that the distribution of geminate obstruents in Japanese loanwords is very complex. On one hand, some consonants are more prone to gemination than others, on the other hand, one and the same consonant is more likely to geminate in some phonological contexts than in others.

This paper makes an attempt to study these problems by considering the relationship between consonant gemination in native words and that of loanwords. It was observed that the distribution of geminate obstruents as opposed to single obstruents (for example, /pp/, /tt/, /kk/ vs. /p/, /t/, /k/) is determined in loanword adaptations in Japanese, whose native system employs consonant length contrastively. To explain this phenomenon, authors proposed a principled prosodic phonological analysis. This states that gemination is allowed in a language only when it improves prosodic structure. Their analysis exposits that loanwords gemination is essentially an output-oriented phenomenon and also loanword phonology is not only closely related with native phonology, but also, it is severely constrained by it as well.

4.1.1.7 Bangla (2009)

Somdev Kar (2009) utilized Optimality Theoretic Analysis for studying Banga Gemination. This paper attempts to identify and analyze different types of gemination processes in Bangla. The focus is mainly on the phonological representation of sound combinations which forms a set of valid geminates in this language. He argues for three major types of gemination processes present in modern Bangla and a stratification strategy for the relavant lexical items based on their origin (SB, NB and OB, depending on the native vs. two type of borrowings). An analysis of these gemination processes are given in the framework of optimality theory (OT). Therefore, the constraint-based analysis of OT is organized in a threefold argument structure for each stratum. The conclusion is drawn towards an understanding of gemination processes of Bangla for different categories of lexical items and their phonological formuations. On The OT analysis for the gemination process given in this study covers almost all possible gemination cases in the Bangla vocabulary.

4.1.1.8 Wolof (2003)

Arthur J. Bell (2003) reported in his study, *Gemination, Degemination and Moraic Structure in Wolof*. There is a rich system of concatenative morphology in Wolof (a West Atlantic language spoken in Senegal and the Gambia by about six million people), consisting mostly of suffixes that attach to verb and noun roots. A number of suffixes trigger changes in the root to which they attach. These changes include gemination, degemination, vowel shortening, fricative-stop alternations, and vowel alternations. Previous analyses of Wolof consider these alternations to be morphological. Whereas, Arthur argues that, although morphologically triggered, the alternations result from systematic phonological processes. Using an Optimality Theoretic (OT) approach, he shows that a moraic analysis of phonological structure in Wolof can account for restrictions on well-formed syllable types,

the distribution of underlying geminates and prenasalized stops, and patterns of gemination and degemination. In this paper , he argues for a moraic representation of geminates in Wolof.

In Sections 2-4, I develop an analysis of Wolof syllables as weight bearing. He shows that geminates contribute weight to a syllable, and provides representations of all basic syllable types in Wolof.

In Section 5, building on the basic ideas from Section 4, he presents a unified phonological analysis of gemination, vowel shortening, and fricative strengthening. He shows that these three alternations are phonologically governed and triggered by the presence of a floating mora at the left edge of geminating suffixes. In his analysis, morphologically triggered gemination is a phonological process whereby weight is added, in the form of a mora, to a singleton coda consonant. The ban on trimoraic syllables explains cases of vowel shortening in Wolof.

Expanding the scope of the moraic account, he shows in Section 5.3 that fricative-stop alternations in gemination are the result of a general constraint in Wolof against moraic fricatives. The same suffixes that trigger gemination also trigger alternations in the root vowels /ə/ and /a/. He argues that these alternations are phonologically governed, although the [a] alternation may also have a lexical component. Vowel alternations in gemination environments are induced by the presence of floating vowel features associated with the left edge of the geminating suffixes. He presents a series of constraints that can account for the behavior of root vowels when under the influence of the floating vocalic features.

Finally, in Section 5.5, He argues that **degemination** is also a phonologically governed process in Wolof, although it too is morphologically triggered. The presence of the degeminating suffixes induces feet to conform to the ideal foot structure in Wolof-**L**.L. He suggests that this behavior may be due to a process-specific constraint on footshape that has a reflex in the general foot-shape preferences of the language.

Implicit throughout his discussion, and especially in more problematic areas such as vowel alternation, is the question of what can be explained by phonology, and what must be attributed to the morphology and/or the lexicon. The core data sets that he has analyzed – gemination, vowel shortening and fricative strengthening – lend themselves very well to a moraic account. By adopting moraic representations and an Optimality Theoretic framework, he is able to present a unified account of gemination in which I show disparate data involving

segment length and feature alternations to be systematically governed by the phonology of Wolof.

In his analysis of vowel alternations and degemination, he investigates the limits of a purely phonological explanation. While he shows that a phonological account of these data is *a priori* possible, there could in fact be a strong lexical component in either or both of these cases. Nonetheless, part of successful research in any field involves testing the outer edges of a theory – a particularly rewarding enterprise when the theory has proven to be a powerful analytical and explanatory tool.

4.2.4 Rules of gemination in standard Generative phonology(begin with a brief introduction here - a short passage)

Phonological rules can be best understood through the following phonological processes.

4.2.4.1 Assimilated Gemination

kor +te + kotte

4.2.4.2 Concatenative gemination

put +te + putte

pat + te + patte

4.2.4.3 Lexical geminates

i. /aṯa/ আতা'custard apple' --- /aṯṯa/ আত্মা 'soul'

ii. /ʃɔman/ সমান 'equal'------- /ʃɔmman/সম্মান 'honour'

ii. / ḏɔʃi/ দোষী 'convict' ------- / ḏɔʃʃi/দস্যি 'FEM'

Phonological rule 1

C----------CC/[V--------V]

Gemination from the borrowed words in Bangla (Foreign words)

i. /sɑnjɑs/ ---- /ʃɔnnɑʃ/

ii./sunjɑ/ ---- /ʃunno/

iii. /bɑljɑkɑl/---- /bɑllɔkɑl

vi. /mriṯju/----/mriṯṯu/

Phonological rule 2

C--------CC/[V------V]

iii. /ʊiɖwɑn/---- /biɖɖɑn/

vii. /paɖmɑ/----/pɔɖɖo/

viii. /cʰɑɖmɑ/---- /cʰoɖɖɔ/

ix. /ɑʈmɑ/----/ɑʈʈɑ/

Phonological rule 2

C----------CC/[V--------V]

Urdu

1. /bəcɑ/- بچاto save /bəccɑ/بچّہ- child

2. /bəlɑ/- بلاdisaster /bəllɑ/-بلّاstick /baton

3. /gəɖɑ/گدا-beggar /gəɖɖɑ/ گدّا-quilt

4. pəka:/ پکا 'cook' /pəkka:/ پکّا 'ripe'

5. /pəʈa:/ پتہ 'address' /pəʈʈa:/ پتّہ 'leaf'

Phonological rule 3

C----------CC/[V--------V]

TELUGU

i. /ɑɖi/ 'that' ---- /ɑɖɖi/ 'apply'

ii. /aʈu/ 'that side' ---- /aʈʈu/ 'pan cake'

iii. /ʊeɭə/ 'time' ---- /ʊeɭɭə/ 'went'

Phonological rule 3

C----------CC/[V--------V]

4.3 CV Phonology

The role of a syllable in phonological theory has been controversial. Like the word and sentence, it is part of the conceptual baggage left from traditional linguistics. At various points in the history of linguistics the syllable has been thrown out in favour of a better theoretical concept. However, with each passing decade the role of a syllable has become more significant. Generative linguistics has recognized the syllable as an essential concept for understanding phonological structure.

Why did the syllable prove to be so elusive? What is a syllable and how do we define it? How do we perceive it? What is its structure? And what is the motivation for positing the syllable as a necessary concept in phonology? These are some of the issues that we shall explore in the sections below.

4.3.1 Sonority

One reason the syllable has proved so elusive is that it lacks any direct uniform phonetic correlates. It is not a sound, but a group of sounds. It is not one specific, uniform group of sounds. Its shape and size varies from language to language. It is an abstract concept; we cannot see it. We do not write in terms of syllables and we do not speak in terms of syllables. It is, therefore, very different from a sound. The problem with the notion of the syllable is that whereas most of the time speakers know how many syllables there are in a sequence they have just pronounced/heard, they do not always know where one syllable ends and the other begins. Intuitively, therefore, it is there at the back of the speakers/hearer's mind and yet it eludes precise demarcation of its boundaries. What is a syllable then?

A working definition of the syllable as a phonological construct, is given by Blevins (1995:207):

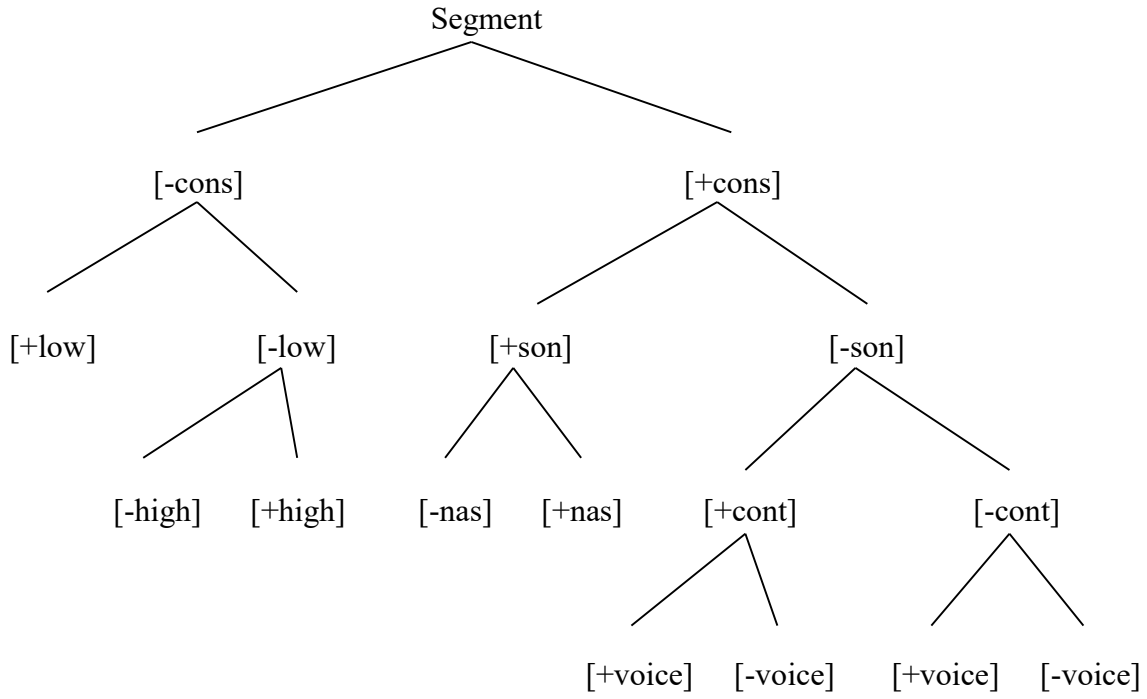
The syllable is the phonological unit, which organizes segmental melodies in terms of sonority.

What is a segmental melody? A segmental melody is, of course, another way of referring to the segment which is made up of features. It is assumed that each segment has an inherent sonority, i.e. its relative loudness in comparison to other sounds.

In other word sounds can be heard as more or less loud in comparison to each other, provided that their length, stress, pitch, velocity of air flow, muscular tension, etc. remain constant. Hence, for example, the sound /l/ is considered more sonorant (that is heard as louder) than

the sound /p/. A sonority hierarchy or a scale (Blevins 1995:211) showing the relative sonority (loudness) of each sound as in (1) is generally, widely accepted among phonologists.

(1)



The sonority scale in (1) is organised in terms of binary relationships. The left branch of the tree in (1) is more sonorous than the right branch. The relationships in this tree are assumed to be absolute in the sense that there is no attested language where, for example, [-low] is more sonorous than [+low].

4.3.2 Syllable structure

We had earlier defined syllable as that unit which organizes segmental melodies in terms of sonority. This suggests that not any sequence of sound can be called a syllable. A syllable has an internal structure of its own. We know that the syllable has an obligatory and an optional component. The obligatory component is usually a vowel, while the optional components are consonants, which both precede and/or follow the obligatory component- the vowel. Consider, for example, monosyllabic sequences like:

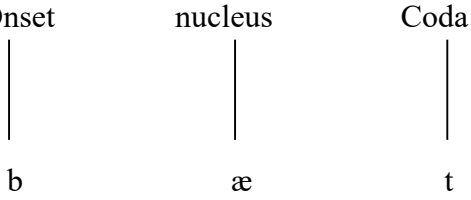
(2) bat /bæt/ - where a consonant both precedes and follows the vowel.

at /æt/ - where a consonant only follows the vowel.

bye /bai/ - where a consonant only precedes the vowel.

I /ai/ - where there is no consonant at all.

(3)



4.3.3 Core syllabification principle

The syllable-building rules are very similar across languages. Since the nucleus is the basis of the syllable, it is not surprising that the syllable is built outward from this core. The following basic rules help us to assign syllable structure to any sequence of sounds in any languages.

(5) Rule A: Assingn a vowel to the nucleus.

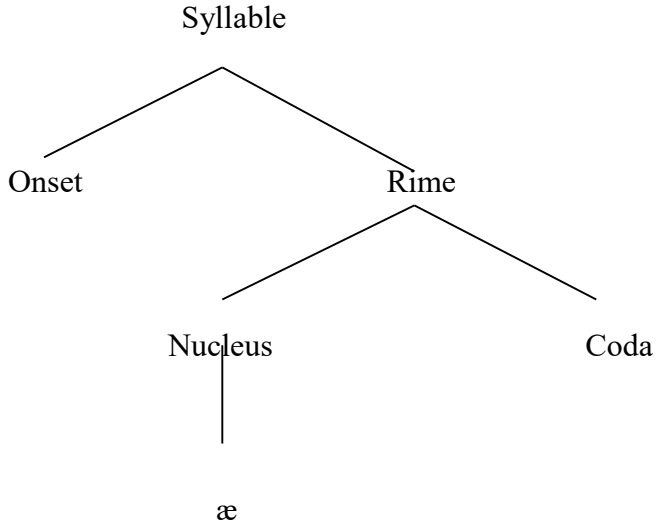
Rule B: Assign a prevocalic consonant to the onset position.

Rule C: Assign a single unincorporated postvocalic consonant to the coda position.

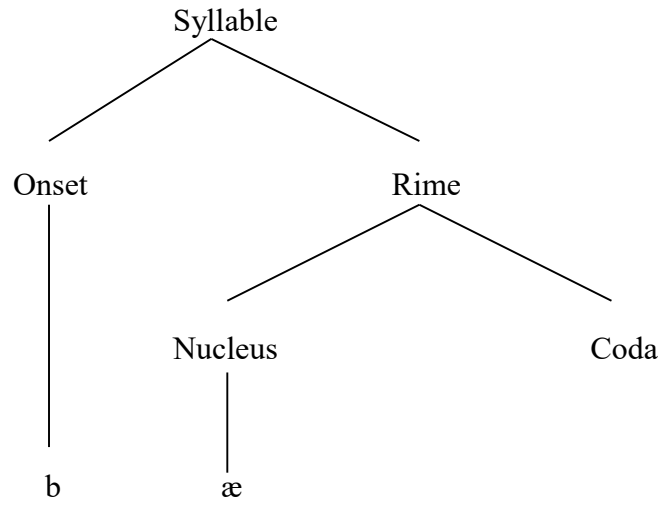
Take, for example, the syllabification of ***bat*** in (6).

By the application of rule (5a) we get:

(6)

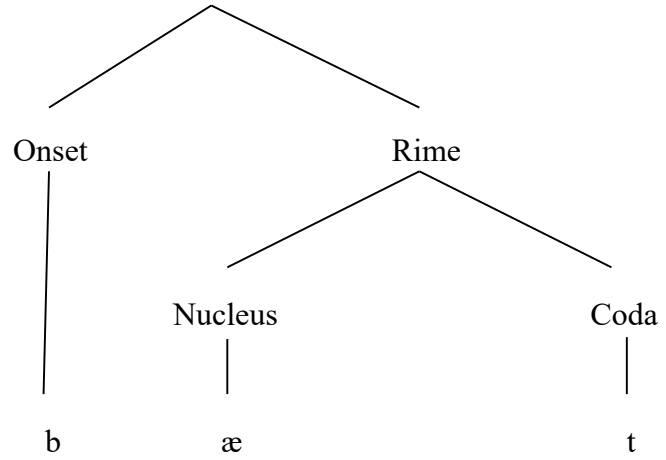


By the application of rule (5b), we get:



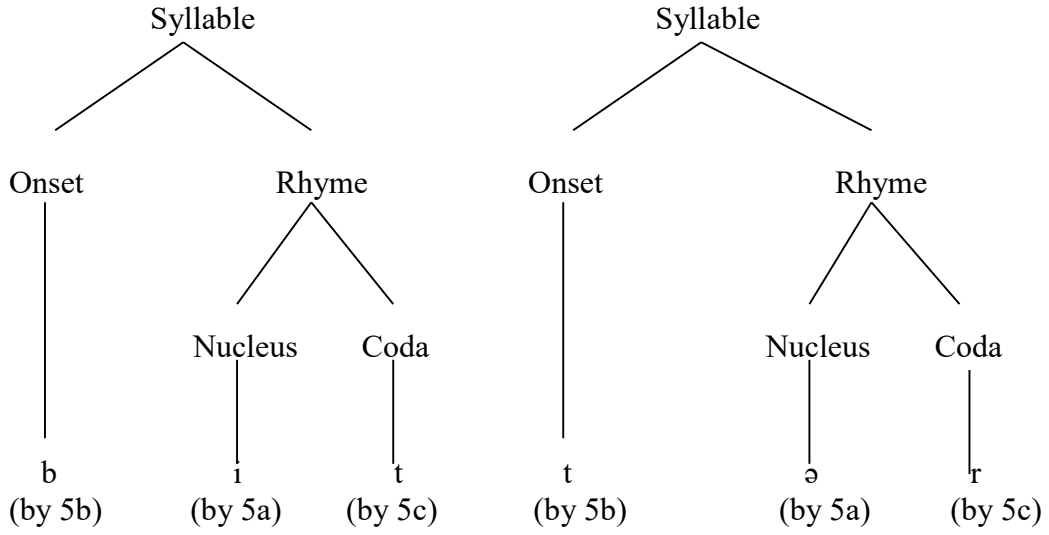
By the application of rule (5c) we get:

Syllable



Languages with clusters are said to have a more complex syllable inventory. therefore, we need additional rules for syllabification in such languages. A disyllabic word like bitter (as a adjective) in Indian English will be assigned the following structure by rules given in (5).

(7)



After teh application of rules given in (5) we still find that the initial [b] and the [r] are left stranded. These are syllabified by rules listed in (8).

(8) Rule D - Assign additional prevocalic consonants into the onset position following the sonority sequencing principle.

Rule E - Assign additional postvocalic consonants to the coda position following the sonority sequencing principle.

Rule F - Sonority sequencing generalization (Clements 1990) requires onsets to rise in sonority toward the nucleus and codas to fall in sonority from the nucleus.

Rule G - Sonority Scale (which ranks the entire class of speech sounds) has vowels as the most sonorous and the voiceless stops as the least.

4.3.4 Sonority hierarchy scale

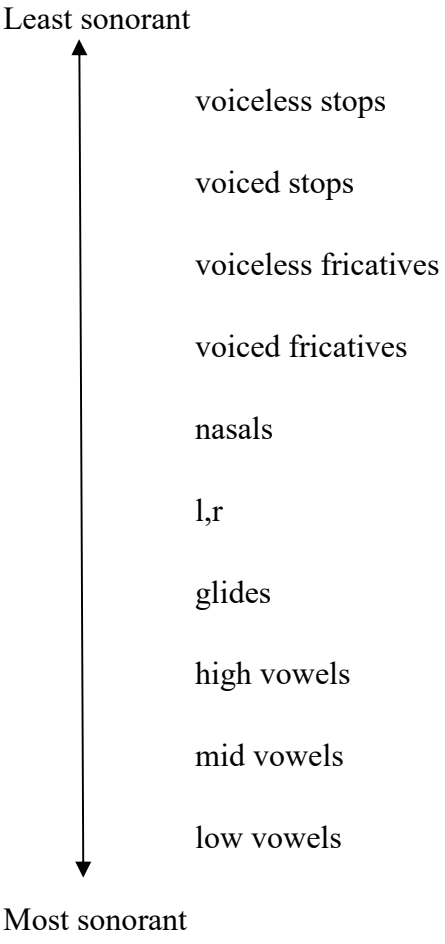


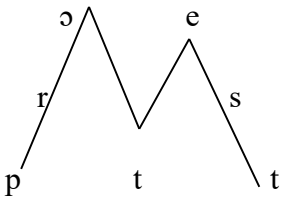
Fig. 6. The chart is modified version of the sonority scale of Burquest and Payne (1993)

Following rule (8d), we can assign the additional prevocalic consonatal /t/ to the onset position (as shown in (9) prior to /t/ as /b/ is less sonorant than /r/. According to (8f) onsets must rise in sonority towards the nucleus.

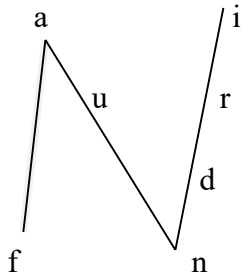
Similarly, rule (8e) will assign the additional postvocalic consonantal /t/ to the coda position after /s/. Rule (8) states that codas must fall in sonority, /t/ is less sonoraous than /s/, therefore, it follows rule (8f). Syllables constructed with rules (5) and (8) are known as ***core syllables***.

Given these rules, the sonority of the syllable peaks at the nucleus and descends toward the margins as reflected in the sonority graph of the word protest and foundry in (10 a and b) respectively.

(10) a.



b.



4.3.5 Motivation for the syllable

Having established the internal structure of the syllable and the rules for core syllabification, let us explore the reasons why we need a concept like the syllable in phonological theory.

It is claimed that the syllable is a natural domain for the statement of phonotactic constraints. Phonotatic constraints refer to the limitations on the distribution of sounds and sound sequences at various points (initial, medial, final) in the phonological word. For example, all English speakers tacitly know that while lexical words may begin with **tr-** and **str-**, sequences such as ***tl-** and ***nt-** are not possible as initial clusters in their language. But what is it that we are claiminh here? Are we saying that no word in English can begin with a *tl- sequence or are we saying that no syllable can begin with the sequence *tl-? Right now there does not seem to be any difference between the two. However, consider words like ***A[t?]lantic*** and ***a[t^{h}]rocious*** where the first /t/ is **glottalised** in **Atlantic** and aspirated in **atrocious**. It is only a reference to the notion of a syllable and not the word which helps us explain why only the /t/ in atrocious is aspirated and not the /t/ in Atlantic. The only possible

All examples in (2) illustrate monosyllabic words of English. The important point is the presence of a vowel, the obligatory component of a syllable, is all these examples.

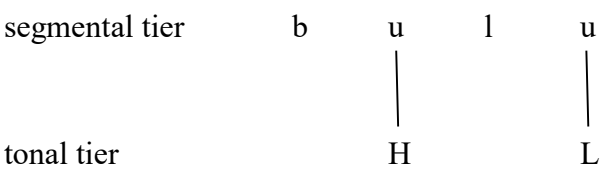
The obligatory component is known as the ***nucleus***, the preceding optional consonantal as the ***onset*** and the following optional consonantal as the ***coda***. In a word like bat, /b/ is the onset, /æ/ the nucleus and /t/ is the coda. Is there any internal structure to the sequence onset-nucleus-coda? Many phonologists assume that there is a further hierarchy that is, for instance, reflected in rhyming in English poetry. For example, take the words *cat* and *bat*. The sequence [æ] constitutes the rhyme/rime component of the syllable made up of the nucleus and the coda (if present).

Another motivation for positing the syllable as a constituent comes from the rule of vowel insertion in several languages. in English, for example, the alternation of rhythm /rðəm/ and rythmic can be explained only with refrerence to the notion of syllable. In /rið.mik/ each segment can be assigned to a syllable while in /riðm/ (the underlying cluster of -ðm) the string -ðm is not possible in coda of English. The /m/ in rhythm will be left unsyllabified. Languages generally use two strategies to deal with such stray consonants: they either delete the stray segment as is done in the case of damn or assign them to a new syllable by inserting a vowel before or after the stray consonant. In /riðm/ (where the second syllable has no vowel) a vowel is inserted in order to make it a well-formed syllabic word/ ri.ðəm/. Withput the notion of a syllable, it is difficult to explain why languages insert vowels out of nowhere into quite specific points in the phonological string. With the help of the construct syllable, the mystry is explained: the vowels are inserted to syllabify unparsed consonants.

4.4. Autosegmental Phonology

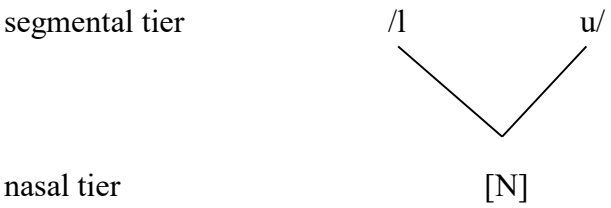
Autosegmental Phonology is a kind of non-linear phonology. It is also a method of formulating and analysing phonological representation, but unlike purely segmental phonology, it postulates several tiers of phonological structure.

Thus, for tone languages, a tonal tier is postulated. On this new tier, tones are represented as autosegments, which essentially overlaid on a sequence of segments. For instance, in the following diagram:



Here, 'H' and 'L' represent high and low tones.

Similarly, we can study languages with nasal harmony. Here, a nasal autosegment is postulated, located on a nasal tier. This nasal autosegment (tier) is attached to individual segments, which are nasal consonants or nasalised vowels. For example, we can see in Gokana [nu] ('thing'), represented as:



Here, '[N]' represents a nasal autosegment is attached to the segments on the nasal segmental tier.

4.5 Geminate inalterability

There is ample of literature supporting the concept that geminates are not subject to certain types of sound changes or phonological alternations (Kenstowicz 1982; Hays 1986a; Schein and Steriade 1986; Elmedlaoui 1993; Inkelas and Cho 1993; Malone 1993; Kirchner 2000). The large number of these cases involve what are traditionally referred to as lenition processes: voicing, spirantization, flapping, gliding or complete loss of a consonant. Gemiante resistance to such processes is sometimes referred to as geminate inalterability. The most frequent cited case of geminate inalterability is found in Tigrinya (Kenstowicz 1982). The singleton velar /k/ in Tigrinya, spirantizes to [x] in post-vocalic position (cf. ʕɑrɑt-kɑ 'bed-2sg.masc,' kətəmɑ-xɑ 'town-2sg.masc'), but this spirantization is blocked in geminates (k'ətəl-nɑ-kkɑ 'we have killed you'). Kircher (2000), recapitulating much of the earlier work on this subject and lists nine cases of singleton spirantization. All of these cases blocked geminates and eight cases of singleton voicing, also blocked in geminates. The generalization which emerges is that geminate resist lenition processes which target non-geminates.

The direct elucidation of this generalization is the characterization of lenition as a process with origins in gestural reduction, either in terms of magnitude or duration (LaVoie 2001). In 6.2.2, phonetic studies of lenition were shown to be consistent with this characterization, and provided a sound basis for the range of sound changes associated with lenition processes. The historical origins of geminates are irrelevant to this phenomena. The contrast between singleton and geminate consonant concerns consonants with shorter and longer durations respectively. The longer a stop closure duration is, the less likely it is that gestural reduction will result in a significant change, or a perceived change in manner or voicing features.

Because geminates can be on average one and a half to three times longer than their singleton counterparts, an intervocalic process which temporally reduces short [t] closure by half may reduce in [d] or [ɾ], or the percept of one of these, but the same temporal reduction of geminate [t:] will shorten the segment, perhaps enough for it to be reinterpreted as a short [t], but not enough for any of the other changes typically phonologized as lenition processes (Blevins 2004). The phenomena of geminate inalterability then is a consequence of the differing signals and percepts which result when short versus long stops undergo gestural reductions. Synchronic grammars do not contain impermeability of long closure durations to phonetic erosion in the form of gestural reduction.

Kirchner (2000) presents a phonological effort-based account of geminate inalterability and lenition. His primary argument against purely phonetic accounts is that they are unable to explain geminate inalterability, but the argument is rather indirect. In order to account for geminate inalterability, phonetic lenition processes must be strict reduction operations. The suggests, however, that there are modifications of the original gestures in lenition which appear to go beyond mere reduction, making the purely phonetic account untenable. None of the instances he provides are convincing, and his argument fails to take into account the important role of perception in sound change. As LaVoie (2001) demonstrates, weakening to true fricatives under lenition does not occur phonetically, and voicing is rare. Stops shorten and/or weaken to approximants, with shortening giving rise to voiced precepts, and approximantization giving rise to phonologization of fricatives.

4.5.1 Geminate Inalterability in Urdu and Bangla

The argument here is to look at the geminate inalterability which is a well-known phenomenon whereby a rule affecting singleton segments fail to alter comparable geminates.The main arguments regarding the two new generalizations pointing in a radically different direction. The first one says that the rules respecting inalterability are purely structure-filling (never structure-changing). And the second one says that the inalterability occurs also among singletons. Therefore, we are here to develop a new theory attributing inalterability to pre-specification keeping in mind that geminate (and singleton) inalterability follows solely from the elsewhere conditions. So, the controversy regarding the observation that geminates may surface a position where due to the phonological rules or constraints of the language thatis comparable with the featuralsingleton segments that cannot appear. This contrast has been attributed to a general phenomenon of the “geminate inalterability” fact (Hayes 1986b).

1. Geminate Inalterability:Rules that otherwise apply to singleton segments systematically fail to apply to geminates.

The focus ishere on the representational properties that distinguish geminates from singletons. Unifying the geminate-specific explanations for inalterability (most notably Hayes 1986b, Schein andSteriade 1986, Selkirk 1990a,b) is the assumption that the unique, branching geometry of geminates is responsible for their ability to persist. This article deals with the question which says the class of geminate-specific approaches at its foundation, contending that geminate inalterability is not a well-defined phenomenon. Therefore, it is neither the case that all geminates are inalterable nor the case that all inalterable structures are geminate. The argument for a radical redefinition of the corpus of effects to which inalterability theory must extend, offering two new generalizations to replace all the genuine inalterability effects involve structure-filling rules, i.e. those affecting only unspecified targets. Evidences show that the geminates are ever specially protected from structure changingand generalization is that co-existing with the well-known inalterability is a parallel phenomenon of singleton alterability that is frequently characterized in other terms "opacity" singleton resistance to phonological rules is widespread. This class of rules say that the singleton segments resist is the same class respect to which geminates are "inalterable". At the ground root of both the generalizations this is a deceptively simple the Elsewhere Condition (Kiparsky 1982, 1993), pre-specified immune to the structure-filling rules. Thus the geminate "inalterability" and "exceptionality" are thus the complementary facets of the same phenomenon. This argument is organized along with the lines that say thestandard inalterability and discuss representative. In the next step they have argued for redefining the phenomenon of inalterability on various types of pre-specification and demonstrate their applicability to genuine cases of inalterability on the basis of the analysis.

Here we have tried to explain how certain features relating to geminate such as inalterability, antigemination rules applies in autosegmental phonology. Inalterability and antigemination-they are the product from autosegmental phonology.

Inalterability, in general, refers lenition processes: voicing, spirantization, flapping, gliding or complete loss of a consonant. And, geminate's resistance to such processes is called geminate inalterability. In other words, Inalterability of geminate is the tendency of geminates to not following the rules whose application tend to modification of one-half of the geminate, while other-half remains unchanged.

Voicing :

For example, intervocalic alveolar fricatives become voiced ,but geminates resist this process in varieties of Italian spoken in the northern parts of the country, as shown in 3.

(1) casa /kasa/ [kaza] "house"
cassa /kassa/ [kassa] "cash register" (Dmitrieva O 2012)

The case of geminate inalterability is found in Tigrinya language (Kenstowicz 1982). In Tigrinya, the singleton velar /k/ spirantizes to [x] in post-vocalic position (cf. ʕ*arat-ka* 'bed-2sg.masc,' *kətəma-xa* 'town-2sg.masc'), but this spirantization is blocked in geminates (*k'ətəl-na-kka* 'we have killed you').

Spirantization:

Post-vocalic spirantization fails to occur, here,

(2) [kʌlbi] "dog" -[ʔaxalɨb] "dogs"
but: [fʌkkʌrʌ] "he boasted" (Dmitrieva O 2012)

Flapping Rule in Urdu

(3) (a) /gɑɖi/ → /gɑɽi/ 'vehicle'
/gʰoɖɑ/ → /gʰoɽɑ/ 'horse'
(b) /kʰɑɖɖɑ/ → /kʰɑɖɖɑ/ 'ditch'
/guɖɖi/ → /guɖɖi/ 'kite'

In the representation of Inalterability, in Urdu, in general, /ɖ/ becomes /ɽ/ whenever it occurs intervocalically (3a). However, the syllable final /ɖ/ fails to become /ɽ/ whenever it forms geminates (3b).

Similarly, in Bangla /kuɖi/ becomes /kuɽi/ or /puɖi/ becomes /puɽi/ but resists whenever the syllable final /ɖ/ gets geminated (4b)

(4) (a) /muɖi/ → /muɽi/ 'puffed rice'
(b)/guɖɖi/ → /guɖɖi/ 'kite'
/lɑɖɖu/ → /lɑɖɖu/ 'an Indian sweet made from a mixture of flour, sugar'

Voicing Rule in Tamil

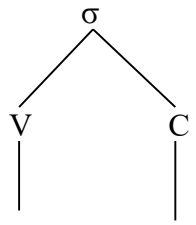
In Tamil, /kakam/ becomes /kagam/ (5a). However the syllable final /k/ fails to become /g/ whenever it forms geminates (5b).

(5) (a) /kakam/ → /kagam/ 'crow'

(b) /kokku/ → /kokku/ 'crane'

To explain the geminate inalterability in Persian v -------> w, Hays (1986) proposes the following rules as shown in (6).

(6) Persian v-------->w



v---------w [ ] -------

The rule (6) indicates that /v/ is converted to /w/ when it is associated with the coda position after a short vowel.

Geminate in (3a) does not satisfy the structural description of the rule (6), because geminates will have a branching geometry (i.e. CC).

In other words, the associations of the /v/ melody exceed those permitted by the linking constrant (Hays 1986). Thus, (v) fails to become /w/ in geminate consonant clusters by the doubly linked structure of itself.

However, the so called linking structure approaches are too strong and have been criticized by many researchers (Goldsmith 1990, Selkirk 1990, Scobbie 1992, Cho and Inkelas 1993, among others).

4.6 Lexical Phonology

Central to lexical morphology is the principle that the morphological component of a grammar is organised in a hierarchical strata. (cf. Allen, 1978; Siegel, 1974; Pesetsky, 1979; Kiparsky, 1982a, 1982b, 1983, 1985; Mohanan, 1982/86; Mohanan and Mohanan, 1984; Halle and Mohanan, 1985; Strauss, 1982a; and Pulleyblank, 1986).

On the phonological basis English affixes (both prefixes and suffixes) can be grouped into two broad categories. One type is neutral and the other type is non-neutral. On the one hand, **Neutral** affixes have no phonological effect on the base to which they are attached. **Non-neutral** affixes, on the other hand, affect in some way the consonants or vowel segments, or the location of stress in the base to which they are attached.

In SPE (The Sound Pattern of English) the difference between the behaviour of neutral and non-neutral affixes was dealt with in terms of the strength of boundaries. Between the base and a neutral affix like -ness or -ly, there was said to intervene a **weak boundary** (symbolised by '#'). In the contrast, a **strong boundary** (symbolised by '+') was assumed to separate the base from a non-neutral suffix like -ic, -ee or -th.

a.	ˈæbstrækt	ˈæbstrækt-nəs	b.	ˈhəum	ˈhəum ləs
	ˈsiəriəs	ˈsiəriəs-nəs		ˈpaʊə	ˈpaʊə ləs
	ˈəlɜ:t	ˈəlɜ:t ləs		ˈpeipə	ˈpeipə ləs
b.	ˈstrætədʒi	strəˈti:dʒik		diˈtein	di:teˈni:
	ˈmɔ:fi:m	mɔˈfi:mik		ˈæbsənt	æbsənˈti:
	ˈfəutəgrɑ:f	fəutəˈgrɑ:fik		ˈpei	peiˈi:
	ˈdeməkræt	demɔˈkrætik		imˈplɔi	implɔiˈi:

(Katamba F, 90)

The distinction between non-neutral affixes (associated with '+ boundary' in SPE) and neutral affixes (associated with '# boundary), corresponds to the more traditional distinction between primary and secondary affixes (Whitney, 1889; Bloomfield, 1933:240).

English primary and secondary affixes show contrasting phonotactic behaviour. Whereas secondary affixation can generate segment sequence that are allowed within a single

morpheme in lexical representations, primary affixation cannot give segment sequences that deviate from those allowed in single morphemes in the lexicon.

For example, English does not allow geminate consonants within roots but Indian English does. The orthographic doubling of letters in, say, *addle* [ædɬ] or *miss* [mis] never corresponds to any gemination (i.e. 'doubling') of the consonants in pronunciation. But in the Indian English, the orthographic doubling of letters in , say, *butter* [ˈbʌtə] , *chilly* [ˈtʃili] and *terrible* [ˈterəbl] corresponds to gemination of the consonants in pronunciation. Likewise, when we attach primary affixes like *ad* as in *adduce* [ədju:s] , again no gemination occurs. However, there is gemination when a secondary affix like sub-, un-, or -ness is adjacent to an identical consonant in the base. Secondary affixation can produce geminates as in *unnamed* [ʌnneimd], *sub-base* [sʌbbeis] and *thinness* [θinnəs].

For instance

	Indian variety of English	**British English**
dinner	/dinnə/	/dinə/
winner	/winnə/	/winə/
summer	/sʌmmə/	/sʌmə/
pillar	/pilə/	/pillər/
	British English	**Indian variety of English**
unknown	/ʌnnəʊn/	/ʌnnəʊn/
unknit	/ʌnnit/	/ʌnnit/
unnatural	/ʌnntʃərəl/	/ʌnntʃərəl/
unnerve	/ʌnnɜːv/	/ʌnnɜːv/
innate	/inneit/	/inneit/
innutrition	/innjuːtriʃn/	/innjuːtriʃn/
innumerable	/innjuːmərəbl/	/innjuːmərəbl/

4.6.1 Lexical morph-phonology model

Lexical morphology model which is based on Kiparsky (1982b:5)

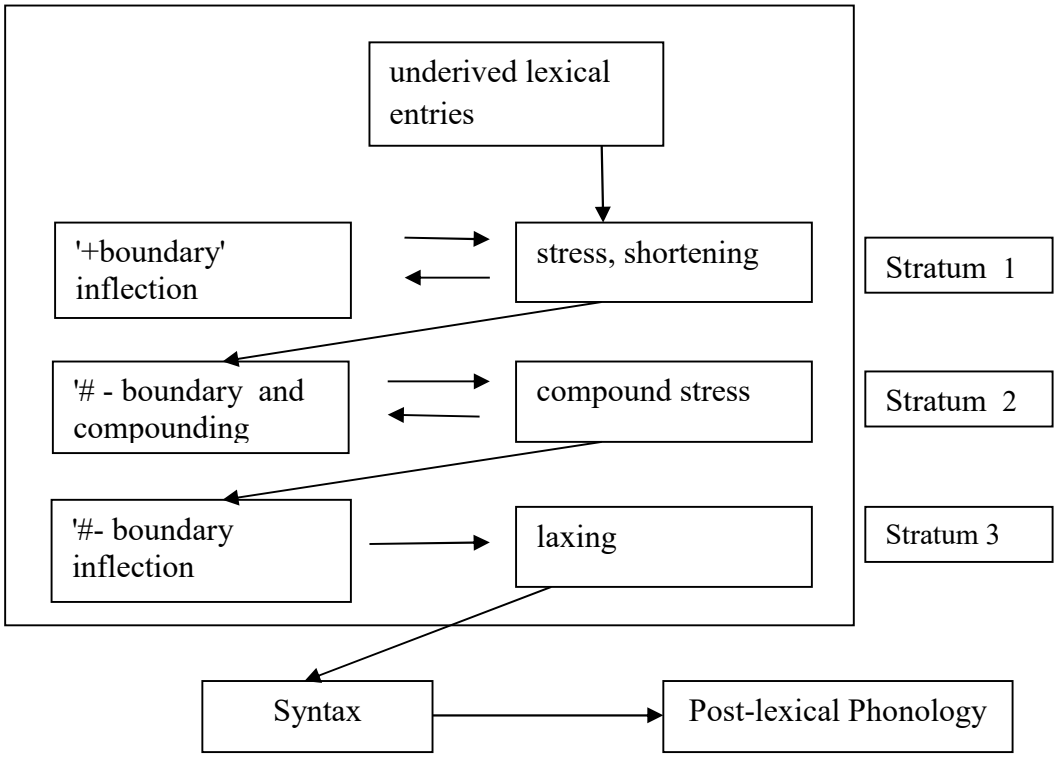


Fig. 7. Lexical morphophonology model which is based on Kiparsky

4.7 Bangla

Bangla (Bengali) will be illustrated here as an example of languages where geminates are attested intervocalic position only. This type of languages are Maranungku (Tryon, 1970), Oromo (Lloret, 1997) and Somali (Puglielli, 1997). Bangla is an Indo-European language spoken in Bangladesh, West Bengal, Tripura and some parts of India. It has Tautomorphemic or underlying geminates, concatenated or heteromorphemic geminates, and geminates from consonant assimilation in its inventory. See instance below from Lahiri and Hankamer (1988):

(i) Underlying geminate: /paṯ̪ṯ̪a/ [paṯ̪ṯ̪a] "whereabouts"

(ii) Concatenated geminate: /puṯ̪ +ṯ̪e/ [puṯ̪ṯ̪e] "bury" (Infinitive)

(iii) Assimilated geminate: /kor + ṯ̪e/ [koṯ̪ṯ̪e] "do" (Infinitive)

The phonemic inventory of Bangla includes bilabial, dental, retroflex, palatal and velar stops. All of which can also be aspirated contrastively: three nasals; a trill/flap and a retroflex rhotic; a lateral; and two fricatives. Palatal stops are usually realized as affricates.

All of the consonantal phonemes can be geminated except aspirated sounds, rhotics (r), velar nasal (ŋ) and glottal fricative (h). All of these consonantal phonemes can contrast as geminates and singletons. Some examples are shown bellow in i -viii.

(i) [kʰaʈa] "toiling" ~ [kʰaʈ̺ʈa] "sour"

(ii) [aɖa] "custard apple" ~ [aɖ̺ɖa] "soul"

(iii) [biɖai] "farewell" ~ [biɖ̺ɖai] "knowledge"

(iv). [bãca] "survive" ~ [bãcca] "child"

(v) [ʃoɟa] "straight" ~ [ʃoɟ̺ɟa] "bed"

(vi). [paɖa] "leaf" ~ [paɖ̺ɖa] "trace"

(vii). [mala] "wreath" ~ [malla] " crew of a boat or a ship"

(viii). [kana] "blind" ~ [kanna] "crying"

Both velar nasal (ŋ) and glottal fricative (h) have some restrictions in Bangla. the velar nasal is not permitted word-initially and the glottal fricative is not found word word-finally after vowels. Similarly, retroflex / ɻ/ does not occur word-initially in Bangla. With respect to geminate /rr/, Furguson and Chowdhury (1960) remark that although it is expected to arise in particular in the concateation of noun ending in /r/ with the animate plural suffix -ra, subjects were reluctant to produce it. There appears to be a tendency to avoid long /r/ or a phonetic neutralization of length for this consonant.

Geminates in Bangla are permitted only in word-medial, intervocalic position. Non-homorganic consonantal clusters are attested word-initially: a stop followed by a liquid [dr kl], a fricative followed by a stop, a nasal, or a liquid [st sr], or rarely, a nasal followed by a liquid [ml nr]. Finally consonant clusters are not allowed in Bangla except in foreign words (strike, strong, etc) used by multilinguals.

4.7.1 Gemination arises from assimilation Processes

This section will focus on the different aspects of gemination derives from assimilation processes.

In Bangla, the approximant /r/ can optionally assimilate totally to any following coronal consonants. This process also applies in non-derived monomorphemic words as well as cross morpheme boundaries.

4.7.1.1 /r/ Assimilation

i. /ordʒon/ ~ /ɔdʒdʒon/ 'earn'

ii. /borʃɑ/ ~ /boʃʃɑ/ 'rainy season'

iii. /korlo/ ~ /kollo/ 'did'

iv. /purno/ ~ /punno/ 'complete'

v. /d̪ʰormo/ ~ /d̪ʰommo/ 'religion'

vi. /ʃɔrd̪ɑr/ ~ /ʃɔd̪d̪ɑr/ 'leader'

vii. /ʃɔrgo/ ~ /ʃɔggo/ 'heaven'

viii. /gɔrɟon/ ~ /gɔɟɟon/ 'roar'

But there are counter examples as well:

i. /d̪orkar/ ~ /dorkar/ 'necessary'

ii. /sorkar/ ~ /sorkar/ 'Government'

4.7.2 Geminates derives from borrowed words

According to Kar (2008) there are three types of gemination processes in Bangla. Based on the earlier research in the area, the following observations have been recorded.

(3) Gemination process in loanwords in Bangla (Sanskrit Borrowing (SB) and Other Borrowing (OB))

i. Obstruents followed by a semi-vowel

ii. Obstruents followed by a liquid

iii. Plosives followed by a nasal /m/

4.7.2.1 Gemination with semi vowels

The very first type in (3) represents a significant number of Sanskrit Borrowed words which lost their post-consonantal semi-vowels in the spoken form of Bangla when borrowed from Sanskrit. Such changes are not visible in some other Indian languages such as Hindi, Gujarati, Marathi etc., which are, like Bangla, also closely related to Sanskrit. These languages maintain the original phonological forms of Sanskrit words even after the borrowing process is over. Sanskrit has two distinct semi-vowels (also called glides): labio-dental semi-vowel [ʋ] and palatal semi-vowel [j]. Below is a set of examples where type (i) gemination process takes place with labio-dental [ʋ]. This observation is also supported by several literary works (see Chatterjee, 1926a, 1926b, 1988; Dey, 1979; Singh, 1980 a.o; Kar, 2008).

Gemination: Consonant followed by a labiodental semi-vowel in Bangla (SB)

a.	San.	/saɖ̪^{h}.ʋi/ > Ban.	[saɖ̪^{h}ɖ̪^{h}i]	‘faithful wife’
b.	San.	/prt̪^{h}.ʋi/ > Ban.	[prt̪^{h}t̪^{h}i]	'earth'
c.	San.	/bis.ʋas/ > Ban.	[biʃʃaʃ]	'faith/trust'

Gemination: Consonant followed by a palatal semi-vowel in Bangla (SB)

a.	San.	/sat̪ja/ > Ban.	[ʃot̪t̪o]	‘truth’
b.	San.	/baljakal/ > Ban.	[ballokal]	'boyhood'
c.	San.	/mrt̪ju/ > Ban.	[mrit̪t̪u]	'death'

Bangla does not allow /t̪j/, /lj/ /ʃj/ type of consonant clusters. And whenever the two sounds, /ʋ/ and /j/ are preceded by any consonants in Sanskrit; the preceding sounds get geminated. For example, the Hindi word /ʋiɖ̪ja/- 'learning' turns into /biɖ̪ɖ̪a/ in Bangla. Here the sound /j/ gets deleted and the preceding sound gets geminated. If we consider the Sanskrit word /punja/ which becomes /punno/ in Bangla, because Bangla does not have /nj/ and /by/ type of consonant cluster. So whenever a consonant sound is followed by /ʋ/ or /j/, the preceding consonant sounds are triggered by gemination.

4.7.2.2 Gemination with liquids

In Bangla vocabulary, voiced plosives geminate before a liquid (/r/ or /l/), keeping the latter sound intact. That means the adjacent consonants C_1 and C_2 forms a geminate as $C_1C_1C_2$. But, this rule actually extends throughout the obstruent, not limited only to voiced obstruents. The Bangla vocabulary exhibits that word initial consonant clusters with a liquid sound at the C_2 position, only except one case (/ʈʰr/), all the clusters have more than zero occurrences in the Bangla lexicon. The occurrence of $C_1C_1C_2$ type gemination are found only in Sanskrit Borrowing and Other Borrowing in Bangla lexicon. The New borrowed words do not allow any gemination of this way.

Gemination : Obstruent followed by liquid in Bangla

Sanskrit Borrowings

a. San. /puʈra/ > Bang. /puʈʈro/ 'son'

b. San. /sutra/ > Bang. /ʃuttro/ 'method'

c. San. /subʰra/ > Bang. /ʃubʰbʰro/ 'white/bright'

d. San. /apluta/ > Bang. /appluto/ 'inundated'

Other Borrowings

e. Eng. /suprim/ > Bang. /ʃupprim/ 'supreme'

f. Eng. /riplai/ > Bang. /ripplai/ 'reply'

g. Eng. /saplai/ > Bang. /ʃapplai/ 'suply'

h. Arab. /maɖrasa/ > Bang. /maɖɖraʃa/ '(Islamic) School

It should be noted that this type of gemination occurs only when the adjacent consonants are preceded by a vowel. This rule has some exceptions. For example, /ilekʈrik/ 'electric' /meʈrik/ 'metric' do not allow such type of gemination at the /ʈr/ cluster, even though it belongs to the Other Borrowing stratum. On the contrary, the words from New Borrowing (NB) category strictly do not follow this gemination pattern at all.

Word-medial obstruent-liquid clusters belonging to New Borrowing stratum

a. Bang. /sãtra/ [ʃã.tra] 'a Bengali surname'

b. Bang. /babri/ [bab.ri] 'long curling hair-style'

c. Bang. /sapla/ [ʃap.la] 'water lily'

4.7.2.3 Gemination with Nasals

Plosive sounds are not preceded by nasal /m/ in Bangla. In Sanskrit, there are numerous instances where a plosive precedes /m/ in the word medial position. In Bangla plosive sound doesn't precede /m/ at the word medial position. They always form a geminate of the first element of the cluster, by either merging or dropping the second element. That means, C_1C_2 becomes C_1C_1 where C_1 is the plosive and C_2 is /m/. For instance,

Gemination: Consonant followed by /m/ (SB)

a. San. /paḍma/ > Bang. /paḍḍa/ [pɔḍ.ḍo] 'lotus'

b. San. /cʰaḍma/ > Bang. /cʰaḍma/ [cʰɔḍ.ḍo] 'disguise'

c. San. /aṭma/ > Bang. /a ṭma/ [aṭ.ṭa] 'soul'

It is clear from the above data that [ḍm] or [ṭm] consonant cluster are found in NIA languages like Hindi, Maithili, Punjabi etc. and of course in Sanskrit. But, in Bangla, the sequence is changed through a gemination process. Because /tm/ or /dm/ cluster is highly marked in Bangla. Bangla doesn't allow /ḍm/ and /ṭm/ clusters and whenever /ṭ/ or /ḍ/ follows /m/ , the nasal sound /m/ gets geminated.

The following conditions may be laid down for the gemination of consonants in the above mentioned languages.

1. Gemination may be caused by double consonants in spelling.

2. The geminated consonant occurs intervocalically:

    (i) the geminated consonant occurs between two short vowels.

4.7.3 Gemination derives from Sandhi[x]

Sandhi forms are forms which have undergone specific modifications in specific circumstances (e.g. various Sandhi rules have applied). Assimilation and dissimilation are

two widespread tendencies which could be classified under this heading. The merit of the Sandhi notion is that it can be used as a very general term within which can be placed a wide range of structural tendencies that otherwise it would be difficult to interrelate. Unlike Sanskrit, Bangla also has Sandhi process as opposed to modern Indo-European languages like English.

In Bangla the process of coalescence or sandhi in word-formation causes gemination as explained below:

4.7.3.1 /d̪/ Assimilation

Whenever the suffix ends with the dental sound /d̪/ and followed by a noun, the initial consonant of noun get geminated by either merging or dropping the final consonant of the first word. These are assimilated geminates which are morphologically derived in Bangla.

i. [t̪od̪] + [likʰit̪o] = /t̪ollikʰit̪o/ your writing

ii. [bʰid̪] + [no] = /bʰinno/ separated

iii. [cʰid̪] + [no] = /cʰinno/ cut off

iv. [kãd̪] + [nɑ] = /kɑnnɑ/ crying

v. [ud̪] + [not̪i] = /unnot̪i/ prosperity

vi. [ud̪] + [nojon] = /unnojon/ development

vii. [ud̪] + [ɖin] = /uɖɖin/ flying

viii. [ud̪] + [caron] = /uccaron/ pronunciation

4.7.3.2 /t̪/ Assimilation

Whenever the suffix ends with the dental sound /t̪/ and followed by a noun, the initial consonant of noun get geminated by either merging or dropping the final consonant of the first word. These are also assimilated geminates which are morphologically derived in Bangla.

i. [ɟɔgot̪] + [nɑːt̪ʰ] = /ɟɔgonnɑt̪ʰ/ Lord of the Universe

ii. [ʃɔt̪] + [mot̪i] = /ʃɔmmot̪i/ permission

iii. [rɑt̪]+ [d̪in] = /rɑd̪d̪in/ day and night

iv. [haʈ̪] + [ɖekʰa] = /haɖ̪ɖ̪ekʰa/ showing hand

v. [haʈ̪] + [ɖije] = /haɖ̪ɖ̪ije/ with the hand

vi. [ɔʃoʈ̪] + [cinʈ̪a] = /ɔʃoccinʈ̪a/ bad thought

vii. [ʃɔʈ̪] + [coriʈ̪rɔ/ = /ʃɔccoriʈ̪rɔ/ chast/virtuous

viii. [colɔt] + [ciʈ̪ro] = /colɔcciʈ̪ro/ cinema

4.7.3.3 /r/ Assimilation

Whenever the suffix ends with the approximant /r/ and followed by a coronal sound, the initial consonant of noun get geminated by either merging or dropping the final consonant (/r/) of the first word. These are also assimilated geminates which are morphologically derived in Bangla.

i. [bʰor] + [ɖ̪in] = /bʰoɖ̪ɖ̪in/ whole day

ii. [kor] + [ʈ̪al] = /kɔʈ̪ʈ̪al/ clapping

iii. [car] + [ʃo] = /caʃʃo/ four hundred

iv. [car] + [ɖ̪ik] = /caɖ̪ɖ̪ik/ all sides

v. [car] + [ʈi] = /caʈʈi/ four pieces

vi. [a:r] + [na] = /anna/ no more

vii. [bʰor] + [raʈ̪] = /bʰorraʈ̪/ whole night

Whenever the first morpheme ends with /u/, /i/ and /o/ and the next morpheme begins with any sound, the final consonant of the first morpheme get geminated. And the last vowel of the first morpheme get deleted. The instances are given below:

i. [onu] + [eʃon] = /onneʃon/ looking for

ii. [onu] + [eʃa] = /onneʃa/ a name

iii. [onu] + [ai] = /onnai/ wrong

iv. [onu] + [ortʰo] = /onnɔrtʰo/ different meaing

v. [oti] + [olpo] = /ottɔlpo/ very few

vi. [moʃi] + [adʰar] = /moʃʃadʰar/ inkpot

vii. [oʈi] + [acar] = /oʈʈacar/ oppression

viii. [aɖi] + [onʈɔ] = /aɖɖɔnʈo/ beginning and end

ix. [proʈi] + [u:ʃ] = /proʈʈuʃ/ early morning

x. [proʈi] + [ek] = /proʈʈek/ every one

xi. [proʈi] + [aʃa] = /proʈʈaʃa/ expectation

xii. [proʈi] + [aɖeʃ] = /proʈʈaɖeʃ/ commandment

Exception :

i. [ɟoʈɔ]+ [ɖin] = /ɟoɖɖin/

ii. [eʈo] + [ɖur] = /eɖɖur/

In all the Bangla instances given above, gemination occurs between two short vowels - VCCV.

4.8 Urdu

When a phoneme ends with a consonant preceded by a vowel, the consonant gets geminated. And the preceding vowel changes into /u/. Examples are given below:

i. /hazik/ - /huzzaq/ 'person who is an expert in his art'

ii. /hafiz/ - /huffaz/- 'the persons who memorize the Quran by heart'

iii. /hasiɖ/ - /hussaɖ/ 'Begrudge'

iv. /hadʒ/ - /hudʒdʒadʒ/ 'Haji'

v. /haris/-/hurras/ 'cultivators'

ii. /dʒin/ - /dʒinnaʈ/ 'spirits'

iii. /ʈadʒir/ - /ʈudʒdʒar/ 'Traders'

viii. /hakim/-/hukkam/'Kings'

ix. /kʰaɖim/ - /kʰuɖɖam/ 'servants'

x. /fadʒir/ - /fudʒdʒar/ 'Impious persons'

Excetional Case

i. /imɑm/-/ɑimmə/ 'Imams'

ii. /nɑs/ - /unnɑs/ 'many people'

Geminates derives from Arabic root

i. /a-s-r/ > /muyassar/ 'feasible'

ii. /ɑ-ḏ-b/ > /muwaḏḏɑb/ 'with respect'

iii. /a-z-n/ > /muwazzin/ 'the person who calls for prayer in Mosque'

iv. b-ḏ-l > /ṯəbɑḏḏɑl/ - 'changeable'

v. b-s-m > /ṯəbɑssum/ 'smile'

vi. dʒ-l-ḏ > /dʒəllɑḏ/ 'executioner'

vii. dʒ-l-j > /ṯədʒɑlli/- 'light'

Geminates derives from Arabic.

i. /ṯɑbi:b/ -/ɑṯibbɑ/ 'Doctors'

ii. /hɑbi:b/ -/ɑhibbɑ/ 'friends'

iii. /dʒɑlil/ - /ɑdʒillɑ/ 'rich persons'

iv. /ṯɑrikʰ/ 'hisrtory' - /muwɑrrikʰ/ 'historian'

v. /usas/ - 'base' > /muwassis/ -'founder'

vi. /ɑḏɑb/ 'literature' > /muwaḏḏib/ 'with literature'

vii. /bayan/ 'divider' >/bayyan/ 'purpose'

viii. /bɑrkɑṯ/ 'abundance' > /ṯəbɑrruk/ 'Consecrate'

ix. /bəri/ 'freedom' > /bɑrrə/ 'hatred'

x. /basar/'eye' > /mobassar/ 'the person who looks'

xi. /dʒiḏ/'cover' > /dʒəllɑ/ 'executioner'

x. /hɑḏis/ 'new words' > /mohɑḏḏis/ 'teacher of Hadith'

xii. /husn/ 'beautiful' > /hussan/ 'one who makes something beautiful

xiii. /hamal/ 'burden' > /hammal/ 'labour'

xiv. /hamḏ/ 'praise' > /hammaḏ/ 'the person who praises someone'

xv. /ḏars/ 'lesson' > /moḏɑrris/ 'teacher'

xvi. /raqs/ 'dance' > /raqqas/ 'dancer'

xvii. /ʃukr/ 'thankful' > /ʈə̪ʃakkur/ 'to thank'

4.9. Telugu

4.9.1 Geminates arises from Sandhi

In slow speech sandhi between two independent words may not be carried out, but it is always compulsory within a word. In slow utterances of speech, it is convenient to observe this geminates in Telugu as the examples given below show:

1. **i+aa> EE**

This rule mentioned above is applied when *it regularly* occurs at the end of a disyllabic words. This rule is also applicable when the word has more than two syllables. For example:

i. Katti – aa> kattEE

2. **V1+V2> V2**

This rule says a short vowel is dropped before another short or long vowel. Apart from that the consonants are also getting changed while coming into contact with other consonants. This could be an influence on the manner in which a vowel is getting changed in contact with another vowel which is preceding another one.As the examples say below:

ii. Vaadu akkada unnaadu> vaadakkadunnaadu
iii. Vaallu ii pandu iccEEru> vaalli pandiccEEru

3. **C1 V1 C2> C1 C2 where C1=C2**

This rule says a short vowel is dropped between two identical consonants. With the dropping of a vowel the immediate consonant is getting doubled and making a geminate. So, this rule which is set for the vowel changing is also applicable for the gemination as well. For example:

iv. Reepu poddunna> reppoddunna
v. Paalu leevu>paalleevu
vi. *Polaalalu> polaallu
vii. *tinunu> tinnu

viii. *Cuudadu> cuddu

ix. Miiru raa leedu> miirra leedu

4. B V P> PP

This rule says a short vowel between a voiced stop and the corresponding voiceless stop is dropped and the voices stop is changed into the corresponding voiceless stop. The intermediate consonant is getting deleted and the next consonant is getting doubled, whereas the formation of germination comes into focus. For example:

x. *aadagakunda> adakkundaa

xi. *lagukoo> laakkoo

xii. Padi tappulu> pattappulu

xiii. Perugu kaavali> perukkaavaali

5. P V B> BB

This rule says a short vowel between a voiceless stop and the corresponding voiced stop is dropped and the voiceless stop is changed into the corresponding voiced stop. The consonant that is following a vowel immediately is getting gemination and that particular consonant is doubled.

xiv. *curukugaa> curuggaa

xv. *paatadi> paddi

xvi. Gurrapu bandi> gurrabbandi

6. t V c/j > ccjj

This rule says a short vowel between *t* and *c* or *j* is dropped and *t* is changed to *c* or *j*. The consonant *t* is changing into *t* and this consonant is being repeated and creates a germination. For example:

xvii. Paata ceppulu> paacceppulu

xviii. Paata jaadii> pajjaddii

7. r V l/n> rl/rn

This rule says a short vowel between *r* and *l* or *n* is dropped. Here no such gemination is happening for the consonants apart from the doubling of the vowels. For example:

xix. *peeru-lu> pirlu
xx. Peeru leedu> peerleedu
xxi. *vaarini> vaarni

8. l V n/r > ln/lr

This rule says a short vowel between the l and n or r is dropped.

xxii. *cEEpalani> cEEplani
xxiii. pillalu raa leedu> pillalraaleedu
xxiv. *kadalaru> kadalru

9. d V n/l/r> nn/ll/dr

This rule talks about the changes of *d* and *n*, *l* or *r* is dropped and *d* and *n* changed to *nn* and *d* and *t* is changed to *ll*. Due to the changes of the consonants as forming the geminates the vowels doubling are unchanged. For example:

xxv. Veerdi niilu> venniillu
xxvi. *vaadi-ni> vanni
xxvii. *koodi-lu> koollu
xxviii. Cuuda leedu> cuul'leedu
xxix. Ooda revu> ood'reevu
xxx. *paadaru> paad'ru

10. n V d/l/r> nd/nl/nr

The above rule says about the dropping of the short vowel which is coming between the *n d r* and *l*. This short vowel dropping is quite frequent so far we have seen our examples.

Therefore, one can assume the changes for both consonants and vowels are occurring when making geminations. For example:

xxxi. Maandi> mandi
xxxii. Manadaari> mandaari
xxxiii. *pani-lu> panlu
xxxiv. Pani leedu> paanleedu
xxxv. Tinaru> tin'ru
xxxvi. Neenu raanu> neenraanu

11. m > N/C

This rule is about the changes of the nasalized consonant *m* into a nasal that is homorganic with the following consonant. Therefore, the nasalized sound is changing into another nasalized and that is why making the homorganic sound.

xxxvii. Andam-ga> andangaa
xxxviii. Pustakam-loo> pustakan-loo
xxxix. Ravadam cEEta> raavadancEEta

12. All consonants except a few aspirated plosives and fricatives /f/, /s/ and/h/ occur as long in Telugu and contrast with their short counterparts in minimal/sub-minimal pairs.

xl. /gudi/ 'temple' > /guddi./ 'blind'
xli. /mona/ 'a sharp tip' > /manna/ 'day before yesterday'
xlii. /kala/ dream'> /kalla/ ' false'

The contrast between *d* and *dd* and *r* and *K* has accompanying quality difference as well. Unlike vowels, the contrast is limited to word-medial position.The contrast has been viewed as an opposition between single and double or geminate consonant.

13. **Distributionally, short consonants occur initially and medially,whereas long consonants occur only medially. Long consonants appear in disyllabic, tri-syllabic and tetra-syllabic structures and before or after a long vowel.**

xliii. /akka/ ‘elder sister’

xliv. /me:natta/ ‘father’ssister’

xlv. /batta:yi/ ’ anorange’

They also occur at word or morpheme boundary as a result of sandhi.

xlvi. /ta:ta/ + /to:/> /t&to:/ ‘with grandfather’

xlvii. /ka:ki/+/ki/>/ka&ki/ “for the crow’

Instrumental records do not provide any evidence of re-articulation. Examples such as

xlviii. /latta/+/to:/>/at. to:/ “with mother-in-law’

xlix. /mokka+ku/ + /mok.ku/‘to (the) plant’ involve re-articulation of the consonant

4.10 Summary

It has been shown that Bangla allows three types of geminates: underlying geminates, concatenated and assimilation (Lahiri & Henkamer 1988). It has been described that Bangla allows lexical geminates, gemination through derivational processes and gemination derived from borrowed words. Gemination through assimilation comes under derivational processes. Assimlation is morpho-phonological processes. The diverse types of assimilation processes (which causes gemination) have been discussed in this chapter. The present chapter also illustrates that there are three types of gemination processes in Bangla (Kar 2008). It has also been tried to show that vowel duration gets reduced when followed by a geminate and consonant cluster though Bangla does not allow vowel length contrast. In Indo-Aryan languages gemination occurs between two short vowels whereas in Dravidian languages gemination takes place between two short vowels, one short vowel and one long vowel and one long vowel and one short vowel. The chapter also attempts an explanation of how gemination processes present in Indic Languages are transferred to Indian English. The chapter also investigates the various processes arises from Sandhi in Telugu.

CHAPTER V

PHONETIC STUDY OF GEMINATES

5. Introduction

Geminates consonants (also known as long or doubling consonants) are found in many languages in the world, and how they contrast with their counterparts, or singletons (e.g. /nn/ vs. /n/), is an important topic that features in most linguistics and phonology textbooks. No book , except in Stuart Davi's (2011) introductory article entitled 'Geminates' (The Blackwell Companion to Phonology), that specifically discusses geminates per se.

This chapter devoted to the phonetics of geminates consonants. The study aims to bring studies on geminate consonants and it also discuss the singleton-geminate contrast from different perspectives including experimental phonetics (speech perception and production).

The contrast of consonant length in Phonetics is primarily signalled by consonant duration (see e.g. Lehiste 1970; Fujisaki and Sugito 1977; Lahiri and Hankamer 1988). It is also known to involve other phonetic features (Ridouane 2010; Kawahara 2015b). However, it is not known how different languages employ these other phonetic features and how much they differ in this respect. Many languages such as bengali (Lahiri and Hankamer 1988), Berber (Ridouane 2010), Hindi (Ohala 2007), and Italian (Esposito and Di Benedetto 1999) shorten pregeminate vowels just as they shorten vowels in closed syllables as against open ones (Maddieson 1985), but other languages such as Japanese lengthen vowels in the same position (Port et. al. 1987; Idemaru and Guion 2008; see Kawahara 2015b for more references). It is interesting to know such interlanguage differences and explore the reasons for them.

In phonology, languages are known to exhibit positional differences where the geminate or singleton contrast can arise. Geminates may occur both initially of the morpheme or in the concatenation of morphemes or it may appear in words. These types of geminates are known as 'underlying' and 'derived' geminates respectively. These types of geminates may appear within a single language such as in Bengali (Lahiri and Hankamer 1988), Japanese (Kubozono et al. 2013; Kawahara 2015b; Kawagoe 2015), Turkish (Lahiri and Hankamer 1988), Sardinian (Ladd and Scobbie 2003) and Berber (Ridouane 2010), Italian (Payne

2005). Derived geminates occur dominantly in some languages such as Russian (Dmitrieva, 2017).

Different languages may have different co-occurence constraints on geminate consonants. For instance, while many languages have a contrast in both vowel length and consonant length, they fall into two groups depending on whether they allow geminate consonants after long vowels and diphthongs, as in Finnish (Aoyama 2001; Isei-Jaakkola 2004), or they do not, as in Japanese (Kubozono et al.2013; Kawagoe 2015; Ito et al). Apart from these two groups, some languages like Italian only have a contrast in consonant length, not in vowel length. (Kubozono 2017)

Languages may show differences in the position where vowel length or consonant length can be contrastive within the word. Languages like Japanese and Italian permit the contrast only in word-medial positions (Kubozono et al. 2013; Kawagoe 2015). Languages like Bengali and Tashlhiyt Berber display the contarst word-initially and word-finally as well (Kotzor et al.,2017; Ridouane and Halle, 2017; Dmitrieva 2017). This positional asymmetry may not be difficult to explain in phonetic terms given the fact that constriction duration- closure duration for stops and friction duration for fricatives-- is generally the primary phonetic cue to the contrast between geminates and singletons: word-medial position provides clearer cues to the onset and offset of the constriction duration than other word positions. (Kubozono 2017)

The contrast of (Section 2.3) gemisntes and singleton are most commonly found in intervocalic position, less commonly word-final position, and least commonly in initial position (Thurgood 1993; Davis 199b; Muller 2001; Dmitrieva 2011; Pajak 2013). The occurence of word-intial voiceless geminate stops constrast with their singleton counterparts are less commonly found among the World languages. To our knowledge, this has been documented phonetically in four languages: Malay (Abramson 1986b, 1987, 1991, 1999 for Pattani Malay; Hamzah 2013 for Kelantan Malay), Cypriot Greek (Tserdanelis and Arvaniti 2001; Muller 2003; Armosti 2009), Swiss German (Kraehenmann 2001; Kraehenmann and Lahiri 2008), and Moroccan Amazigh (Berber) (Ouakrim 1993, 1994; Louali and Puech 1994; Ridouane 2003, 2007; Rodouane and Halle 2011 for Tashlhiyt; and Bouarourou at al. 2008 for Tarifit). The singleton-geminate contrast for voiceless stops in utterance-initial position raises a puzzling issue in both production and perception: do speakers produce the length contrast distinguishing these segments, even though ir conveys no acoustic duration

information? Are there any other acoustic cues that would enhance the distinction between singleton anf geminates int his position? Are native listeners sensitive to these attributes, if present?

The present chapter specially demosntrated the word-medial geminates and gemination in Indic Languages, e.g. Bangla, Urdu, Telugu and Indian variety of English (Telugu variety of English). The above mentioned languages except Indian English, deploys a singleton-geminate contrast in obstruents and nasals, but not in glides. These languages also permit sonorant geminates and disfavour glide geminates in particular.

Concerning the distinction between obstruent geminates and sonorant geminates, Podesva (2002) hypothesizes that the phonological dispreference for sonorant geminates exists because these geminates are easily confused with corresponding singletons. This confusability problem arises because sonorants are spectrally continuous with flanking vowels, and consequently their constriction durations are difficult to perceive.

Relating to the difference between glide geminates and nasal geminates Kato given stream of sounds, listeners use amplitude to demarcate segmental boundaries. He also tries to show in Experiment III and IV that amplitude changess facilitate categorization and discrimation of short-long contrasts of consonantal intervals. These are amicable with the fact that several languages disfavour glide geminates more than nasal geminates (Kato et. al 1997).

5.1 Related Works

In this section, we will discuss the results of phonetic studies of gemination occuring in a number of languages in the World. Languages taken into consideration are- Bengali, Hindi-Urdu, Turkish, Marathi, Cypriot Greek, Pattani Malay, Tashlhiyt Greek, Japanese, Norwegian, russian, Swiss German, Malayalam, Italian etc.

5.1.1 The timing of Geminate Consonants (Bengali and Turkish)

Lahiri and Hankamer (1988) investigated various acoustic cues and their perceptual relevance on the distinction between geminates and non-geminates in Bengali and Turkish. Their study, which focused only on voiceless stops, confirmed that closure duration was a perceptually salient cue for distinguishing between geminates and singletons in Bengali and Turkish, but discounted the fact that V1 duration was a secondary cue that could be used to identify geminates.

Lahiri and Hankamer (1988) found that only duration played a crucial role in the perception of the consonants although both Voice Onset Time (VOT) and closure duration systematically varied with gemination. They also demonstrated the issue of possible phonetic differences between underlying, concatenated, and assimilated geminates using material from Bengali and concluded that such differences could not be determined.

5.1.2 Phonetic and Phonological Aspects of Geminate Timing

Ham (2001) provided an overview of a number of phonetic studies of geminate and addresses that most of the studies are directed at establishing the acoustic correlates of gemination, agreeing for the most part that duration is the major phonetic cue to gemination. A perceptual component of these studies is usually focused on determining the perceptual boundary between singleton and geminate consonants, i.e. the durational value that corresponds to the categorical shift in perception. Another question frequently asked in the phonetic literature on geminates is whether any phonetic differences can be found between geminates of various origins: lexical, concatenated, and assimilated.

5.1.3 Perception of consonant length: Voiceless stops in Turkish and Bengali

Hankamer et al. (1989) examined the perception of consonant duration contrast in Turkish and Bengali. They established that if stimuli were created by shortening geminate consonants a perceptual shift from singleton to geminates was observed on average 8 ms earlier than for stimuli created by lengthening singleton consonants. This effect was observed mainly in the medial duration range, where consonants were not obviously short or long and the durational cue was not very informative. They hypothesized that acoustic cues other than increased duration are involved in production and perception of geminate consonants. Listeners rely predominantly on the primary cue when its contribution is most revealing. While secondary cues affect perception of durational categories when duration of the target consonants is ambiguous. However, none of the eight additional acoustic measurements showed a correlation with the perceived geminacy.

5.1.4 Word-initial geminates: From production to perception

The contrastive relationship between the geminates and singleton lies on the intervocalic position mostly, less commonly word-finally and least commonly word initial position (Thurgood 1993; Davis 1999b; Muller 2001; Dmitrieva 2011; Pajak 2013).Though the singleton or geminate contrast for voiceless stops raises a puzzling issue in both the production and perception for utterance-initial position. And that is a matter for the native

speakers or listeners. The natives can make a distinction between the geminates and singleton in terms of closure duration. The natives can make accurate distinction depending on the absence of the closure duration information to identify the geminates vs. singletons. In utterance-initial position, Cypriot listeners also reliably perceive the singleton/geminates contrastsmainly on the basis of VOT difference (Muller, 2003). In Pattani Malay, the singleton/geminates contrast seems to entail a difference in accentuation. In Cypriot Greek, the contrast between singletons and geminates is also a laryngeal contrast between unaspirated and aspirated stops, respectively (Muller 2001; Tserdanelis and Arvaniti 2001; Armosti 2009). Therefore, the relationship between the production and perception of word-initial gemination with the special focus on the voiceless stops is not an exception as in Tashlhiyt; geminates in this language primarily implemented through longer duration, even for utterance-initial voiceless stops. Acoustically how Tashlhiyt geminates are implemented and present some new electropalatographic (EPG) data on the articulatory correlates in the singleton/geminates contrast in word-initial position which show in Tashlhiyt, each consonant has a geminate counterpart both in lexical and morphological level as shown **in section 3.2 of *word-initial geminates* from production and perception by Rachid Ridouane and Pierre A. Halle Pp-68**. This gemination contrasts is perceptually recovered by the Tashlhiyt native speakers.

Studies have agreed that the duration is the most acoustic or articulatory parameter distinguishing singletons from geminates.How gemination is implemented in terms of durational or non-durational information for voiceless or voiced stops and fricatives in theword-initial or intervocalic orfinal position on the basis ofthe acoustic and articulatory data have been shown by Ridouane (2007)**Pp-69.**Geminates had longer duration than singletons. Therefore, the studies have proved the clear distinction between the singleton and geminates on the basis of the native speakers' intuitions. Though this research has been done focusing on the voiceless stops in word-initial position gemination. Ridouane's report (2007) says the timing differences for the utterance of both the geminates and singletons in his research.

Therefore, voiceless stops geminates are producedsystematically than their singleton counterparts in a large number. The differences between the singleton and geminate lieword-initially voiceless stops which also hold in utterance-medial position.The duration is the most

systematic way distinguishesword-initial geminates from their singleton counterparts for voiceless stops.

Word-initial geminates: perception:

The germination contrasts in Tahslhiyt have been observed depending on the natives' perception as the studies have been shown (Louali and Puech 1994; Ouakrim 2003).Inter-vocalic duration is the most important cue found for the contrast perception. Studies have shown that the native speakers can reliably perceive the singleton and geminate contrast in the absence of acoustic duration differences.Stop release intensity as well as vowel intensity were greater for geminates than singletons.

5.1.5 Effects of duration and phonological length of the preceding/following segments on perception of the length contrast in Japanese

This study aims at influencing the physical duration and phonological length of the preceding vowel on the perception of singleton and geminate stops in Japanese. Thisstudy of perception experiment shows the duration and phonological length of the vowel in two syllable words preceding the stop as the examples have given in the charts. This perception experiment shows the presence of the physical duration and the phonological length of a vowel precedes the consonant of a singleton and geminate stops in Japanese language. The native speakers and listeners are well aware of this distinction. The vowels are long than the singleton phonologically and the stops are longer in closure afterlong vowel than short vowels as the studies have shown (Pp-95-97). The identification of consonant length both in the singleton and geminate is affected by the physical duration and phonological length of the preceding vowel in Japanese language. Though the physical duration effects in assimilation and the phonological length is contrastive. The vowel length perception is affected by both the physical duration of the following stop closures and the phonological length in singletons and geminates of the following stops. Studies have shown that the production experiment that demonstrates the effects of the durations of the preceding vowels and the following stop closures which are found in the perception experiment as shown the charts in the description given in the text book, are parallelly with variation contextually in duration of the preceding vowel and the following stop closure in speech production.

5.1.6 Articulatory coordination in long and short consonants: An effect of rhythm class?

The studyin this chapter aims at examining the physical properties of how the consonants are being produced in Japanese such as the articulatory pattern and the involvement of the vocal organs like the lip and tongue movements for the production of the long and short consonants. The study arises the question if there is any difference between Japanese and Italian syllable timing that might be in relation torhythm classes where the movements of the tongue both in the vertical and horizontal dimension as done by Smith. The interval between the consonant release and the offset of the tongue body movement subjects the ending movements after the release. There are some subjects which show a significant difference between the long and short consonants in cases like the offsetsare occurring and with respect to the release for the short consonant. The tonguemovement trajectory between the two vowels appears to be close to a straight line in both languages. The timing of the tongue movement could be changed relative to both consonant onset and offset and onset both and the movement would occur during the consonant. It has been shown that the duration of the tongue movement is mostly longer than a long consonant. Though its magnitude tends to be longer in long consonants, but its average speed is always lower in long consonants in Japanese where it tends to be higher in Italian long consonants. Thus, it appears that speakers can make up the speed of the movement to maintain a similar coordination under changes in movement duration and magnitude.Therefore, it is also possible to argue that there is any consistent difference between speakers of Japanese and Italian in this respect at least not on the basis of the current results. The onset and offset of the tongue movement were defined as minima in the speed signal, but as suggested by the large variability in some of the temporal intervals.The positions of the tongue for the vowels do not have point targets but rather regions which are influenced by the phonetic context and the rate of the speaking. At the same time, the tongue movement between the two vowels tends to start before the oral closure for the consonant and end after the release of the consonant. Presumably, there is an acoustic and perceptual basis for this. The relative onset and offset times of the tongue movement examined here will result in formant transitions, but they would be absent, or much less salient, if the whole tongue trajectory was hidden by the intervocalic consonant.

5.1.7 Acquisition of long consonants in Norwegian

Sonorants can be found in monosyllables as well as bi-syllables. The natives, as well as the children are also aware to differentiate between the CV: C and CVC: structures in a statistically significant way.For monosyllablesthe differentiation consistently along all the measures investigated. For the bi-syllables the children are consistently differentiating along all measures. The raw durations of Vand C were decreasingsignificantly with the physical means of age but for monosyllables V and VC they did not vary significantly with the means of physics as age which strongly indicates that at least for the monosyllables the VC relationship is acquired early on and remains fairly robust throughout development. Now, the question arises as to how the appropriate VC relationship is achieved varies also as a function of word lengthwith vowel-duration differences which is playing a larger role in bi-syllables and along with that the consonant duration differences which is also playing a larger role in monosyllables? The processes of the global timing reduction as phonetic skills development lead to some distortions in the mapping onto phonological structure. The children have reduced their long vowels in monosyllables to be close in duration to the adult target.For the bi-syllables the mapping distortions at a minimum age are greater and affect the V andVC to a larger extent. Thesignificant interaction of is a closer inspection that revealed the V and VC both of which are too low in V and C structures and too high in VCstructures at that particular age. The results from both the long vowels and long consonants being too short,it would be appearing that the temporal relationship in VC poses a greater challenge in the development for bi-syllabic words rather than for the monosyllabic words. Therefore, the summarizations cane be done with the children who are able to produce the vowels and the consonants of contrasting durations atan early age. The production of a clear distinction along the measure of V and VC increasingly phonetic mastery that results in shorter vowels and consonantdurations as children develop. There are someof individual contrasts which are undermined as the vowels or consonants are either insufficiently reducing or the child overshoots reduction processes and vowels or consonants that ends up too short for a specific contexts. Therefore, the knowledge of phonological structures in their native language is acquired at an early age and expressed utilizing the means that are already available to the child. However, the period of this phonetic ‘catch-up’ exhibited in the subsequent developmental trajectory which results in a finely tuned phonetic exponent that affects the phonological and the phonetic mapping. This in turn results that the child is passing through a period in which the structure is undermined as the critical period hypothesis says. The picture

for the voiceless stops is somehow different with the evidence of a more subtle contrastwhich suggests that the manner of articulation is possibly along with the competition for the temporal relationships as a cue for the phonological voices and theconditions whose expression of vowel and consonant quantity found in the adult speech are also a part ofacquisition. With the sonorants though the durations of vowels and consonants decrease as the child develops towards the adult target but again as with sonorants for both the monosyllables and the bi-syllables the children were shown to differentiate between the CV and C and CVCstructures in a statistically significant way throughout the developmental as we have investigated so far. However, the measurements along which they do so are different from those observed for sonorants. For monosyllables and bi-syllables thequantity distinctions are expressed via the measures of the Vowelsand VC across the early stages of the developmental arc and in adult speech. This is somehow an interesting phenomenon from a cross-linguistic perspective because it goes against the general pattern across geminating languages for voiceless stops to be more commonly geminated than sonorants.Within the Norwegian sonorants voiceless stops are different in their V and VC which are obtained almost entirely through the variations in Valone. The V and the VC has a differentiating measure which holds across all the ages proving itself to be the robust measure in both monosyllables andbi-syllables though as with sonorants it is much reduced at an early age. Evidences are there for undershoot the long vowels and overshoot of short vowels.Thus there are broad similarities with the sonorants being made at all ages in one form or another to a lesser or greater degree and with mapping. Though there is no apparent reason why this complexity should constitute as an obstacle to the systematic duration variation rather the long geminate stops especially the voiceless ones are fairly common among those languages that have geminates. Nevertheless, there is a cross-linguistic evidence that the geminate:singleton contras is typically greater in sonorants than in obstruents. For, while the geminate obstruents may either be relatively long from their singleton counterparts or not. For the stopsounds there would appear to be a complex interaction of timing in relation signaling both the voice ‘length’ contrasts resulting in a greater number of durational contrasts and competing demands on timing. Therefore, the smaller magnitude of the ‘length’ contrast observed for plosives is in keeping with observing more complex systems that have smaller durational differences within them. In that case of Norwegian the system is particularly complex since both the vowel and the consonant duration vary systematically with the voice and ‘length’ contrasts and that is why perhaps is not surprising that contrasts for stops are durationally more subtle than for sonorants. In the given complexity of the

system an understanding of long consonants in acquisition and of the acquisition of temporal relations more generally which needs to take into account the cueing of phonological by both the temporal and non-temporal cues among which is the presence of pre-aspiration.The stopsounds are appearing to be a complex interaction of timing relations signaling both voice and 'length' contrasts resulting in a greater number of durational contrasts and competing demands on timing.

5.1.8 Second language learners' production of geminate consonants in Japanese

There is various durational units those are in association with the stop-length distinctionby the intermediate learners of Japanese natives. The comparison between them shows for the native Japanese speakers as has been discussed in our previous literature. Therefore, the learners of the native Japanese speakers always did make a durational distinction betweensingleton and geminate stop closureswith the geminates approximately twice as long as the singletons as the data have shown to us in our above chart. However, the G/S ratio (1.97–2.11) was small, compared to the NJs' G/S ratio of 2.88–3.13(Han 1992; Hirata and Whiton 2005). The learners' results replicate previous studies such as Han (1992), and are consistent with Toda (1997), who pointed out that this comes from the way native English speakers produce English geminates across words, such as cat tail (as in native English speakers' English data provided by Han 1992). The result of the closure over the preceding vowel ratio shows theconsistent of learners in that the ratio values for the singletons and geminates were not as separated as those of native speakers (**Pp-179**). The study we have gone through in this chapter examines other durational units which are associated with the disyllabic words as in'word duration' and 'the ratio of the stop closure' to the word (**Pp-180**). Therefore, the results of these values confirmed that the earlier conclusion of the singleton or geminate distinction was not that much in compare to the natives' values. So, the questions remain as to how do we determineif the learners are making significant progress in their durational control? Because all of the identical measures (thus far we have seen above) were compared before and after the learners' immersion in Japan and none of the **ANOVA** results indicated a significant change, and differences between singleton and geminate values did not increase after the immersion in Japan (**Pp-180**). Therefore, one of the unique aspects of this study was to examine the learners' accuracy in producing singleton and geminate stops as measured by the boundary criterion of native Japanese speakers. The examination of

classifyingthe accuracy on the basis ofthe native speakers' C/W boundary ratio indicated improvement by only 1.4percentage points from 73.0% to 74.4% (**Pp-180**). On the basis of the speaking rate factor we can make a hypothesiswhich says that theduration of a sentence would be getting shorter at post-Japan that expresses a sign of increased fluency and especially at a faster rate. So, the definition of which was 'to speak as fast as possible without making excessive mistakes' did not support this. And that is why it was not the case that the learners were able to speak faster when they were asked to speak at the fastest rate possible (**Pp-180**). With regard to this it was also not the case that the stop-length distinction was made with ratios closer to those of the native speakers at a particular rate. Therefore, the speaking rates and the learners' production performance did not reach that of native speakers.

The first question we have been introduced in this study is to what extent the ability to produce consonant length distinction improves over four months abroad in Japan. If we are to summarizeall of the measures and statistical results then thepossible conclusion would bethe intermediate learners of Japanese do not improve their durational control of the consonant-length distinction after a four-month immersion in Japan. Themeasurement of the distinction maintained in this study was not large enough though, and it did not significantly increase in any of the measures such as the sentence, word, or contrasting stop closure duration. The conclusion can be made interesting if it is generally believed by the learners and the instructors that the language immersion has a positive effect on language learning. And obviously not likely a general spontaneous speaking fluency that may involve instant access to vocabulary and grammar. The ability to produce the differences of consonant length contrasts accurately within a word may not be something that the learners can automatically learn by the language immersion (**Pp-180**). In the introduction part theoverall word duration plays an important role in the case of the native Japanese speaker as we have seen the data above. It is also not impossible that the learners also can make some small local improvements. But they have not yet reached at that level where the significant improvement is clearly visible in terms of precision of durational control (**Pp-181**). The possible reason for this would be the limited improvement in the production of singleton and geminate stop distinction found in this study.So, the first question arises, is this limitation due to the fact that the immersion was comparatively late in their language learning, coming after two years of formal language instruction in their home country, or is it due to the length of the immersion not being long enough? (**Pp-181**). The second question that arises in this study is, how the present participants' results compare with those of previous studies, especially

regarding the different learning stages, i.e. beginning learners (Toda 1997; Masuda and Hayes-Harb 2005) and advanced learners (Han 1992). If we take all of these studies together then there is an accumulation of evidence for a conclusion that learners of Japanese have sustained difficulty at all levels in making precise and authentic consonant-length distinction in their production (**Pp-181**). Beginning learners examined in Toda (1997) and Masuda and Hayes-Harb (2005) showed some changes, but their ratios either were over exaggerated or did not reach the native values, and advanced learners in Han (1992) also did not show clear distinction. Experiment shows that the present intermediate learners fill the gap between at the beginning and in advance and even after a four-month immersion in Japan, they did not show improvement as a whole. The difficulty that may be attributed to the fact is that the learners automatically use the strategy used in producing English geminates across words (Han 1992; Toda 1997), thus producing [kak:o] as two words, [kak] and [ko]. Indeed, Han's (1992) data showed that the geminate/ singleton ratio was about 2. This phenomenon may be a case of Flege's (1987) 'equivalence classification'. The way infants are learning their first language is different from the way the adults are. The infants move from physical, sensory responses to abstract, categorical perception of meaningful words, or equivalence classifications. They use the earlier sensory system less and lesswhile the adults learners tending to go about learning to perceive an L2 is more with the latter response such as abstract, categorical perception which Flege (1987) claims is the direct reason why they cannot perceive L2 speech sound as they are. The developmental change has the advantage of being able to extract essentiallinguistic messages from highly variable speech acoustics, it has disadvantages for adult L2learners. According to Flege (1987), this process of equivalence classification prevents L2learners from acquiring authentic L2speech sounds (**Pp-182**). The overall production accuracy calculated in this present study suggests that they can produce minimal pairs at far above a chance level. Therefore, the learners can 'get by' with their inaccurate pronunciation in many cases when communicating with native speakers, and thus their practical motivation and perceived urgency to improve their realization of this distinction to the authentic native level may not be high(**Pp-182**). One of the possible reasons for this may be why the strategy of substituting English geminates continues to be used and why this problem persists. The only measure that showed an improvement was the result of C/V1ratio classification accuracy, and there was actually a large individual variation in terms of the learners' progress during the period studied. A future study including native Japanese speakers' perception of learner production should provide insight as to whether both the C/V 1ratio and the C/W ratio must be accurate in order for their production to be perceived

accurately by native Japanese listeners. It may also confirm whether native Japanese listeners' identification of some of the individual learners' production does improve from pre-Japan to post-Japan. It would also be interesting to test how native speakers evaluate the 'accentedness' of these words and sentences, and whether this accentedness score would or would not improve with immersion(**Pp-182**). The basis of this present conclusion is only one word pair and this investigation needs to be expanded in future studies to examine various other word pairs with other stops [p, t] and with other obstruents(**Pp-182**). The given findings in this chapter we would predict that learners also do not improve their production of fricative and affricate consonant length pairs.

There is one more interesting direction for future research is to compare the present results with learners' production of vowel length contrasts. There are two types of contrasts share the same mechanism of durational control for native speakers of Japanese (Fujisaki et al. 1975), but results in previous studies are mixed as to whether the consonant and the vowel length contrasts pose equal difficulty for L2learners. One study suggests learners seem to improve both equally (Enomoto 1992), but another suggests that vowel length contrasts may be easier for native English learners to produce (e.g. for perception: Toda 1998)(**Pp-182**). Our preliminary analysis for this presentintermediate learners' production of vowel-length distinction accords with the latter finding. Though the classification accuracy for the learners' production of vowel-length distinction improved significantly from pre-Japan to post-Japan. This preliminary result suggests that the lack of significance in the present stop-length results may not be due to a lack of statistical power from the small number of participants or the limited set of stimuli, though this preliminary analysis needs to be expanded to a full analysis in the near future(**Pp-182**). Another interesting phenomenon would be to examine the production and perception of extremely advanced learners of Japanese since some data show that learners' perception eventually improves over time (e.g. Enomoto 1992), their production is also likely to improve at some advanced stage(**Pp-182**). However, there is currently no data showing advanced learners' production matching that of native speakers, therefore, it is necessary to clearly pinpoint where the highest possible level lies and what the limitations may be, as well as what factors account for the ultimate success or failureof learners in acquiring consonant- and vowel-length distinction. Learners' data typically exhibit large individual variations, which is also to be expected for most advanced learners as well, but it is an important goalspeech acquisition research to determine the precise factors that account for those variations(**Pp-182**).

Similar studies were conducted for the variety of languages with geminate consonants, including Hindi (Ohala, 2007; Samudravijiya, 2003), Malayalam (Local and Simpson, 1999), Bengali (Lahiri, 2017), Swiss German (Kraehenmann, 2001; Kraehenmann and Lahiri, 2008), Kentani Malay (Hamzah, 2010), Pattani Malay (Abramson, 1986, 1987, 1991, 1999a,b, 2003), Cypriot Greek (Arvaniti, 1999, Arvaniti and Tserdanelis, 2000; Muller, 2001), Finnish (Doty et al., 2007), Italian (Esposito and Di Benedetto, 1999; Faluschi and Di Benedetto, 2001; Farnetani and Kori, 1986; Giovanardi and Di Benedetto, 1998; Mattei and Di Benedetto, 2000; Payne, 2005; Pickett et al., 1999), Russian (Dmitrieva, 2017), Japanese (Takeyasu and Giriko, 2017), Norwegian (Payne et all., 2017), Japanese (Hirata, 2017).

5.2 Indic Languages

Bangla permits a lexical singleton-geminate (short vs. long) contrast, and this phonological contrast is primarily cued by a difference in consonantal duration. This contarst is limited to obstruents and nasals, as shown by the examples in (1). On the other hand, Bangla does not allow lexical singleton-geminate constrast in glides.

(1) Lexical singleton-geminate contrast in Bangla

i. /a̪ta/	'custard apple'	/a̪t̪ta/	'soul'
ii. /dɔʃi/	'convict'	/dɔʃʃi/	'FEM'
iii. /kana/	'blind person'	/kanna/	'crying'

Lexical singleton-geminate contrast in Urdu

iv. /pə̪t̪a:/	'address'	/pə̪t̪t̪a:/	'leaf'
v. /rəsa/	'to be received'	/rəssa/	'rope'
vi. /ʈ̪ənɑ/	'stem'	/ʈ̪ənnɑ/	'become hard'

Lexical singleton-geminate contrast in Telugu

vii. /puɽa/	'page number'	/puɽɽa/	'anthill'
viii. /celi/	'lover'	/celli/	'younger sister'
ix. /koni/	'to buy'	/konni/	'some'

furthermore, in loanword gemination patterns in which word-medial consonants in the source languagess are borrowed as geminates, oral consonants undergo gemination. This symmetry is shown in (2):

(2) Gemination of oral consonants in loanword adaptation in Bangla

a. San. /bis.ʋas/ > Ban. [biʃʃaʃ] 'faith/trust'

b. San. /saʈ̪ja/ > Ban. [ʃoʈ̪ʈ̪o] ‘truth’

c. San. /mrʈ̪ju/ > Ban. [mriʈ̪ʈ̪u] 'death'

d. San. /puʈ̪ra/ >Ban. [puʈ̪ʈ̪ro] 'son'

e. San. /paɖ̪ma/ > Bang. [paɖ̪ɖ̪a] [pɔɖ̪.ɖ̪o] ‘lotus’

A spectogram has been given below to show the duration of geminate consonant in bangla.

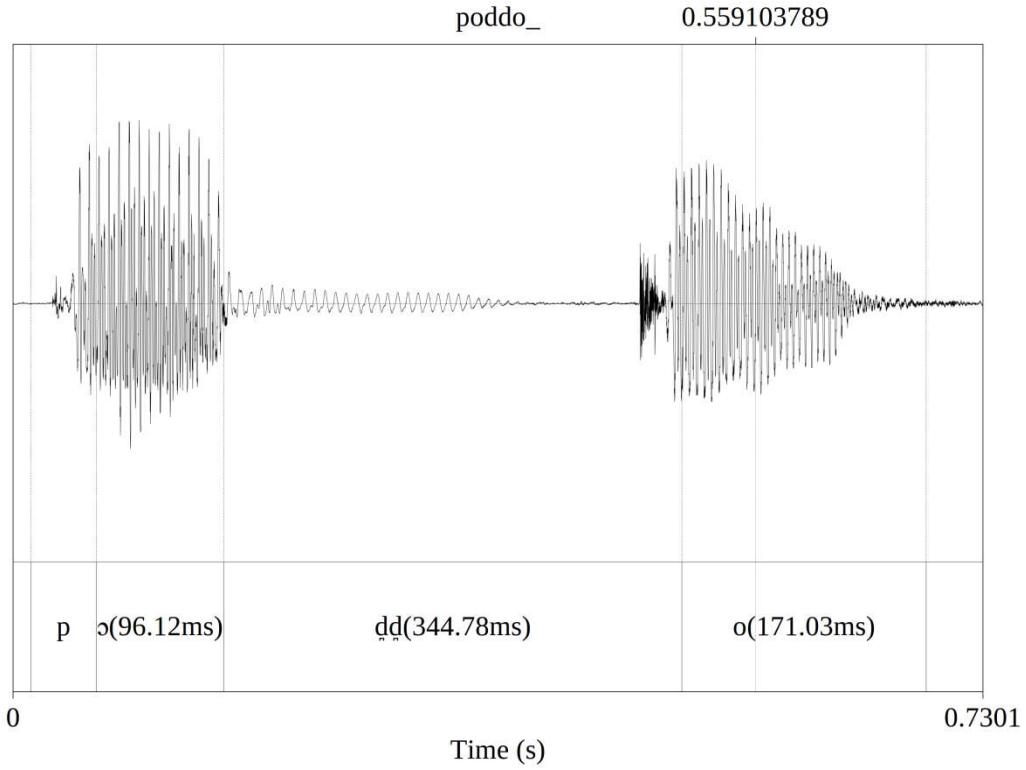


Fig. 8. Diagram showing the spectogram and waveform of voiced dental geminate stop /pɔɖ̪.ɖ̪o/ in Bangla.

We recognize that caution is needed when using loanword adaptation patterns in phonological argumentation (de Lacy 2006, 2009) because loanword adaptation is non-

trivially affected by non-phonological -- e.g. perceptual, orthographic, and sociolinguistic--factors (e.g. Irwin 2011; Kang 2011; Peperkamp 2005; Peperkamo and Dupoux 2003; Peperkamp et al. 2008; Silverman 1992; Takagi and Mann 1994; Vendelin and Peperkamp 2006).

Exaples from Urdu and Telugu (Geminates) as follows :

i. /mohabbaʈ̪/ محبت 'love'

ii. /ɑkkɑs/ عکاس 'painter'

iii. /ʈəkkɑr/ ٹکر 'striking'

iv. /iʈ̪ʈ̪eləh/ اطّلاع 'information'

v. /ʈ̪ɑməɖɖun/ تمدن 'civilization'

vi. /ʈ̪ɑnəffur/ تنفّر 'disgust'

vii. /ʈ̪ɑləffuz/ تلفظ 'pronunciation'

viii. /ʈ̪əʔdʒdʒub/ تعجب 'wondering'

A spectogram has been given below to show the duration of geminate consonant in Urdu.

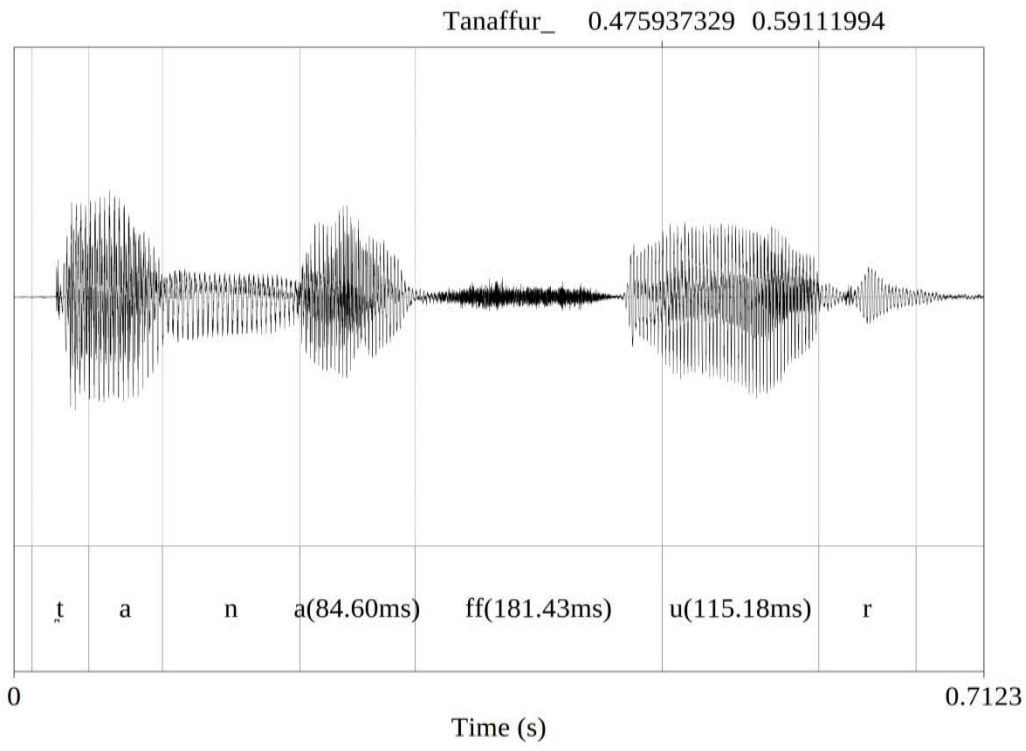


Fig. 9. Diagram showing the spectogram and waveform of voiceless labiodental geminate fricative /ʈ̪ɑnəffur/ in Urdu.

Telugu

i /ʋeɭɭa/ - 'went' వెళ్ళా

ii. /ippuɾu/- now ఇప్పుడు

iii. /meṯṯa/ - 'soft' మెత్త

iv. /iwwa:ɭa/ - today, ఇవాల

v. /yekkuwa/- much ఎక్కువ

vi. /mabbu/ cloud మబ్బు

vii. /uccu/ - deceit ఉచ్చు

viii. /utta/- empty ఉత్త

A spectogram has been given below to show the duration of geminate consonant in Telugu.

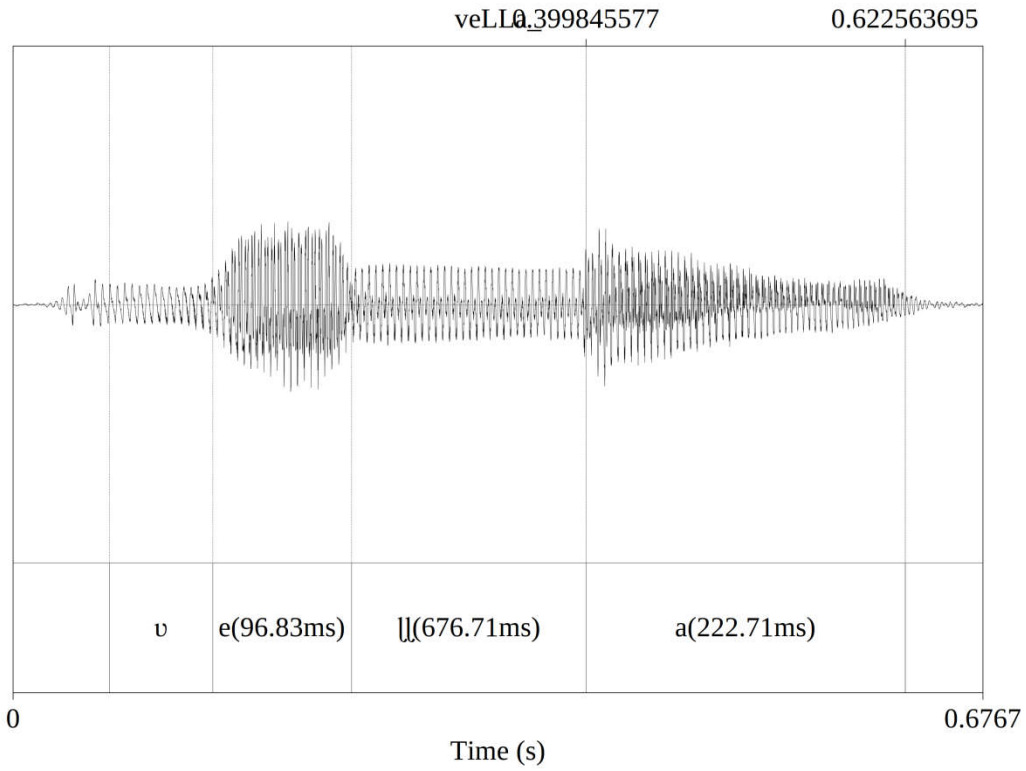


Fig. 10. Diagram showing the spectogram and waveform of voiced retroflex geminate lateral /ʋeɭɭa/ in Telugu.

In summary, except Urdu, Telugu and Bangla avoid glide geminates the most in that they are never used to make lexical contrasts. These languages permit nasal geminates to signal lexical contrasts, but nevertheless avoids creating them in gemination processes. The

preferential hierarchy in the phonology of Bangla and other Indic languages is therefore: obstruent geminates > nasal geminates > glide geminates.

5.3 Other Languages

Not only is this preferential hierarchy of geminates clearly observed in Bangla, but the same hierarchy can be observed in other languages like Urdu and Telugu as well. Some languages avoid sonorant geminations entirely, whereas others avoid glide geminates in particular, just as in Japanese. This observation is clearly articulated in Podessva (2000, 2002).

One example that instantiates the avoidance of sonorant geminates comes from gemination blocking in Selayarese (Podesva 2000, 2002). When the prefix /taʔ/- is attached to a root that begins with a voiceless obstruent, the prefix-final glottal stop assimilates to the following consonant, resulting in a geminate, as shown in (3) (Mithun and Basri 1986:243):

(3) Gemination when root-initial consonants are voiceless obstruents

a. / taʔ-pelaʔ/ → [tappelaʔ] 'get lost'

b. / taʔ-tuda/ → [tattuda] 'bump against'

c. /taʔ-kapula/ → [takkalupa] 'faint'

d. / taʔ-sambaŋ/ → [tassambaŋ] 'stumble, trip'

The gemination also fails when root-initial consonants are sonorants, as in (4) (Mithun and Basri 1986: 244). Since there are no glides in Selayarese, it is impossible to tell whether glides would undergo gemination or not. Gemination also fails when root-initial consonants are voiced stops. The dispreference for voiced-stop geminates is well motivated phonetically: stop closure raises intraoral air pressure and therefore it is difficult to maintain a transglottal air pressure drop to sustain voicing during stop closure. thus aerodynamic problem is particularly challenging for geminates because of their long constriction (Hays and Steriade 2004; Ohala 1983; Westbury 1979). However, this aerodynamic challenge does not explain the dispreference for sonorant geminates, because the airway is not significantly occulded in sonorants-- the intraoral air pressure should not rise so much as to hinder the airflow across the glottis.

5.4 Experiment I. Duration of singletons and geminates contrast in Indic Languages

The first experiment test whether singletons and geminates contrast make same duration or make different duration between singleton and geminate consonants. The stimuli were singleton-geminate pairs of stops, fricatives, and sonorants. The experiment used non-speech stimuli so as to control for acoustic parameter other than spectral continuity, such as preceding vowel duration, intensity of surrounding vowels, or duration of consonant intervals themselves.

Speech sounds require time for their utterance. Duration is the length of time involved in the articulation of a sound or syllable. Distinctions between relatively 'ling' and relatively 'short' durations are measured in units of time, such as the millisecond (msec). Whereas length refers to the relative durations of sounds and syllables when these are linguistically contrastive; also referred to as quantity. Hence, length, duration or quantity is a type of modification of articulation, and measurable with considerable precision.

Duration is used for various purposes. It may be used to distinguish one word from another. It may be used to emphasize or to focus a particular word in a sentence. There may be variations of duration according to phonetic context. Here it has been used to distinguish one word from another. The present study is limited to singleton-geminate contrast only. The Indic languages we have taken are Bangla, Urdu and Telugu.

The **factors** associated with durational variations are:

a. phonemic contrast

b. intrinsic duration of consonants

c. influence of neighbouring sounds, which includes voicing and aspiration.

d. positional variation

e. syllable structure

5.4.1 Aims

The aim of the present study is to examine the duration of singleton as well as geminate consonants of Bangla, Urdu and Telugu by using instruments. More than fifteen pairs of singleton-geminate words are chosen for this study. The mono syllabic and di-syllabic words have been chosen. The syllable structure of words contains VCV, VCCV, CVCV, CVCCV,

CVCV, CVCVC, CVCCVC for Bangla, CVCV, CVCCV for Urdu and VCV, VCCV, CVCV, CVCCV for Telugu. Stops, affricates, fricatives, nasals and liquids have been adopted for the present study.

5.4.2 Procedure

The participants were eighteen adult native speakers of Bangla, Urdu and Telugu. Out of eighteen nine were male and nine were female speakers. They were all residents of Kolkata, Delhi and Hyderabad. The informants' age varied from 22 to 32 years. Equal number of male and female participants were included. The data collection was conducted in JNU Campus in Delhi, EFLU Campus in Hyderabad and using a Sony digital recorder with a microphone.

The test material for Bangla, Urdu and Telugu comprises more than fifteen pairs of words. All words consists of Stops, affricates, fricatives, nasals and liquids for this study. Two types of words have been selected, for example, singleton, geminate consonants. The mono syllabic and di-syllabic words have been chosen. The words chosen seperately for Bangla, Urdu and Telugu for this study are:

Sl. No		**Singleton**	**Glossary**	**Geminate**	**Glossary**
1.	Stop	/aʈa/	custard apple	/aʈʈa/	Soul
2.	Stop	/biɖai/	Farewell	/biɖɖai/	in wisdom
3.	Stop	/bʰago/	to leave	/bʰaggo/	Fortune
4.	Affricate	/baca/	To save	/bacca/	Child
5.	Affricate	/ʃɔdʒa/	Straight	/ʃɔdʒdʒa/	Bedding
6.	Nasal	/ʃɔman/	Equal	/ʃɔmman/	dignity/honour
7.	Nasal	/kana/	Blind	/kanna/	Crying
8.	Liquid	/ʈulo/	To lift sth.	/ʈullo/	Comparable
9.	Fricative	/ɖɔʃi/	Convict	/ɖɔʃʃi/	Fem. of dacoit

Tab. 6. showing singleton and geminate words in Bangla.

Sl. No		Singleton	Glossary	Geminate	Glossary
1.	Affricate	/bəcɑ/	Save	/bəccɑ/	Kid
2.	Liquid	/bəlɑ/	Disaster	/bəllɑ/	Baton
3.	Stop	/gəɖɑ/	Beggar	/gəɖɖɑ/	Quilt
4.	Stop	/pəka:/	to cook	/pəkka:/	Ripe
5.	Stop	/pəʈa:/	Leaf	/pəʈʈa:/	Address
6.	Fricative	/rəsa/	To be received	/rəssa/	Rope
7.	Nasal	/ʃəma/	Mixed	/ʃəmma/	Light
8.	Nasal	/ʈənɑ/	Stem	/ʈənnɑ/	Become hard
9.	Liquid	/zəra/	For a while	/zərra/	Small particle

Tab. 7. showing singleton and geminate words in Urdu.

Sl. No		Singleton	Glossary	Geminate	Glossary
1.	Stop	/ɑɖi/	That	/ɑɖɖi/	Apply
2.	Stop	/aʈu/	That side	/aʈʈu/	Pan cake
3.	Stop	/baɖi/	School	/baɖɖi/	Small shop
4.	Stop	/ʈɑgi/	Suitable	/ʈɑggi/	Reduce
5.	Nasal	/koni	To buy	/konni/	Some
6.	Liquid	/bɑli/	Sacrifice	/bɑlli/	Lizard
7.	Liquid	/ʋeɭɑ/	Time	/ʋeɭɭɑ/	Went
8.	Liquid	/guru/	Teacher	/gurru/	Anger

Tab. 8. showing singleton and geminate words in Telugu.

5.4.3 Average duration of singletn and geminated consonants in Bangla, Urdu and Telugu.

BANGLA (duration in milliseconds)

	M1	M2	M3	Avg	F1	F2	F3	Avg	Total Avg
t̪	166.508	102.897	143.586	**137.6637**	182.674	142.531	180.972	**168.7257**	**161.7515**
t̪t̪	325.242	183.663	353.598	**287.501**	355.609	274.413	372.259	**334.0937**	**323.336**
d̪	89.704	88.06	104.661	**94.14167**	91.653	87.923	89.182	**89.586**	**88.5525**
d̪d̪	241.243	158.822	392.749	**264.2713**	290.565	260.649	212.955	**254.723**	**236.802**
g	100.715	111.099	154.669	**122.161**	99.912	105.094	97.84	**100.9487**	**101.467**
gg	270.299	154.448	344.9	**256.549**	349.312	250.607	265.264	**288.3943**	**257.9355**
C	192.166	134.448	185.803	**170.8057**	168.758	152.697	174.047	**165.1673**	**163.372**
cc	256.19	202.489	357.675	**272.118**	363.449	309.735	318.429	**330.5377**	**314.082**
dʒ	152.718	100.776	141.703	**131.7323**	125.585	108.809	94.715	**109.703**	**101.762**
dʒdʒ	298.128	151.445	420.645	**290.0727**	344.459	256.92	253.382	**284.9203**	**255.151**
M	91.141	106.31	133	**110.1503**	97.696	90.49	116.098	**101.428**	**103.294**
mm	210.749	149.574	228.658	**196.327**	275.194	224.103	205.347	**234.8813**	**214.725**
N	105.365	88.875	101.554	**98.598**	102.05	85.154	117.998	**101.734**	**101.576**
nn	293.88	158.612	267.468	**239.9867**	281.351	250.393	263.302	**265.0153**	**256.8475**
L	141.172	64.374	87.177	**97.57433**	95.098	117.824	99.999	**104.307**	**108.9115**
Ll	293.662	165.839	296.572	**252.0243**	253.633	285.427	260.129	**266.3963**	**272.778**
ʃ	181.819	122.465	191.76	**165.348**	180.978	139.934	166.438	**162.45**	**153.186**
ʃʃ	285.151	185.025	365.568	**278.5813**	321.492	274.856	286.564	**294.304**	**280.71**

Tab. 9. Table showing the average duration of singleton and geminate in Bangla.

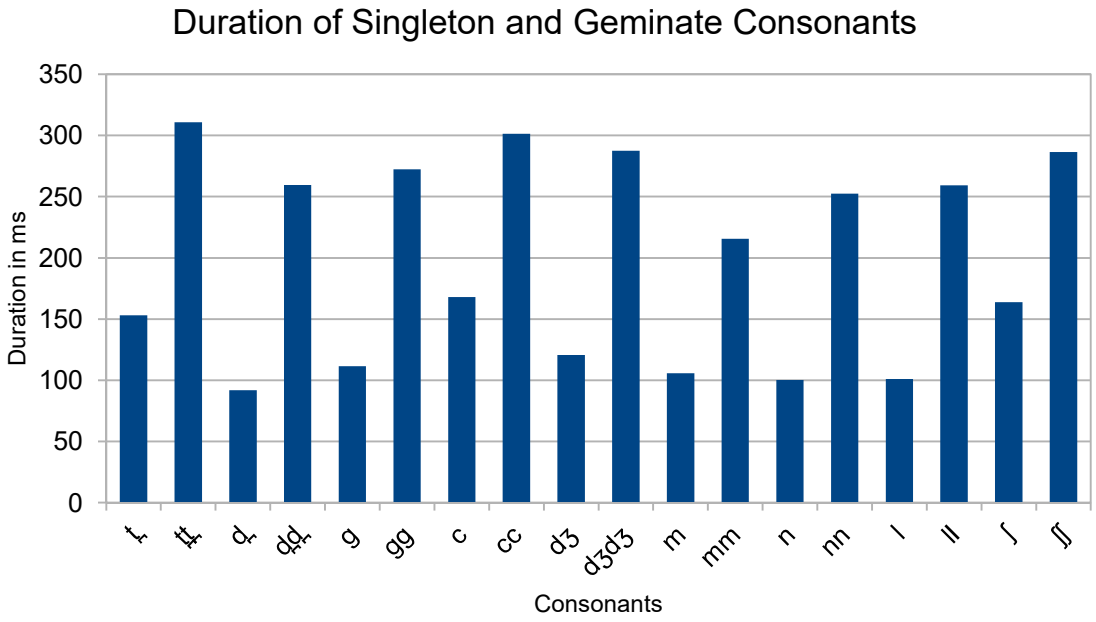


Fig. 11: **Diagram showing the average duration of singleton and geminate consonants of Bangla**

URDU

	M3	M2	M1	Avg	F1	F2	F3	Avg	Total Avg
l	88.378	76.884	73.101	**79.4543**	109.23	87.142	88.828	**95.0666 7**	**87.985**
ll	212.403	225.301	220.571	**219.425**	240.074	224.086	226.169	**230.109 7**	**225.1275**
ɖ	84.366	71.805	75.87	**77.347**	114.826	108.45	98.552	**107.276**	**103.501**
dd	236.659	214.404	258.923	**236.662**	246.987	244.464	196.133	**229.194 7**	**220.2985**
k	146.999	93.52	130.634	**123.717 7**	149.504	137.832	136.492	**141.276**	**137.162**
kk	299.61	278.788	320.615	**299.671**	270.516	289.585	237.396	**265.832 3**	**263.4905**
ʈ	145.569	116.465	161.059	**141.031**	150.014	136.853	139.45	**142.105 7**	**138.1515**
tt	322.564	260.099	299.512	**294.058 3**	262.145	290.085	265.338	**272.522 7**	**277.7115**
s	146.988	127.771	125.29	**133.349 7**	131.957	131.32	124.613	**129.296 7**	**127.9665**
ss	253.042	261.014	272.691	**262.249**	287.227	233.475	235.153	**251.951 7**	**234.314**
m	92.734	103.529	78.775	**91.6793 3**	108.648	103.267	94.749	**102.221 3**	**99.008**
mm	232.875	203.341	214.886	**217.034**	204.701	218.344	198.173	**207.072 7**	**208.2585**

n	103.251	70.675	68.296	**80.7406 7**	113.416	81.06	73.943	**89.473**	**77.5015**
nn	250.89	240.193	240.508	**243.863 7**	234.176	237.164	204.628	**225.322 7**	**220.896**
r	70.785	66.833	63.379	**66.999**	82.718	56.499	43.772	**60.9963 3**	**50.1355**
rr	213.999	161.817	171.019	**182.278 3**	242.788	189.738	153.58	**195.368 7**	**171.659**

Tab. 10. Table showing the average duration of singleton and geminate in Urdu.

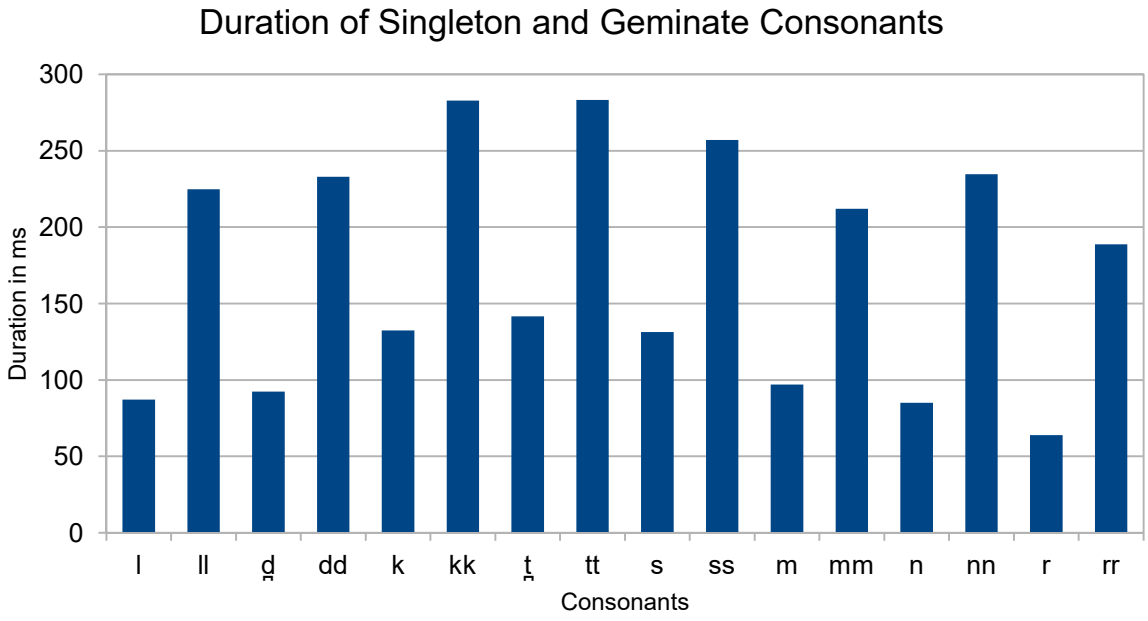


Fig.12. Diagram showing the average duration of singleton and geminate consonants in Urdu.

TELUGU

	M1	M2	M3	Avg	F1	F2	F3	avg	Total Avg
d̪	106.721	121.487	75.128	**101.112**	101.168	99.644	90.701	**97.171**	**95.1725**
d̪ d̪	356.396	233.332	195.3	**261.676**	188.746	214.119	278.542	**227.135667**	**246.3305**
ʈ	140.158	155.427	109.714	**135.099667**	109.907	142.644	104.352	**118.967667**	**123.498**
ʈʈ	416.574	263.167	256.152	**311.964333**	248.476	253.339	259.135	**253.65**	**256.237**
ɖ	60.649	63.511	53.887	**59.349**	52.303	46.764	58.801	**52.622667**	**52.7825**
ɖ ɖ	316.404	190.694	173.435	**226.844333**	185.805	172.914	222.6	**193.773**	**197.757**
g	97.708	109.737	100.78	**102.741667**	98.734	112.876	137.822	**116.477333**	**125.349**
g g	309.407	178.053	210.874	**232.778**	198.621	207.204	249.722	**218.515667**	**228.463**
N	84.635	94.388	83.183	**87.402**	85.135	89.926	63.7	**79.587**	**76.813**
N n	328.693	179.432	224.989	**244.371333**	169.357	171.275	267.788	**202.806667**	**219.5315**
L	97.195	101.131	97.103	**98.476333**	91.999	101.807	84.826	**92.877333**	**93.3165**
ll	283.162	211.937	209.676	**234.925**	190.154	175.47	200.157	**188.593667**	**187.8135**
ɭ	107.315	64.722	101.972	**91.336333**	75.985	73.487	72.192	**73.888**	**72.8395**
ɭɭ	265.961	192.762	180.723	**213.148667**	165.413	178.921	257.18	**200.504667**	**218.0505**
R	69.594	40.628	81.303	**63.841667**	54.282	33.031	44.78	**44.031**	**38.9055**
rr	229.346	130.216	157.289	**172.283667**	135.898	163.343	152.904	**150.715**	**158.1235**

Tab. 11. Table showing the average duration of singleton and geminate in Telugu.

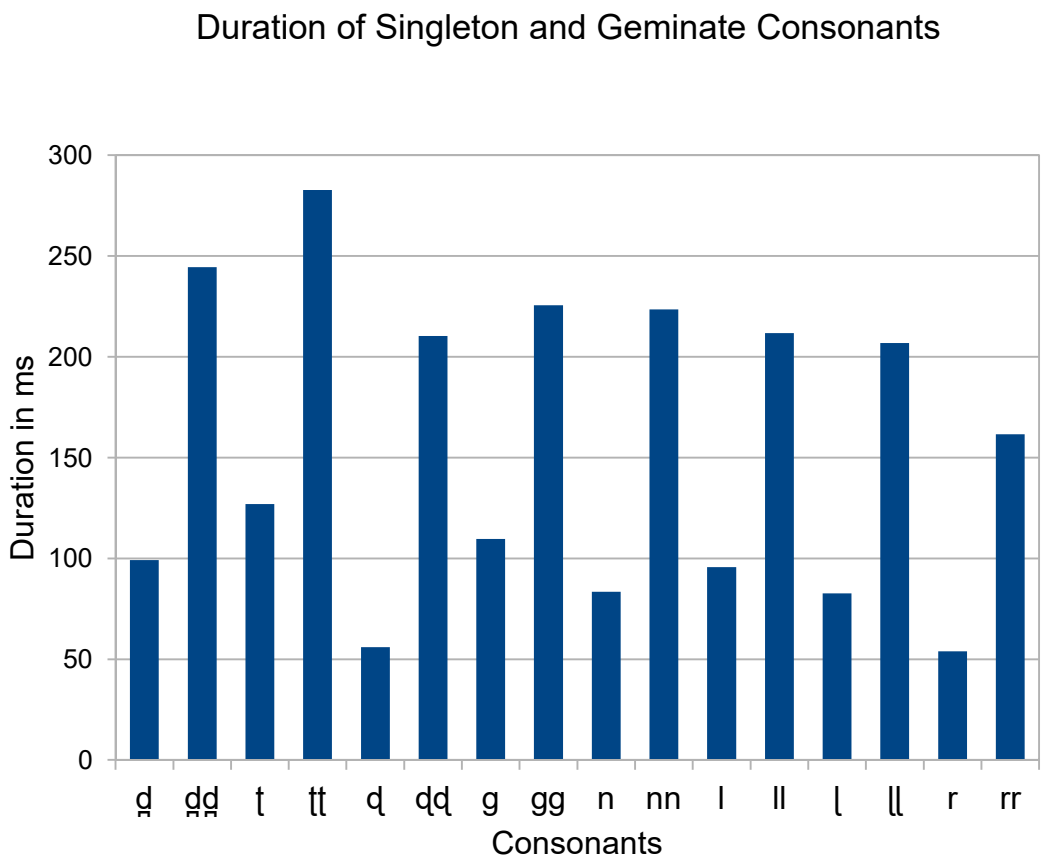


Fig.13. Diagram showing the average duration of singleton and geminate consonants in Telugu.

The following inferences are drawn from the observation of the segmental values in the words given below:

1. The duration of singleton is almost half in comparison to the geminated consonant.

2. The length or duration of geminate consonants is approximately twice the duration of singleton.

3. For example, the duration of singleton and geminate consonant are 116.465 and 260.099 in the case of /pəɖa:/and /pəʈʈa:/in Urdu. The same cases are found in Bangla as well as Telugu too.

4. The average duration of singleton and geminate consonant have been shown separately for Bangla, Urdu and Telugu in the three different tables respectively. The average duration of male and female speakers has been shown differently in the above tables.

5.4.4 Discussion

From the above data, we can infer that the singleton is comparatively shorter in duration than the geminate consonant. In other words, geminate consonant is longer in duration than the singleton. The average duration of singleton is 117.021 whereas the duration of geminate consonant is 245.734 in case the case of /bəcɑ/ and /bəccɑ/ in Urdu. So it is evident that the duration of a geminate consonant is approximately two times longer than the duraion of singleton.

If we observe the waveform mentioned in the following we can easily distinguish the difference between the duration of a singleton and the duration of a geminate consonant. For example, in fig. no 14 and 15clearly indicate that the duration of a singleton is shorter than the duration of geminate consonant. One pair of waveforms has been cited below and the rest of the waveforms will be shown in Appendix II.

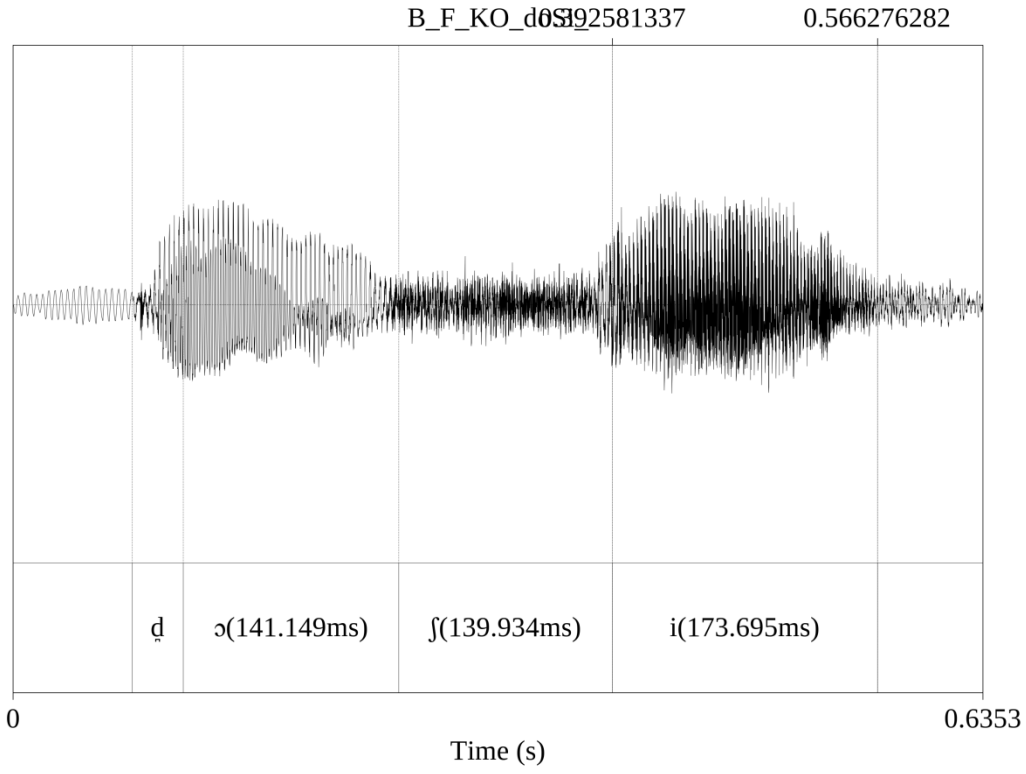


Fig. 14. Diagram showing the waveform of voiceless post alveolar fricative /d̪ɔʃi/ in Bangla.

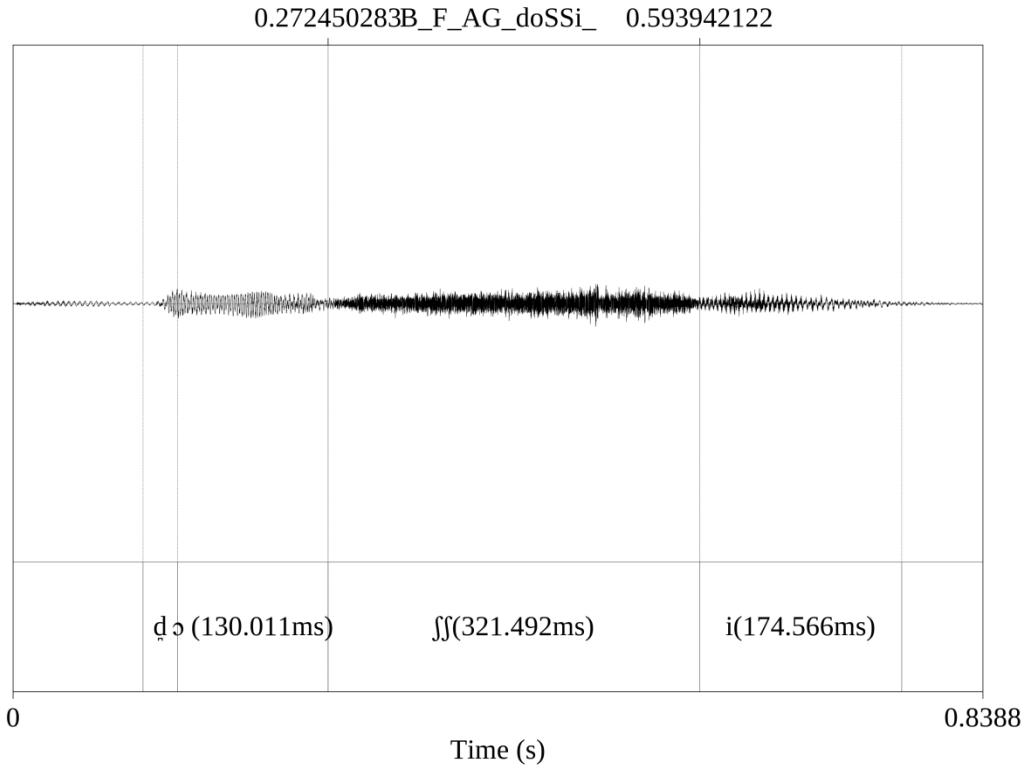


Fig.15. Diagram showing the waveform of voiceless post alveolar geminate /d̪ɔʃʃi/ in Bangla.

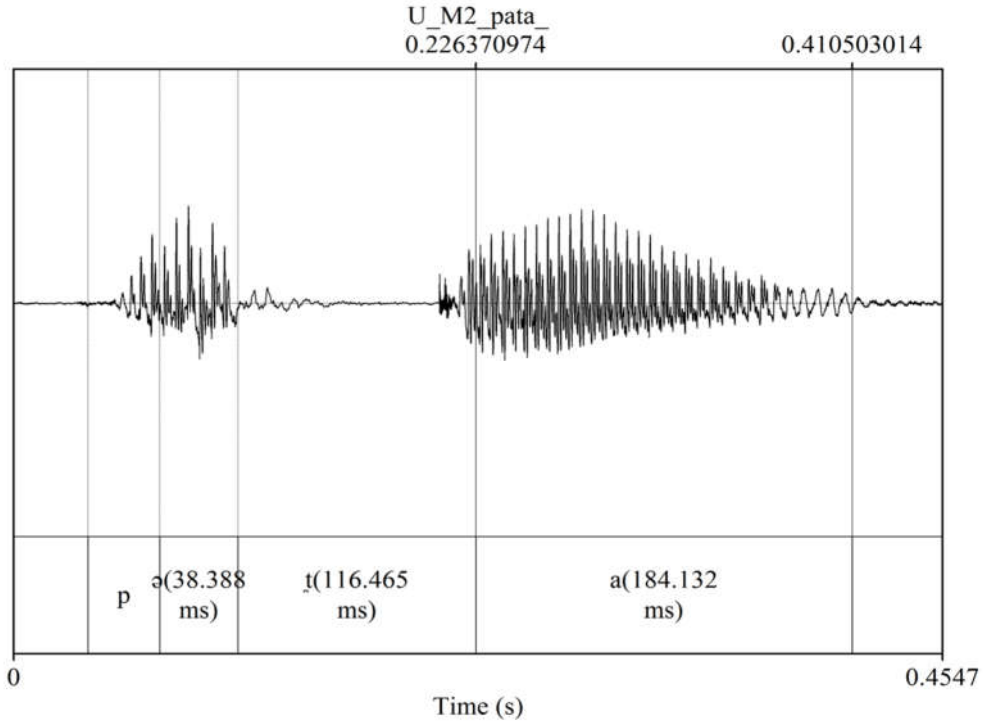


Fig. 16. Diagram showing the waveform of voiceless dental stops /pət̪a:/in Urdu.

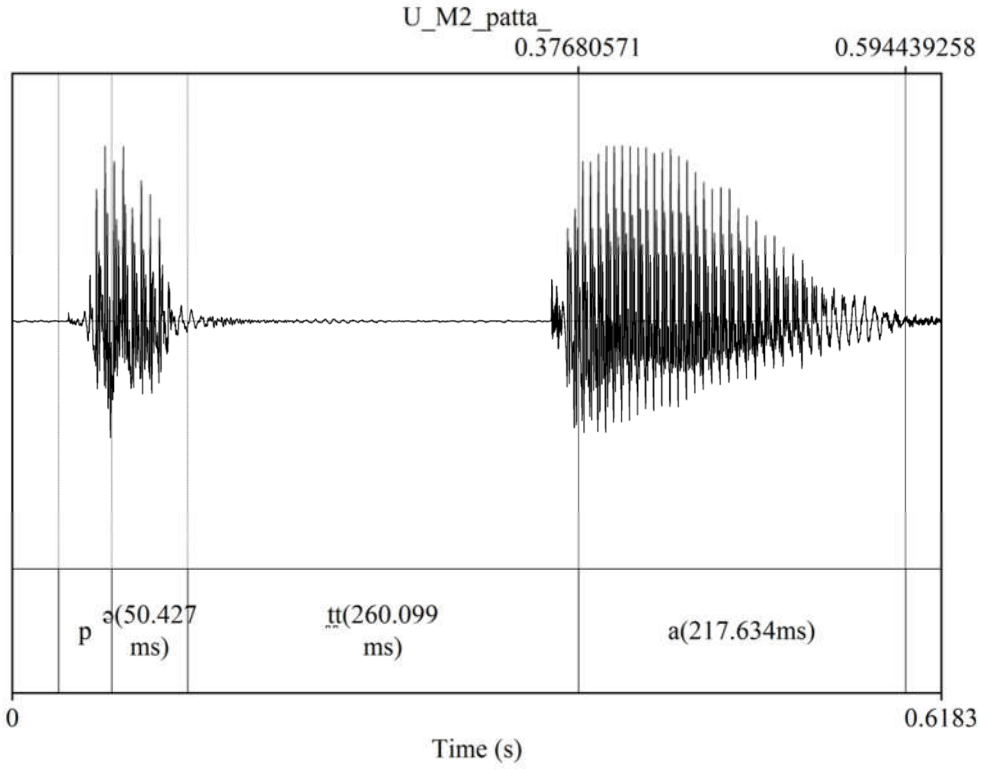


Fig. 17. Diagram showing the waveform of voiceless dental geminate stop /pə̪tta:/ in Urdu.

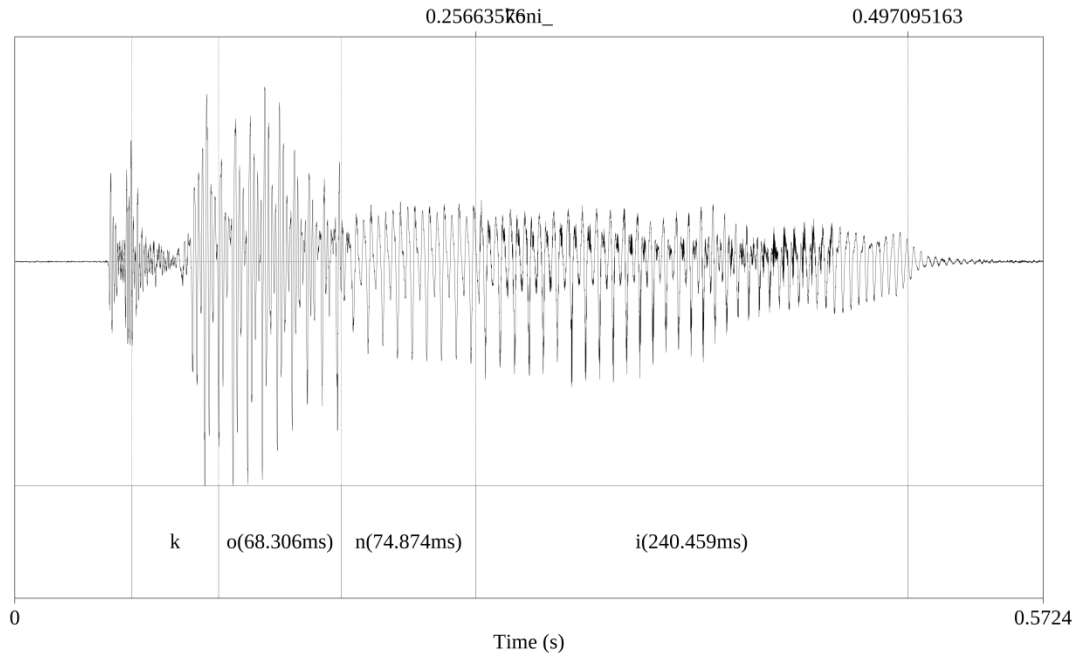


Fig. 18. Diagram showing the waveform of voiced alveolar nasal /koni/ in Telugu

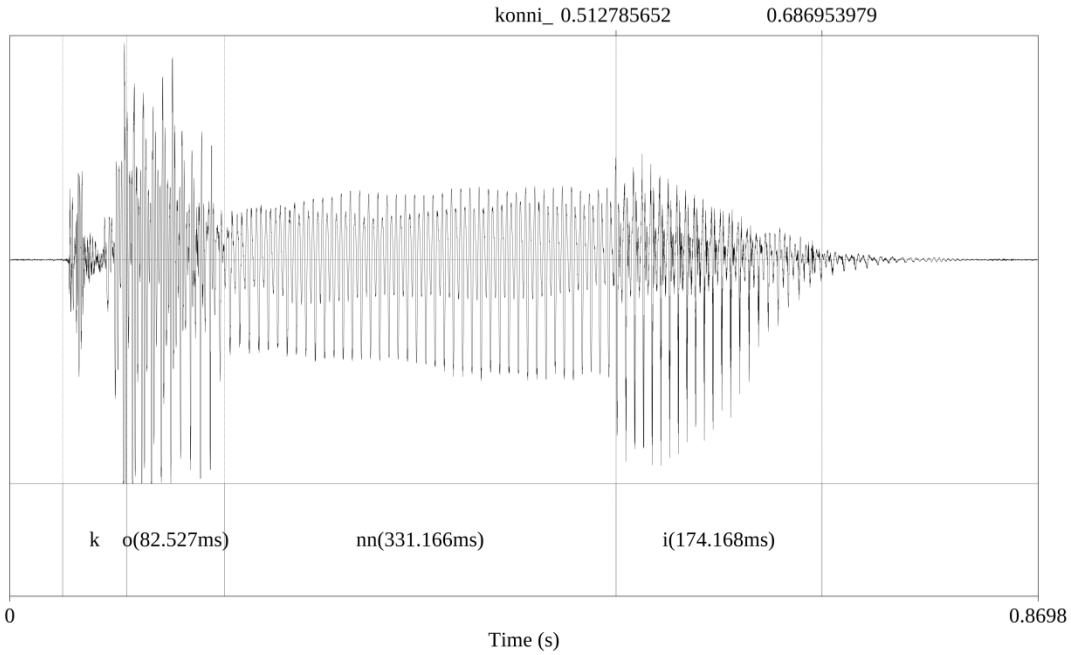


Fig.19. Diagram showing the waveform of voiced alveolar geminate nasal /konni/ in Telugu.

5.5 Experiment II. Geminate duration in Telugu variety of English (Telugu English)

Speech sounds require time for their utterance. Duration is the length of time involved in the articulation of a sound or syllable. Distinctions between relatively 'ling' and relatively 'short' durations are measured in units of time, such as the millisecond (msec). Whereas the length refers to the relative durations of sounds and syllables when these are linguistically contrastive; also referred to as quantity. Hence, length, duration or quantity is a type of modification of articulation, and measurable with considerable precision.

Duration is used for various purposes. It may be used to distinguish one word from another. It may be used to emphasize or to focus a particular word in a sentence. There may be variations of duration according to phonetic context. Here it has been used to distinguish one word from another. The present study is limited to vowel length only. Except Urdu and Telugu, Phonologically Bangla does not register vowel length contrast, but phonetically vowel length is possible. The language we have taken here is Telugu variety of English (TE).

The **factors** associated with durational variations are:

a. phonemic contrast

b. intrinsic duration of vowels

c. influence of neighbouring sounds, which includes voicing and aspiration.

d. positional variation

e. syllable structure

5.5.1 Aims

The aim of the present study is to examine the duration of the geminate consonants of Telugu English using instruments. Ten words with geminate consonants are taken for this study. The di-syllabic and trisyllabic words have been chosen. The syllable structure of words contain VCCV, CVCCVC, VCCVCVC, VCCVCVCVC.

5.5.2 Procedure

The participants were xis adult native speakers of Telugu English. Out of six, three were male and three were female informants. They were all residents of Hyderabad. The informants' age varied from 22 to 32 years. Equal number of male and female participants were included. The data collection was conducted in JNU Campus in Delhi, EFLU Campus in Hyderabad and using a Sony digital recorder with a microphone.

The test material for Telugu English comprises twenty sentences and more than fifteen pairs of words with geminate consonants. All words consists of Stops, fricatives, nasals and liquids for this study. One types of words have been selected, for example, geminate consonants.The words are given in the table below:

Sl.No		Geminates in Telugu English	Received Pronunciation (RP)
1.	Upper	/ˈəp.pər/	/ˈʌp.ə(r)/
2.	Rubber	/ˈrəb.bər/	/ˈrʌb.ə(r)/
3.	Beggar	/ˈbeg. gə/	/ˈbeg.ə(r)/
4.	Illegal	/iˈlli.gəl/	/iˈliː.gəl/
5.	Pillars	/ˈpil.ləs/	/ˈpil.ərz/

6.	Summer	/ˈsəm. mər/	/ˈsʌm.ə(r)/
7.	Immoral	/iˈm.mor.əl/	/iˈmɒr.əl/
8.	winner	/ˈʊin.nər/	/ˈwin.ə(r)/
9.	Dinner	/ˈdin. nər/	/ˈdin.ə(r)/
10.	Irregular	/iˈr.regu.lɑr/	/iˈreg.jə.lə(r)/

Table 12: Showing geminate consonants in Telugu English.

5.5.3 Average duration of geminate consonants in Telugu English.

(duration in milliseconds)

TELUGU ENGLISH

	M1	**M2**	**M3**	**Avg**	**F1**	**F2**	**F3**	**Avg**	**Total Average**
/ˈʌp. pər/	193.838	178.566	226.922	**199.775333**	234.609	210.943	260.793	**235.448333**	**248.120667**
/ˈrʌb. bər/	149.855	173.108	165.09	**162.684333**	106.563	171.754	130.568	**136.295**	**133.4315**
/ˈbeg. gər/	146.185	150.748	179.294	**158.742333**	167.798	155.622	185.469	**169.629667**	**177.549333**
/iˈlliː.gɑl/	144.209	110.257	126.111	**126.859**	120.36	143.033	131.342	**131.578333**	**131.460167**
/ˈpil. lɑrz/	92.464	77.256	130.006	**99.9086667**	50.521	135.603	138.783	**108.302333**	**123.542667**
/ˈsʌm. mɑr/	140.336	162.359	174.708	**159.134333**	147.198	155.656	165.634	**156.162667**	**160.898333**
/iˈm.mɒr .ɑl/	161.246	170.394	183.13	**171.59**	158.504	185.048	207.945	**183.832333**	**195.888667**
/ˈʊin.nɑr/	140.795	158.464	175.999	**158.419333**	192.533	162.051	171.746	**175.443333**	**173.594667**
/ˈdin. nɑr/	135.608	88.425	166.162	**130.065**	166.922	121.162	154.466	**147.516667**	**150.991333**
/iˈrregu.lɑr/	110.673	78.083	144.301	**111.019**	124.979	143.779	173.5	**147.419333**	**160.459667**

Table 13: Showing average duration of geminate consonants in Telugu English

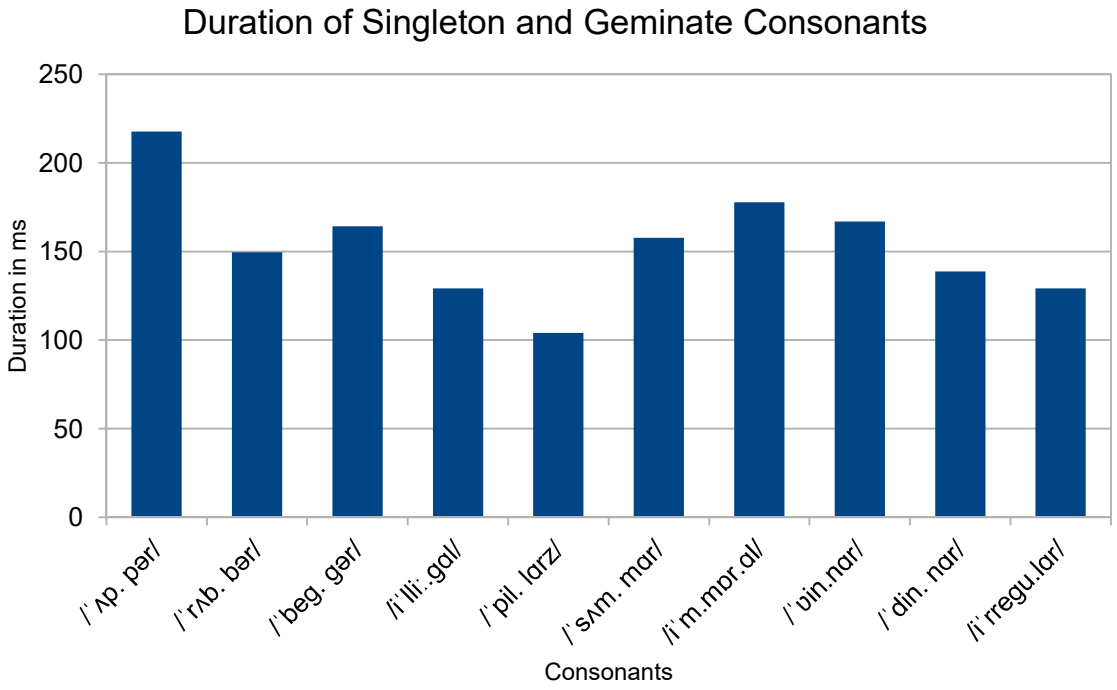


Figure 20: Diagram showing the average duration of geminate consonants in Telugu English

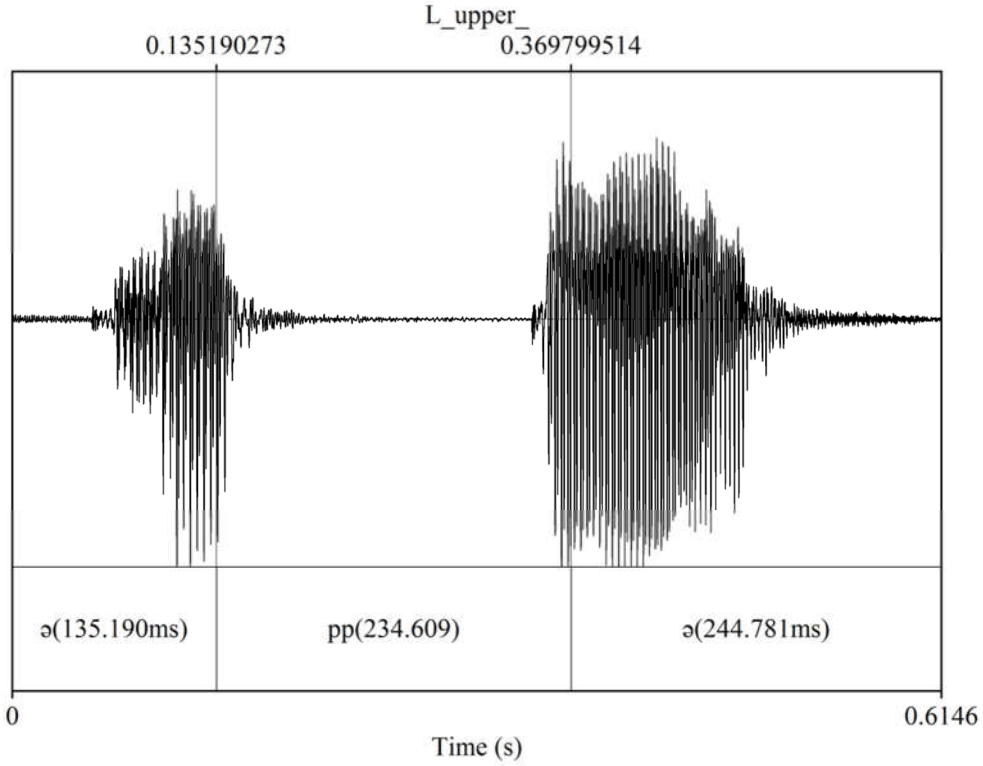


Figure 21. Diagram showing the waveform of voiceless bilabial geminate plosive in the word /əpper/ in Telugu English.

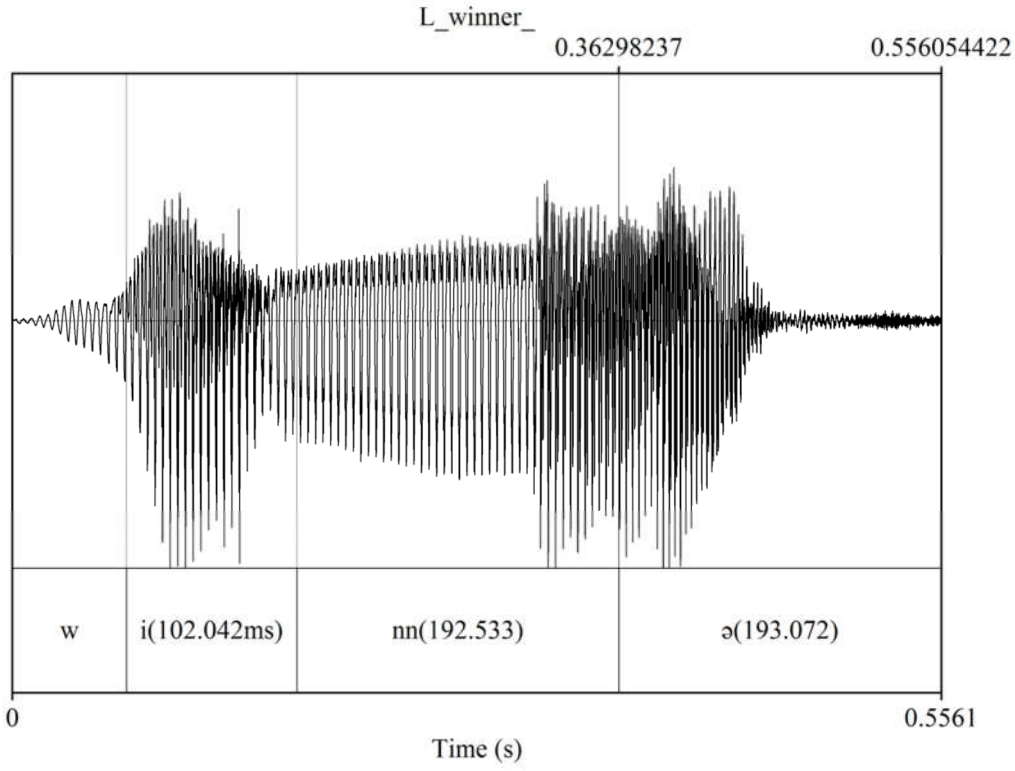


Figure 22. Diagram showing the waveform of voiced alveolar geminate nasal in the word/winner/ in Telugu English.

5.5.4 Discussion

From the above spectogram we can infer that the values of geminate consonants in the words /upper/ and /winner/ are 234.609 (ms) and 192.533(ms) respectively in Telugu English. There are informants who have come from rural background as well as urban background. Most of the geminate consonants are found in the pronunciation of rural vernacular medium informants.

5.6 Experiment III. Effects of duration and phonological length of the preceding and following vowel segments on perception of the length contrast in Bangla, Urdu and Telugu.

Speech sounds require time for their utterance. Duration is the length of time involved in the articulation of a sound or syllable. Distinctions between relatively 'ling' and relatively 'short' durations are measured in units of time, such as the millisecond (msec). Whereas length refers to the relative durations of sounds and syllables when these are linguistically contrastive; also referred to as quantity. Hence, length, duration or quantity is a type of modification of articulation, and measurable with considerable precision.

Duration is used for various purposes. It may be used to distinguish one word from another. It may be used to emphasize or to focus a particular word in a sentence. there may be variations of duration according to phonetic context. Here it has been used to distinguish one word from another. The present study is limited to vowel length only. Except Urdu and Telugu, Phonologically Bangla does not register vowel length contrast but phonetically vowel length is possible. The Indic languages we have taken are Bangla, Urdu and Telugu.

The **factors** associated with durational variations are:

a. phonemic contrast

b. intrinsic duration of vowels

c. influence of neighbouring sounds, which includes voicing and aspiration.

d. positional variation

e. syllable structure

5.6.1 Aims

The aim of the present study is to examine the duration of the preceding and following vowels in Bangla, Urdu and Telugu using instruments. More than five pairs of vowels are chosen for this study. The mono syllabic and di-syllabic words have been chosen. The syllable structure of words contain VCV, VCCV, CVCV, CVCCV, CVCV, CVCVC, CVCCVC for Bangla, CVCV, CVCCV for Urdu and VCV, VCCV, CVCV, CVCCV for Telugu. Stops, affricates, fricatives, nasals and liquids have been adopted for the present study.

5.6.2 Procedure

The participants were eighteen adult native speakers of Bangla, Urdu and Telugu. Out of eighteen nine were male and nine were female speakers. They were all residents of Kolkata, Delhi and Hyderabad. The informants' age varied from 22 to 32 years. Equal number of male and female participants were included. The data collection was conducted in JNU Campus in Delhi, EFLU Campus in Hyderabad and using a Sony digital recorder with a microphone.

The test material for Bangla, Urdu and Telugu comprises more than fifteen pairs of words. All words consist of Stops, affricates, fricatives, nasals and liquids for this study. Two types of words have been selected, for example, singleton, geminate consonants. The mono syllabic

and di-syllabic words have been chosen. The words chosen separately for Bangla, Urdu and Telugu for this study are:

Sl. No	Singleton	Glossary	Geminate	Glossary
1.	/aʈa/	custard apple	/aʈʈa/	Soul
2.	/biɖai/	Farewell	/biɖɖai/	in wisdom
3.	/ʈulo/	to lift sth.	/ʈullo/	Comparable
4.	/bʰago/	to leave	/bʰaggo/	Fortune
5.	/ʃɔman/	Equal	/ʃɔmman/	dignity/honour
6.	/ɖɔʃi/	Convict	/ɖɔʃʃi/	Fem. of dacoit

Tab. 14. Diagram showing singleton and geminate words in Bangla.

(VCV, VCCV, CVCV, CVCCV, CVCV, CVCCV, CVCVC, CVCCVC)

Sl. No	Singleton	Glossary	Geminate	Glossary
1.	/bəcɑ/	Save	/bəccɑ/	Kid
2.	/bəlɑ/	Disaster	/bəllɑ/	Baton
3.	/gəɖɑ/	Beggar	/gəɖɖɑ/	Quilt
4.	/pəka:/	to cook	/pəkka:/	Ripe
5.	/pəʈa:/	Leaf	/pəʈʈa:/	Address
6.	/ʃəma/	Light	/ʃəmma/	Light
7.	/ʈənɑ/	Branch	/ʈənnɑ/	Become hard

Tab. 15. Diagram showing singleton and geminate words in Urdu.

CVCV, CVCCV

Sl. No	Singleton	Glossary	Geminate	Glossary
1.	/ɑd̪i/	That	/ɑd̪d̪i/	Apply
2.	/aʈu/	That side	/aʈʈu/	Pan cake
3.	/guru/	Teacher	/gurru/	Anger
4.	/koni	To buy	/konni	Some
5.	/ʋeɭɑ/	Time	/ʋeɭɭɑ/	Went

Tab. 16. Diagram showing singleton and geminate words in Telugu.

(VCV, VCCV, CVCV, CVCCV,)

5.6.3 Average duration of preceding and following vowelsin Bangla, Urdu and Telugu.

(duration in milliseconds)

BANGLA

	M1	M2	M3	Avg	F1	F2	F3	Avg	Total Avg
1. a-t̪	101.796	124.509	134.884	**120.3963**	154.38	122.894	155.751	**144.3417**	**139.3225**
t̪-a	260.585	238.827	201.02	**233.4773**	294.044	122.894	260.595	**225.8443**	**191.7445**
2. a-ʈʈ	118.914	95.422	109.47	**107.9353**	190.299	86.904	139.183	**138.7953**	**113.0435**
ʈʈ-a	239.779	192.88	110.439	**181.0327**	288.331	166.316	229.211	**227.9527**	**197.7635**
1.i-d̪	92.879	57.301	65.898	**72.026**	127.66	97.886	91.918	**105.8213**	**94.902**
d̪-ai	364.719	331.45	277.159	**324.4427**	394.457	231.585	298.858	**308.3**	**265.2215**
2. i-d̪d̪	99.89	59.963	63.994	**74.61567**	106.388	81.334	111.487	**99.73633**	**96.4105**
d̪d̪-ai	338.353	304.496	244.684	**295.8443**	397.843	290.388	299.425	**329.2187**	**294.9065**
1.u-l	39.071	112.156	90.735	**80.654**	110.948	109.354	115.822	**112.0413**	**112.588**
l-o	181.828	136.367	180.58	**166.2583**	134.708	142.742	221.857	**166.4357**	**182.2995**
2. u-ll	44.292	78.19	93.549	**72.01033**	108.657	90.037	116.912	**105.202**	**103.4745**
ll-o	206.82	126.718	296.572	**210.0367**	174.886	196.746	199.542	**190.3913**	**198.144**

1.a-g	120.637	107.64	104.34	**110.8723**	143.536	155.878	113.914	**137.776**	**134.896**
g-o	243.812	99.745	202.543	**182.0333**	226.921	214.594	236.424	**225.9797**	**225.509**
2.a-gg	71.371	58.005	101.091	**76.82233**	99.42	127.018	110.593	**112.3437**	**118.8055**
gg-o	183.38	149.885	121.31	**151.525**	226.636	187.964	194.741	**203.1137**	**191.3525**
1.ɔ-m	94.204	102.807	135.533	**110.848**	147.98	133.538	112.772	**131.43**	**123.155**
m-a	128.669	79.52	140.6	**116.263**	132.559	164.287	129.518	**142.1213**	**146.9025**
2.ɔ-mm	92.266	70.635	134.59	**99.16367**	147.988	121.55	147.034	**138.8573**	**134.292**
mm-a	132.081	82.714	99.857	**104.884**	148.774	165.609	159.366	**157.9163**	**162.4875**
1.ɔ-ʃ	151.622	120.745	116.015	**129.4607**	149.928	141.149	109.686	**133.5877**	**125.4175**
ʃ-i	239.058	113.809	182.172	**178.3463**	167.958	173.695	217.466	**186.373**	**195.5805**
2.ɔ-ʃʃ	154.533	97.816	74.039	**108.796**	130.011	136.294	141.28	**135.8617**	**138.787**
ʃʃ-i	205.285	86.995	149.235	**147.1717**	174.566	188.406	188.425	**183.799**	**188.4155**

Tab. 17. Table showing the average duration of preceding and following vowels in Bangla.

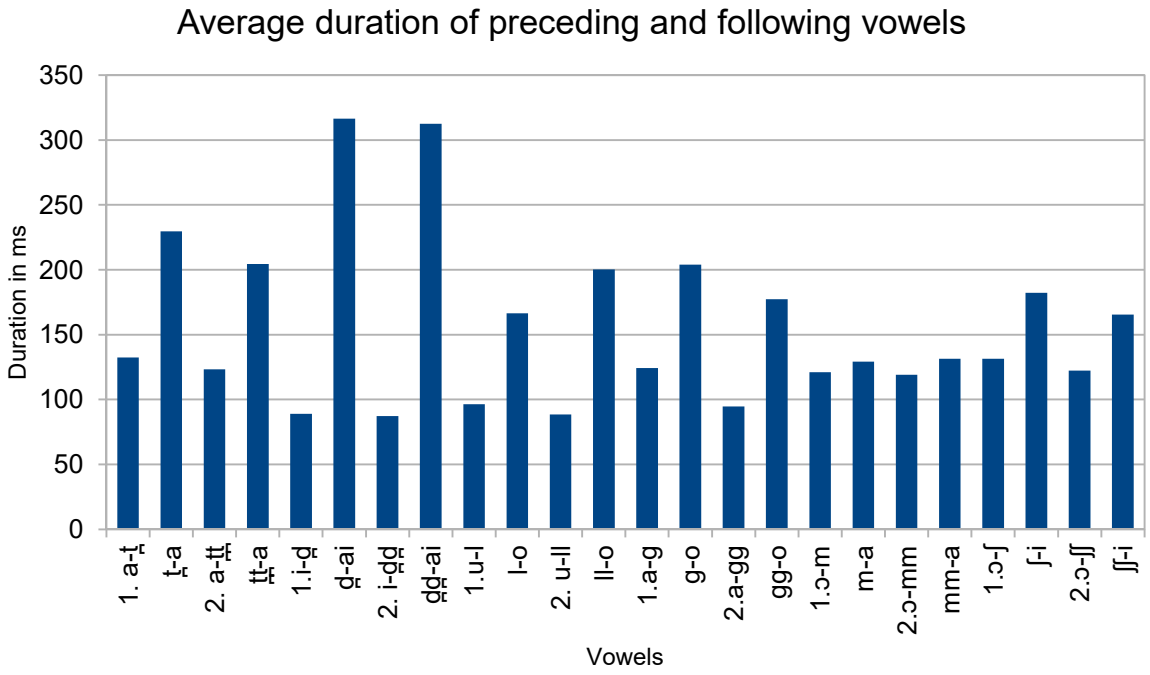


Fig.23. Diagram showing the average duration of preceding and following vowels in Bangla.

URDU

	M1	M2	M3	Avg	F1	F2	F3	avg	Total Avg
1. ə-/l/	90.821	64.758	70.458	**75.34567**	101.53	67.698	63.802	**77.67667**	**65.75**
/l/-a	370.16	243.591	244.843	**286.198**	393.881	213.607	191.495	**266.3277**	**202.551**
2.ə-/ll/	107.136	47.495	55.687	**70.106**	91.228	40.168	65.672	**65.68933**	**52.92**
/ll/-a	269.314	223.163	179.056	**223.8443**	333.311	261.97	245.316	**280.199**	**253.643**
1. ə-/d/	111.302	81.974	112.706	**101.994**	105.289	56.162	82.028	**81.15967**	**69.095**
/d/-a	305.145	278.332	247.667	**277.048**	276.893	255.633	223.886	**252.1373**	**239.7595**
2.ə-/dd/	98.816	61.258	66.696	**75.59**	96.83	57.118	71.591	**75.17967**	**64.3545**
/dd/-a	275.615	279.337	201.795	**252.249**	300.314	170.211	244.221	**238.2487**	**207.216**
1. ə-/k/	53.766	63.097	56.468	**57.777**	86.098	37.236	63.347	**62.227**	**50.2915**
/k/-a:	296.712	268.6	239.355	**268.2223**	294.927	163.893	177.668	**212.1627**	**170.7805**
2. ə-/kk/	55.428	51.835	50.678	**52.647**	76.417	41.299	49.293	**55.66967**	**45.296**
/kk/-a:	299.85	259.51	199.609	**252.9897**	269.617	154.967	191.381	**205.3217**	**173.174**
1. ə-/t/	75.989	38.388	49.118	**54.49833**	52.242	50.782	45.951	**49.65833**	**48.36653**
/t/-a:	300.03	184.132	247.376	**243.846**	266.165	225.506	195.702	**229.1243**	**210.604**
2. ə-/tt/	70.541	50.427	57.478	**59.482**	67.261	30.437	54.894	**50.864**	**42.6655**
/tt/-a:	261.916	217.634	200.385	**226.645**	299.813	212.025	258.75	**256.8627**	**235.3875**
1. ə-/m/	98.71	106.819	91.724	**99.08433**	153.712	83.223	98.359	**111.7647**	**90.791**
/m/-a	294.677	203.561	183.218	**227.152**	291.935	177.848	207.546	**225.7763**	**192.697**
2. ə-/mm/	84.162	59.893	86.439	**76.83133**	123.693	61.902	84.162	**89.91833**	**73.031**
/mm/-a	316.166	252.92	176.207	**248.431**	345.662	192.458	211.668	**249.9293**	**202.063**
1. ə-/n/	95.992	86.272	55.44	**79.23467**	100.454	69.376	108.503	**92.77767**	**88.9395**
/n/-a	241.1	155.7	226.6	**207.86**	379.1	171.6	181.7	**244.16**	**176.686**

	89	09	85	**1**	34	13	59	**87**	
2. ə-/nn/	73.791	67.905	52.802	**64.83267**	90.849	53.901	89.487	**78.079**	**71.694**
/nn/-a	237.116	225.144	181.908	**214.7227**	344.989	162.601	208.489	**238.693**	**185.545**
1. ə-/r/	114.712	95.989	113.69	**108.1303**	150.29	119.291	106.904	**125.495**	**113.0975**
/r/-a	190.632	266.41	212.597	**223.213**	250.483	192.177	172.561	**205.0737**	**182.369**
2. ə-/rr/	130.777	112.431	101.279	**114.829**	157.812	81.012	104.461	**114.4283**	**92.7365**
/rr/-a	322.32	239.573	168.044	**243.3123**	265.718	171.617	178.317	**205.2173**	**174.967**
1. ə-/s/	78.076	98.95	76.226	**84.41733**	109.243	87.547	75.806	**90.86533**	**81.6765**
/s/-a	355.991	261.305	210.277	**275.8577**	275.812	181.347	157.188	**204.7823**	**169.2675**
2. ə-/ss/	104.468	76.961	75.565	**85.66467**	110.172	78.187	75.105	**87.82133**	**76.646**
/ss/-a	305.575	248.561	214.649	**256.2617**	341.479	209.585	161.741	**237.6017**	**185.663**

Table 18. Table showing the average duration of preceding and following vowels in Urdu.

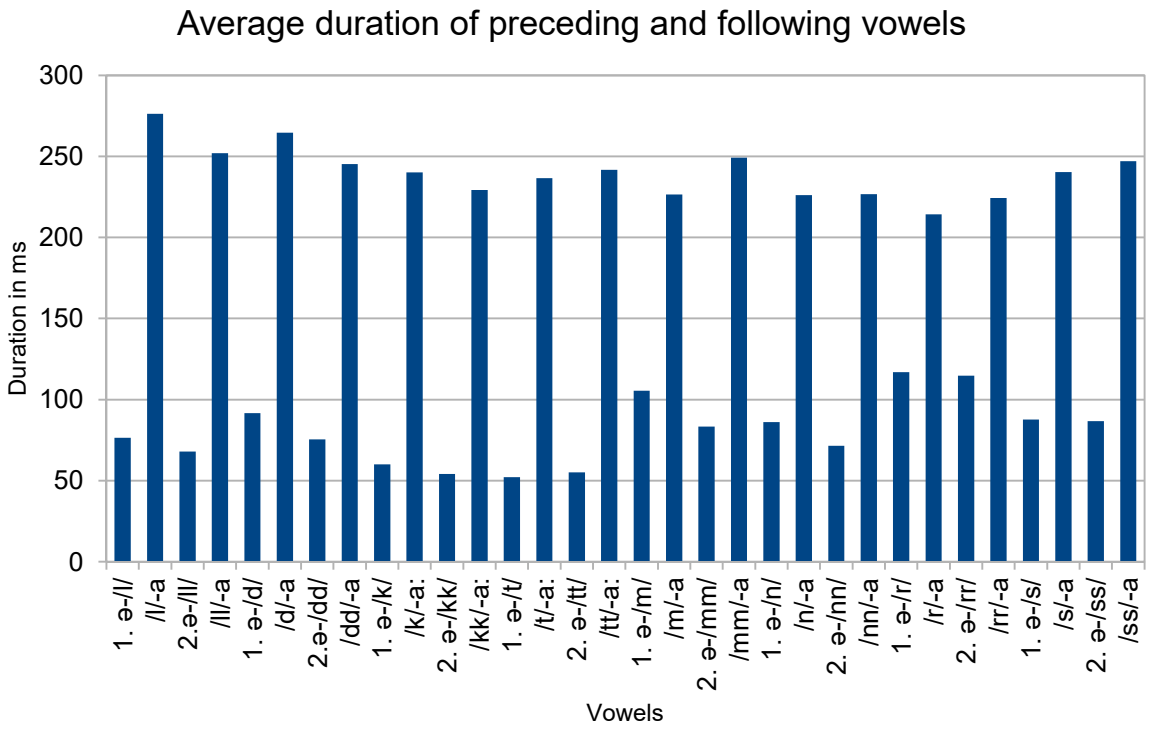


Figure 24. Diagram showing the average duration of preceding and following vowels in Urdu.

TELUGU

	M1	M2	M3	Avg	F1	F2	F3	avg	Total Avg
1. a-ḍ	131.714	134.433	66.7	**110.949**	109.239	111.062	104.17	**108.157**	**107.616**
ḍ-i	268.24	185.13	156.882	**203.417333**	177.215	227.188	249.287	**217.896667**	**238.2375**
2. a-ḍḍ	97.414	103.924	103.536	**101.624667**	94.485	74.812	86.744	**85.347**	**80.778**
ḍḍ-i	242.371	195.425	185.501	**207.765667**	198.802	250.558	252.645	**234.001667**	**251.6015**
1.a-ṭ	91.994	101.369	110.919	**101.427333**	84.463	102.268	69.874	**85.535**	**86.071**
ṭ-u	221.627	210.058	153.117	**194.934**	184.583	181.979	212.767	**193.109667**	**197.373**
2.a-ṭṭ	71.653	106.692	117.963	**98.7693333**	82.424	79.184	70.638	**77.4153333**	**74.911**
ṭṭ-u	219.703	187.071	169.165	**191.979667**	199.587	188.234	229.855	**205.892**	**209.0445**
1.u-r	123.095	112.381	100.507	**111.994333**	116.102	97.608	96.975	**103.561667**	**97.2915**
r-u	189.098	175.484	163.568	**176.05**	184.361	234.052	253.503	**223.972**	**243.7775**
2.u-rr	129.872	92.729	78.644	**100.415**	102.906	122.154	89.435	**104.831667**	**105.7945**
rr-u	259.178	125.944	158.139	**181.087**	206.457	240.27	269.34	**238.689**	**254.805**
1.o-n	68.306	79.657	75.372	**74.445**	49.388	96.333	69.088	**71.603**	**82.7105**
n-i	205.527	136.399	136.909	**159.611667**	172.633	177.688	236.771	**195.697333**	**207.2295**
2.o-nn	72.567	92.226	73.736	**79.509667**	64.893	85.084	53.891	**67.956**	**69.4875**
nn-i	176.641	105.246	165.88	**149.255667**	168.361	155.809	199.551	**174.573667**	**177.68**
1.e-ḷ	223.797	219.718	193.338	**212.284333**	188.062	207.947	164.198	**186.735667**	**186.0725**
ḷ-a	334.95	149.791	183.933	**222.891333**	200.619	186.797	253.098	**213.504667**	**219.9475**
2.e-ḷḷ	113.377	72.286	97.416	**94.3596667**	82.065	89.686	97.351	**89.7006667**	**93.5185**
ḷḷ-a	322.68	111.615	170.443	**201.579333**	221.697	214.599	273.501	**236.599**	**244.05**

Table 19. Table showing the average duration of preceding and following vowels in Telugu.

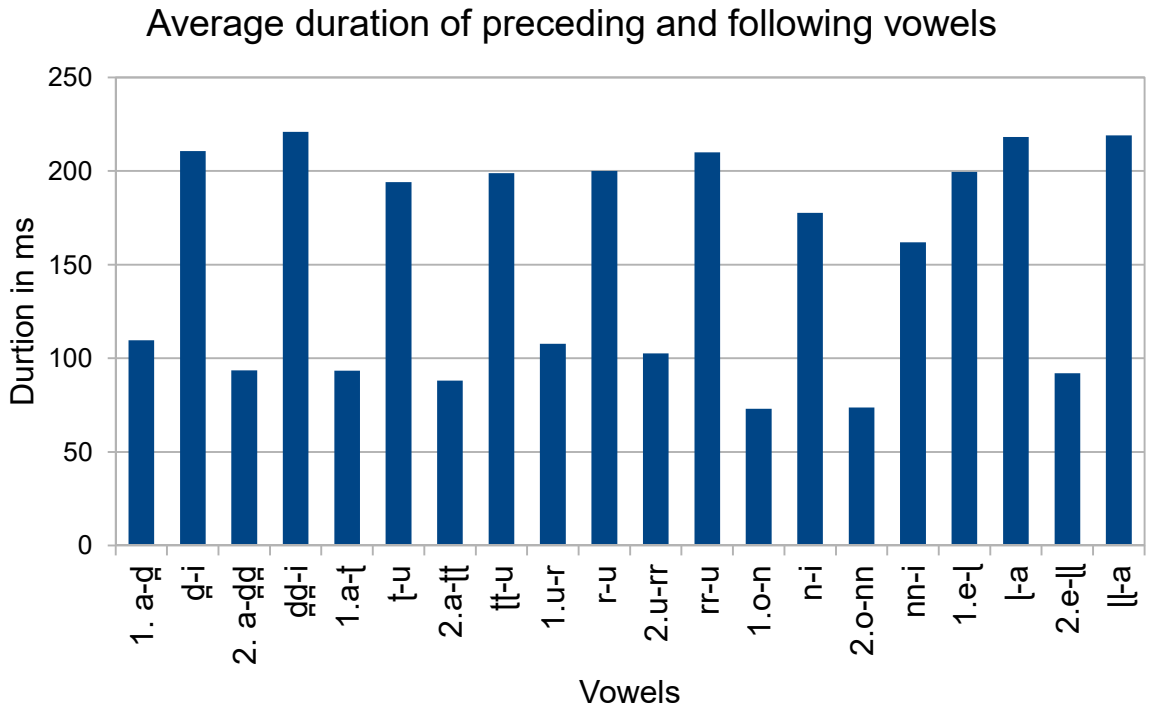


Figure 25. Diagram showing the average duration of preceding and following vowels in Telugu.

The following inference are drawn from the observation of the segmental values in the words given below:

1. The duration of vowels in geminate is shorter in comparison to the vowels in singleton consonant.

2. The length or duration of vowels in singleton consonant is longer than the duration of vowels in geminated consonant.

3. For example, the average duration of the preceding /ə/ and the following /ɑ/ vowels in singleton and in the geminated consonant are **66.444** and **294.536** and **71.528 and 249.195**respectivelyin the case of /bəcɑ/ and /bəccɑ/ in Urdu. The same cases are found in Bangla as well as Telugu too.

4. The average duration of singleton and geminate consonant have been shown separately for Bangla, Urdu and Telugu in the three different tables in the above. The average duration of male and female speakers has been shown differently.

5.6.4 Discussion

If we analyze the data we can see that the duration of vowels get reduced when they followed by geminate and consonant clusters. On the other hand, duration of vowel is longer when it is followed by singleton. So the vowel quality effects on singleton as well geminate consonant on preceding and followed vowel.

If we observe the waveform mentioned in the following we can easily distinguish the difference between the duration of vowel preceded and followed by a singleton and the duration of vowel preceded and followed by geminate consonant. For example, in fig. no. 26, 27,28,29,30 and 31 clearly indicate that the duration of vowel preceded and followed by a singleton is different from the duration of vowel preceded and followed by geminate consonant. Spectogram and waveform has been given below to show the difference .

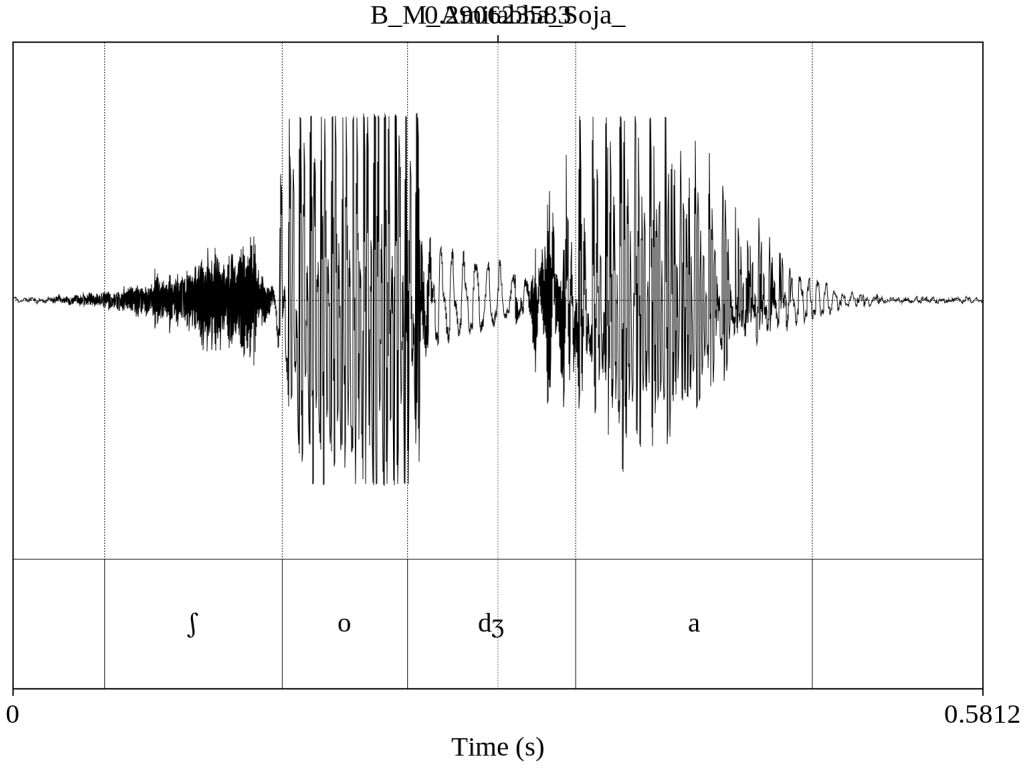


Fig.26. Diagram showing the waveform of the preceding and following vowels /o/ and */a/*in the word /ʃodʒa/ in Bangla.

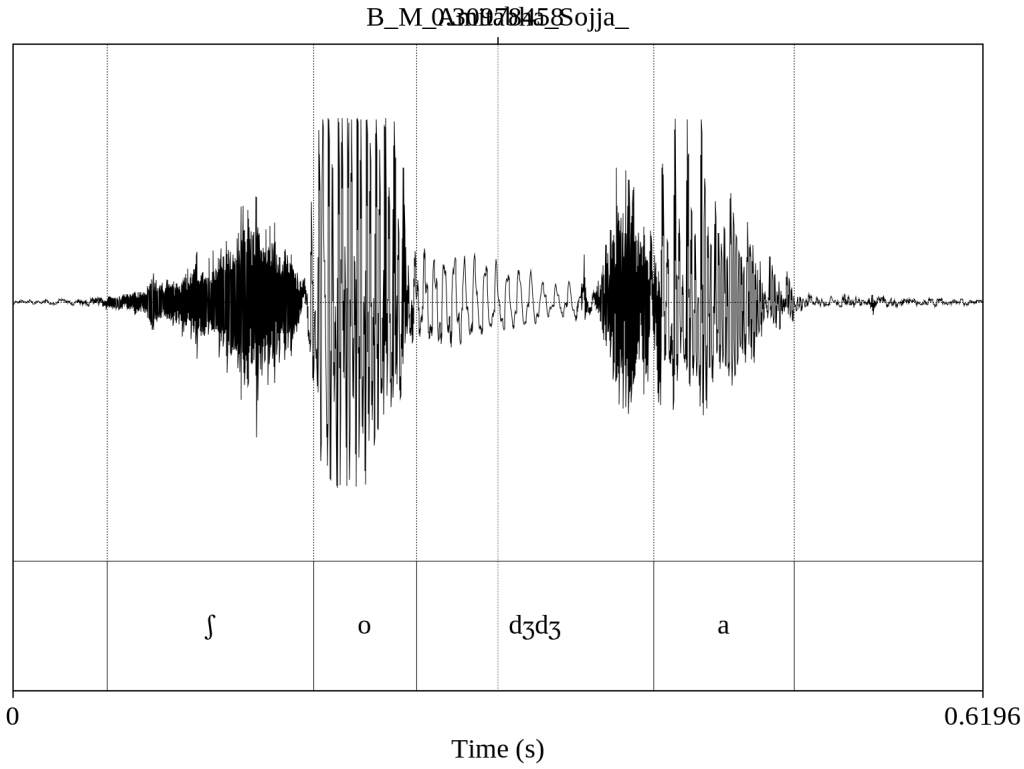


Fig.27. Diagram showing the waveform of the preceding and the following vowels */o/* and /a/ in the word /ʃodʒa/ in Bangla.

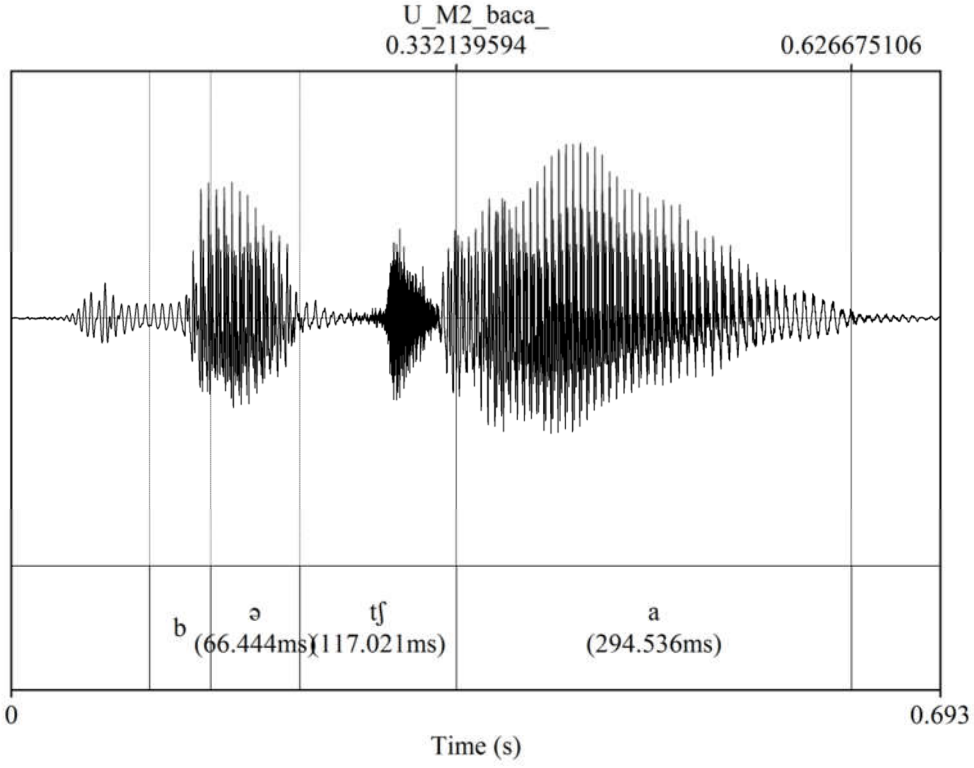


Figure 28. Diagram showing the waveform of the preceding and the following vowels */ə/* and /a/ in the word /bətʃa/ in Urdu.

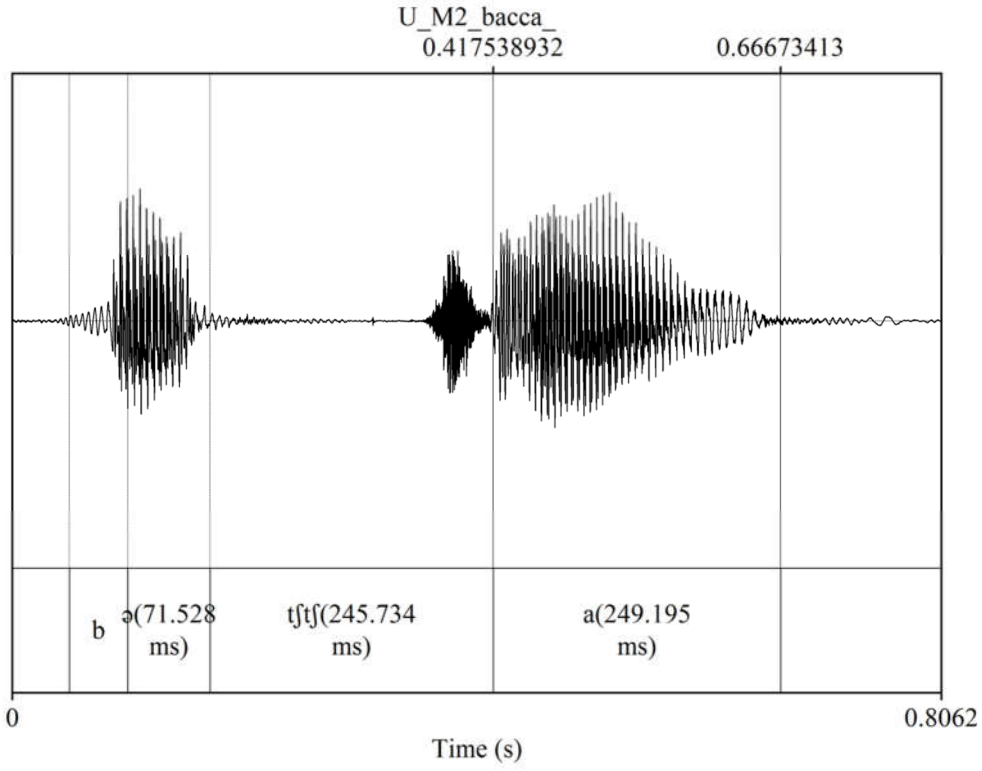


Fig.29. Diagram showing the waveform of the preceding and the following vowels */ə/* and /a/ in the word /bətʃtʃa/ in Urdu.

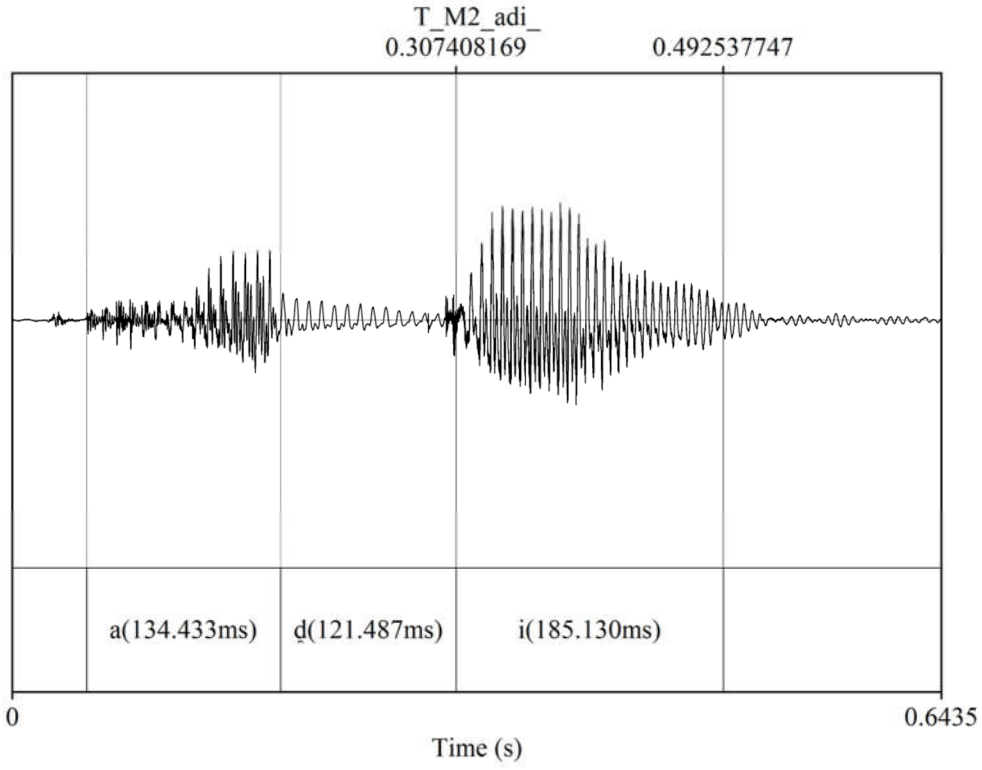


Fig.30. Diagram showing the waveform of the preceding and the following vowels /a/ and /i/ in the word /ɑd̪i/ in Telugu.

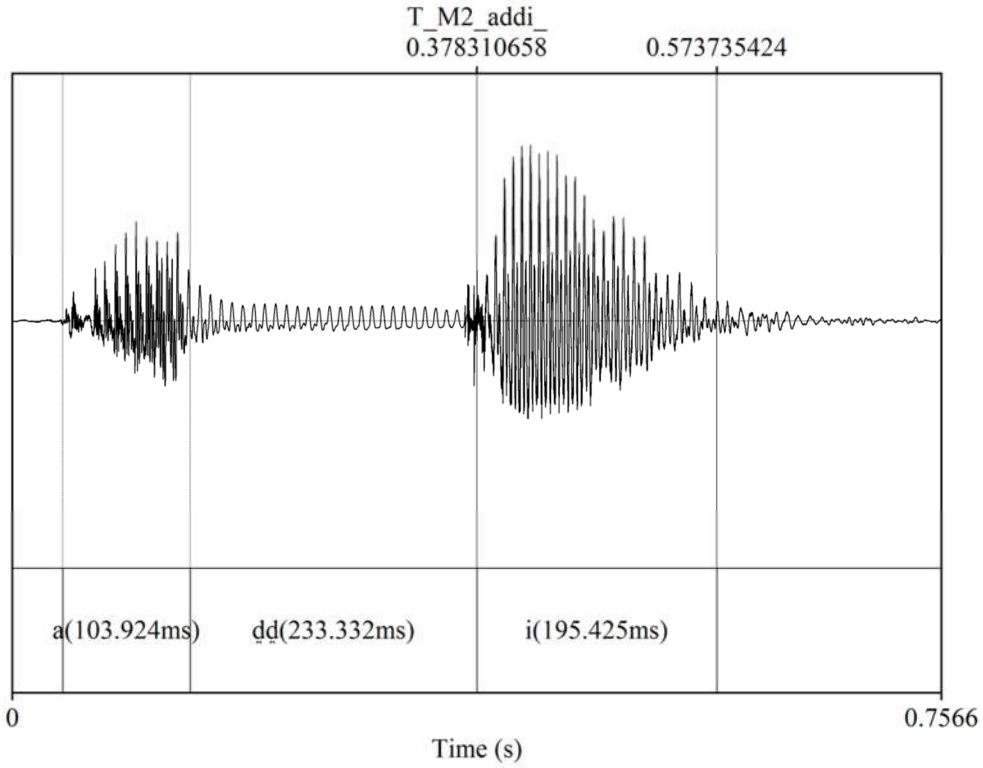


Fig.31. Diagram showing the waveform of the preceding and the following vowels /a/ and /i/ in the word /ad̪d̪i/ in Telugu.

5.7 Summary of the Chapter

The fifth chapter deals with phonetic study of geminates. It presents the detailed discussion on singleton and geminate consonants of Bangla, Urdu, Telugu and Telugu variety of Indian English. It describes the vowel lengthening of the preceding as well as following vowel lengths of the above mentioned languages. This chapter deals with the duration of consonant length. For acoustic cues we have used PRAAT to display the duration of the singleton-geminate consonant. Geminates are comparatively longer in duration than the singleton counterparts in all position in Indian languages. In Indo-Aryan languages gemination occurs between two short vowels whereas in Dravidian languages gemination takes place between two short vowels, one short vowel and one long vowel and one long vowel and one short vowel. Duration of a vowel followed by a singleton is longer than those which are followed by a geminate or a consonant cluster in Bangla. The patterns of gemination present in Indian Languages are transferred to Indian English.

CHAPTER VI

CONCLUSION AND IMPLICATIONS OF FURTHER STUDY

In this chapter, we look at the findings of the present study, sum up whatever has been stated so far in the first four chapters and indicate the future scope of the present research.

6.1 Dissertation summary

The opening chapter reports a detailed study of phonetics and phonological investigations of geminates and gemination in some Indic languages. This work presents the results of a cross-linguistic investigation of word-medial geminate consonants. The investigation of their behaviour in a variety of languages postulates that the word-medial sounds are true geminate consonants, especially in that they exhibit typical dichotomous geminate behaviour. Here dichotomous means that geminates behave both as a unit and as a consonant cluster. Furthermore, the phonetic issues relevant to medial geminates are discussed, and the preliminary data pertaining to these issues are presented. The study also explains how gemination processes present in Indic Languages are transferred to Indian English.

Gemin is a phonological process which is very prevalent in Indian languages. And this feature is quite common in Indian English (I.E.). It is found word internally in Indian English (Punjabi English, Bangla English, Hindi English, Urdu English, Telugu English, Tamilian English etc). English does not register geminates within the word but Indian English allows geminate consonants. A marked feature of Indian English which reflects the strong pull of the mother tongue influence and which is untypical of native English is the phenomenon of gemination in speech. The present section explains how gemination processes present in Indian Languages are transferred to Indian English. There are various reasons for the geminating of consonants in I.E.

In the first chapter aims and scopes of the present study have been described. The term 'geminate' and the characteristics have been outlined in the chapter. In the methodology part it

has been shown how the data has been collected. The chapter also contains the materials which has been collected from various sources. For examples, grammar books, journals, dissertations texts in Indian languages. The collected data has also been verified by the native speakers. The methodology part has also been shown the procedures of the data collection. Finally it has been demonstrated that the data which has been collected from various primary as well as the secondary sources have been analyzed acoustically by PRAAT (by Paul Boersma, University of Amsterdam), a standard software for instrumental analysis of speech sounds.

A cursory glimpse of main objectives of the present study has been given below:

- to study the geminate and gemination in Indic Languages exhaustively.
- to attempt the medial geminates in Indic Languages such as Bangla, Urdu, Telugu and Indian variety of English.
- to find out the geminate patterns of Indian English with special reference to Telugu variety of English.
- to study the effect of vowel lengthening in Bangla, Urdu and Telugu.
- to study the different acoustic phonetic correlates contributing to listener's perceptions in Indic Languages.
- to study the influence of L1 (Mother tongue) on gemination in Indian English.
- to study how gemination processes present in Indian Languages are transformed to Indian English.
- to compare and contrast the geminate patterns of Indo-Aryan Languages and those of Dravidian Languages.
- to discuss the phonological implication of the findings of the present study.

The second chapter deals with the literature review of the phonetic and phonological issues related to word-initial, word-medial geminates, with a focus on the production and perception of geminates. Various arguments, points of views and proposals on geminates and gemination of different authors have been described in this chapter.

The third chapter discusses the pattern of geminate and gemination in Indic Languages. In the languages examined geminates commonly occur in the intervocalic position. The languages have geminate consonants as well as the singleton contrast. It is also reported that all the languages except Bangla have very few singleton-geminate contrast. In Bangla all geminate

consonants contrast with singleton consonants. Geminate consonants occur except for the following: [bʰ ʃ h j] in Urdu. A sequence of a long vowel followed by a consonant has the lexical alternant of a short vowel followed by a geminate consonant, e.g., /ɖərʊa:za:/ ~ /ɖərʊəzza:/ 'door'. Urdu allows lexical geminates as well as singleton-geminate contrast. There are two types of consonant clusters. The first one is two-consonant cluster that allows initial, medial and final. The initial consonant cluster permits (i) C+L/G; (ii) s+C, the medial and final is general. The second one is three-consonant clusters which allows Initial, medial and final. The initial permits /spr str smr/, the medial is general and the final allows /str ntr ʂʈr rdr/. Geminate consonants occur inter-vocalically, except for the following: /pʰ bʰ dʰ ʈʰ ɖʰ tʃʰ dʒʰ kʰ gʰ ʂ h/ in Telugu. Telugu also permits lexical geminates as well as singleton-geminate contrast. Telugu allows morpho-phonemic processes resulting with geminates. The chapter also delineates the variety of Indian English with special reference to Telugu English (TE). There are various reasons for the geminating of consonants in Indian variety of English. The study also explains how gemination processes present in Indian Languages are transferred to Indian English.

Chapter four delineates the phonological study of geminates. Here, different types of theories such as generative phonology, Sound Patterns of English (SPE), CV phonology, Autosegmental phonology and geminate inalterability have been described. In this chapter describes the phonetic study of geminates. Geminates are comparatively longer in duration than the singleton counterparts in all position in Indian languages. In Indo-Aryan languages gemination occurs between two short vowels whereas in Dravidian languages gemination takes place between two short vowels, one short vowel and one long vowel and one long vowel and one short vowel. Duration of a vowel followed by a singleton is longer than those which are followed by a geminate in Bangla, Urdu and Telugu.

Chapter five investigates that geminates are comparatively longer in duration than the singleton counterparts in all position in Indian languages. In Indo-Aryan languages gemination occurs between two short vowels whereas in Dravidian languages gemination takes place between two short vowels, one short vowel and one long vowel and one long vowel and one short vowel. Duration of a vowel followed by a singleton is longer than those which are followed by a geminate or a consonant cluster in Bangla. The patterns of gemination present in Indian Languages are transferred to Indian English.

6.2 Summing up the findings

The findings of the research are summed up as follows:

- Gemination occurs in intervocalic position in most of the Indic languages
- Gemination takes place between two short vowel in Urdu and Bangla.
- Geminates can occur between two short vowels or one short and one long vowel.
- Vowel duration gets reduced when followed by a geminate and non-geminate consonant in Bangla
- Vowel duration in singleton is comparatively longer than the vowel followed by geminate. In other words, vowel duration gets reduced when it followed by geminate.
- The geminated consonant occurs between **two short** vowels in Telugu, or
- Between a **long vowel and a short** vowel, or
- Between a **short vowel and a long** vowel
- Gemination processes present in Indian languages are transferred to Indian English

6.3 Scope of future research

The present study has raised various interesting issues which could only be pointed out for future research, as they lie outside the purview of this study. Some of these topics are given below:

- Future research on Indo-Aryan languages with medial geminates and final geminates may provide for further research
- There are a number of language families (Indo-Aryan, Dravidian, Tibeto Burman) that emerge to be breeding ground for future research
- As demonstrated in chapter four, the investigation of geminates in Bangla elucidates that geminate consonants are longer than those of singleton counterparts. They also have an additional duration. Future research on other languages with medial geminates or final geminate will show for this assumption to be investigated.
- Gemination processes present in Indic languages are transformed to Indian variety English. This new topic may provide for future research
- Another topic for future research concerning to the production of vowel length in Bangla. As illustrated in chapter four, it has been shown the vowel length in singleton is longer than the vowel in geminate and non-geminate counterparts.

- It has been claimed that speakers produce aspirate geminate in Bangla and some other Indian languages. To modify, or clarify or reject the claim, future research of actual geminate production will be necessary.

Appendix I

Samples of data collected from different Indiac Languages

1. Bangla
Bengali

Singleton and geminate

	Word		Word	
1.	/a̤ta/	আতা'custard apple'	/a̤t̤ta/	আত্মা 'soul'
2.	/bi̤dai/	বিদায় 'farewell'	/bi̤d̤dai/	বিদ্যায় 'in wisdom'
3.	/bãca/	বাচা'survive'	/bacca/	বাচ্চা 'child'
4.	/ʃodʒa/	সোজা 'straight'	/ʃɔdʒdʒa/	শয্যা 'bed'
5.	/modʒa/	মোজা'mirth, joy'	/mɔdʒdʒa/	মজ্জা'marrow'
6.	/pa̤ta/	পাতা 'leaf'	/pa̤t̤ta/	পাত্তা 'whereabouts'
7.	/t̤ulo/	তুলো 'to lift sth/cotton'	/t̤ullo/	তুল্য 'comparable'
8.	/mulo/	মুলো'radish'	/mullo/	মূল্য 'price'
9.	/ʃuno/	শুনো 'to listen'	/ʃunno/	শূন্য'zero'
10.	/kana/	কানা 'blind person'	/kanna/	কান্না 'crying'
11.	/ʃɔ̤to/	শত 'hundred'	/ʃɔ̤t̤to/	সত্ব 'ownership/truth'
12.	/bʰago/ভাগো	'leave'	/bʰaggo/ভাগ্য	'fortune'
13.	/ʃɔman/	সমান 'equal'	/ʃɔmman/সম্মান	'honour'
14.	/dɔʃi/	দোষী 'convict'	/dɔʃʃi/দস্যি	'FEM'
15.	/ʃɔ̤ti/	সতী 'sati'	/ʃɔ̤t̤ti/	সত্যি 'truth'

Geminated Words

	Words	Gloss
1.	ṳd̤dan	'park'

2.	biʃʃaʃ-	'belief'
3.	balləkal	'childhood'
4.	mriʈʈu	'death'
5.	suʈʈrɔ	'-------'
6.	puʈʈro	'son'
7.	pɔɖɖo	'lotus'
8.	chɔɖɖo	'disguise'
9.	kɔllan	'wellbeing'
10.	oikko	'Unity'
11.	bakko	'sentence'

2. Urdu

Urdu

Singleton and geminate Consonant

	Word	**Gloss**	**Word**	**Gloss**
1.	/bəcɑ/- بچا	to save	/bəccɑ/بچّہ	child
2.	/bəlɑ/- بلا	disaster	/bəllɑ/بلّا	stick /baton
3.	/gəɖɑ/گدا-	beggar	/gəɖɖɑ/ گدّا	quilt
4.	/pəka:/ پکا	'cook'	/pəkka:/ پکّا	'ripe'
5.	/pəʈa:/پتہ	'address'	/pəʈʈa:/ پتّہ	'leaf'
6.	/rəsa/ رسا	'soup; sauce'	/rəssa/ رسہ	'rope'
7.	/ʃəma/ شمع		/ʃəmma/شمہ	
8.	/ʈənɑ/ - تنا	branch	/ʈənnɑ/- تنّا	
9.	/zəra/	'a little, just'	/zərra/	'a particle, a speck, a shred'

10.	/bəna:/ بنا	'make'	/bənna:/ بنّا	'bridegroom'
11.	/pəʈɑ/	'address'	/pəʈʈɑ/	'leaf'

Geminated Words

	Words	**Gloss**
1.	/mohabbaʈ̪/ محبت	'love'
2.	/ɑkkɑs/ عکاس	'painter'
3.	/ʈəkkɑr/ ٹکر	'striking'
4.	/iʈ̪ʈ̪eləh/ اطّلاع	'information'
5.	/iɖ̪ɖ̪əʈ̪/عدت	'probationary period of four months and ten days'
6.	/ʈ̪ɑməɖ̪ɖ̪un/ تمدن	'civilization'
7.	/ʈ̪ɑnəffur/تنفّر	'disgust'
8.	/ʈ̪ɑləffuz/ تلفظ	'pronunciation'
9.	/ʈ̪əʔdʒdʒub/ تعجب	'wondering'
10.	/ummɑʈ̪/ امت	'followers of a prophet'
12.	/mosannif/ مصنف	'writer'
13.	/ʈ̪ɑmənnɑ/ تمنّا	'desire/wish'
14.	/izzəʈ̪/ عزّت	'respect, dignity'
15.	/qilləʈ̪/ قلّت	'shortage'
16.	/ʈ̪ɑsəlli/ تسّلی	'consolation'
17.	/ʈ̪ədʒɑssus/ تجسس	'curiosity'
18.	/ʈ̪ɑbəssum/ تبسّم	'a smile'
19.	/ʈ̪ɑbərruk/ تبرّک	'blessing'
20.	/ʈ̪ɑrəqqi/ ترقّی	'promotion'

21. /ɑwwɑl/ أول 'first'

22. /tʃʰuʈʲi/ **چھٹي** **'vacation'**

23. /tʃʰappən/ چھپن 'fifty six'

24. /dʒubbə/ **جُبّہ** 'a type of gown' , 'frock'

25. /ʈaɖabbur/ تدبر 'sobriety', 'prudence', 'statesmanship'

3. Telugu

Telugu

Singleton and geminate consonant

Words	**Words**
1. /koni/ 'to buy' కొని /కొనుట	/konni/ 'some' **కొన్ని**
2. /kɑ(hwa)lɑ/ 'dream' కల	/kɑllɑ/ 'lie' (Art) కళ
3. /koɟɑ/ 'hunter'	/koɟɟɑ/ 'transgender'
4. /kɑnu/ 'to see/to give birth' కను	/kɑnnu/ 'eye' కన్ను
5. /ʈoʈi/ ' ?? (along/with someone) తోటి	/ʈoʈʈi/ 'tub' తొట్టి
6. /ʈɑgi/ 'suitable' తగి	/ʈɑggi/ 'reduce' తగ్గి
7. /bɑli/ 'sacrifice' బలి	/bɑlli/ 'lizard' బల్లి
8. /celi/ 'lover' చెలి	/celli/ 'younger sister' చెల్లి
9. /ɑɖi/ 'that' అది	/ɑɖɖi/ 'apply' అద్ది
10. /uli/ 'chisel' ఉలి	/ulli/ 'onion' ఉల్లి
11. /ʈɑnu/ 'anybody' తాను	/ʈɑnnu/ 'kick' తన్ను

12. /cali/ 'shivering' చలి /calli/ 'to throw sth' చల్లి

13. /aɽu/ 'that side' అటు /aʈʈu/ 'pan cake' అట్టు

14. /puɽa/ 'page number' పుట /puʈʈa/ 'anthill' పుట్ట

15. / guru/ 'teacher' గురు /gurru/ 'anger' గుర్రు

16. /bʌɖi/ 'school' బడి /bʌɖɖi/ 'small shop' బడ్డీ

17. /ʋeɭɑ/ or /ʋeɭə/ 'time' వేళా /ʋeḷḷɑ/ or /ʋeḷḷə/ 'went' వెళ్ళా

Geminates

1. kiḷḷi - betel leaf కిల్లి

2. ippuɾu- now ఇప్పుడు

3. /meṯṯɑ/ - 'soft' మెత్త

4. /a/ʌmmenu/- 'sold' అమ్మెను

5. iwwa:ɭa - today, ఇవాల

6. yekkuwa- much ఎక్కువ

7. gabbu- bad smell గబ్బు

8. mabbu cloud మబ్బు

9. uccu - deceit ఉచ్చు

10. utta- empty ఉత్త

11. buʈʈa- basket బుట్ట

4. Telugu variety of English

GEMINATES IN TELUGU VARIETY OF ENGLISH

Sentences containing with geminated words

1. Please have some bread and butter.

2. Have you fully recovered from your illness?

3. Can you bring some chillies or chilli powder from the kitchen ?

4. The police car drove at a terrific speed.

5. It is illegal to drive a car that is not taxed and insured.

6. Releasing the goods without an invoice is most irregular.

7. We met on several occasions to discuss the issue.

8. Tyres are almost always made of rubber.

9. Last summer they went to Australia, and two summers ago they went to Brazil.

10. The story was nothing but lies.

11. For homework I want you to write an essay on endangered species.

12. Asique scored the winner in the last minute of the match.

13. She had suffered terribly over the years but it had not made her bitter.

13. We were just having (our) dinner.

14. Do I look ridiculous in this hat ?

15. A row of reinforced concrete pillars supports the bridge.

16. I would love to play table tennis.

17. I like chicken curry.

18. The book is a thrilling adventure story.

19. It's an immoral tax, because the poor will pay relatively more.

20. His father is buried in the cemetery on the hill.

Words containing with geminates

1. butter

2. terrific

3. fully

4. rubber

5. summer

6. nothing

7. winner

8. opposition

9. essay

10. utter

11. beggar

12. dinner

13. pillars

14. upper

15. suddenly

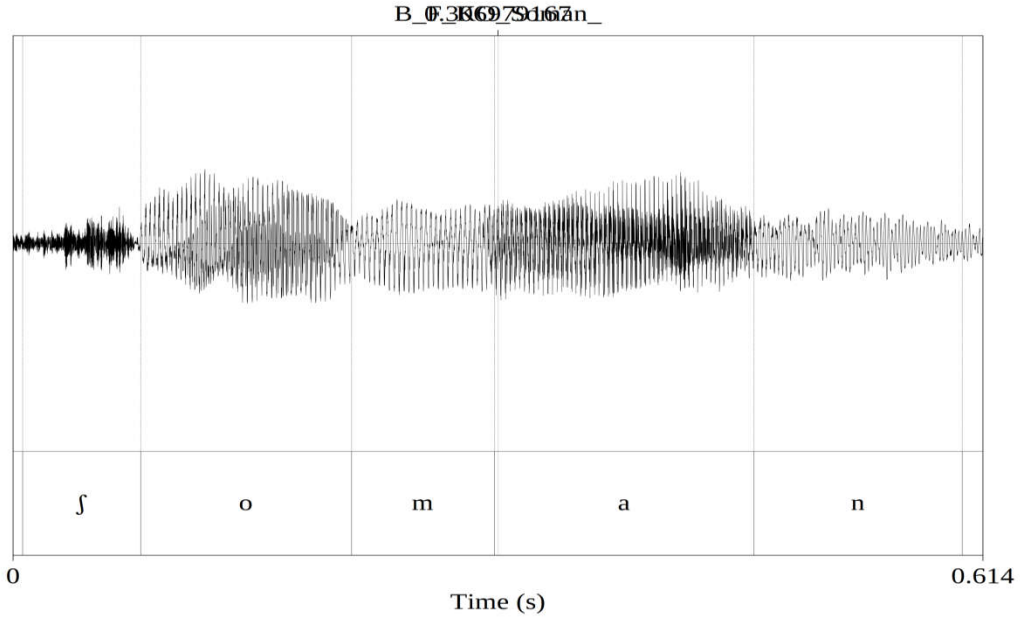
16. kitchen

17. judging

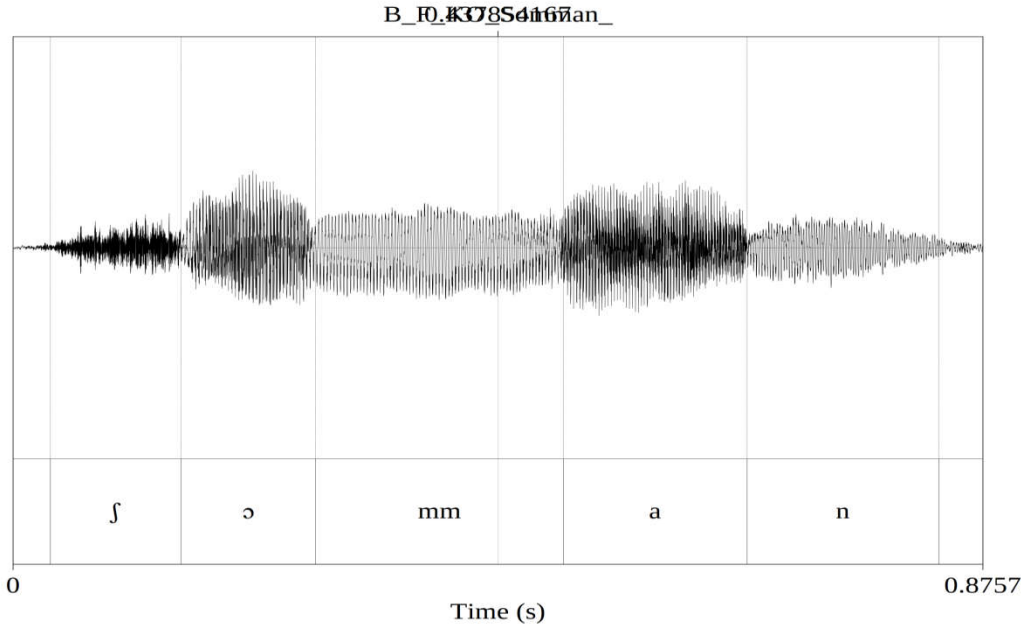
18. accurately

Appendix II

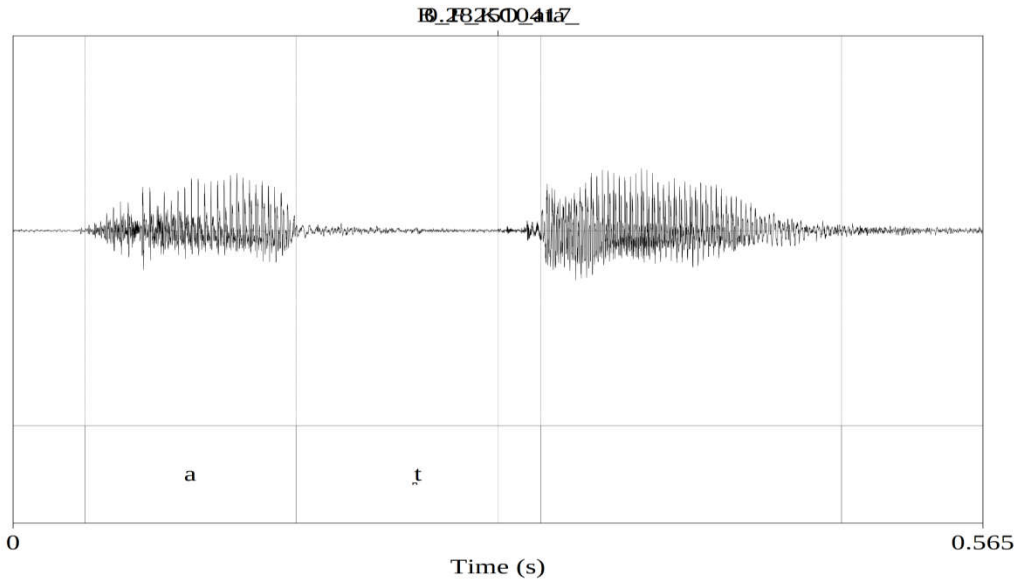
Spectogram or wave pictures of Bangla.



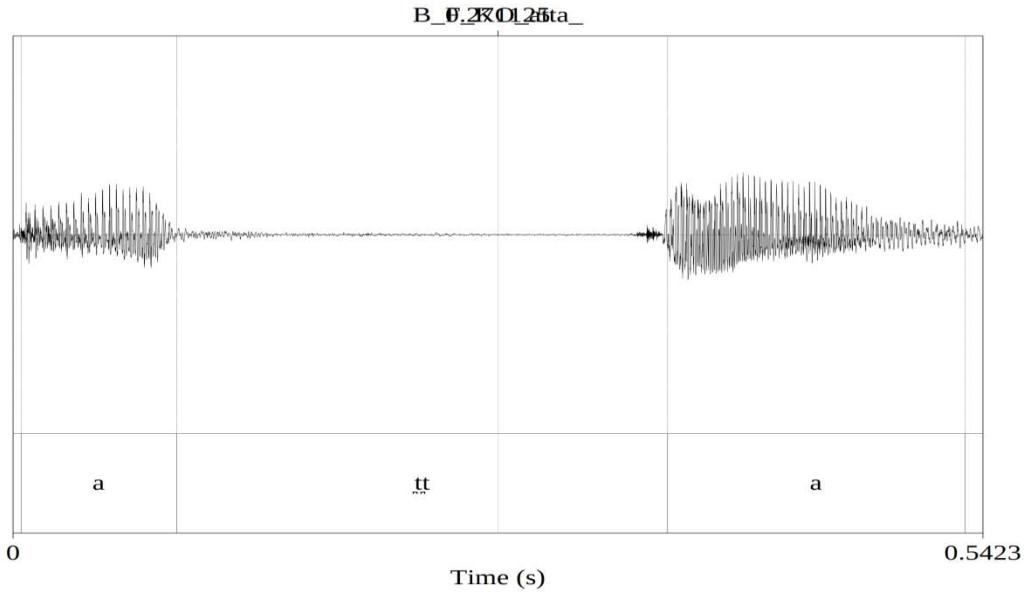
1. Diagram showing the waveform of voiced bilabial singleton nasal /ʃɔman/ in Bangla.



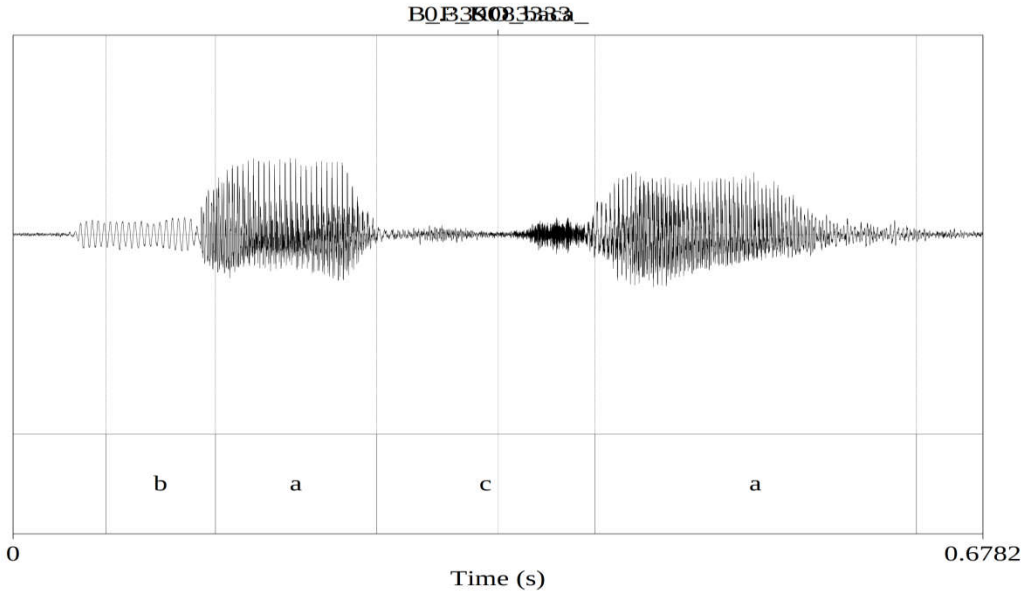
2. Diagram showing the waveform of voiced bilabial geminate nasal /ʃɔmman/ in Bangla.



3. Diagram showing the waveform of voiceless alveolar singleton plosive /aṯa/ in Bangla.



4. Diagram showing the waveform of voiceless alveolar geminate plosive /aṯa/ in Bangla.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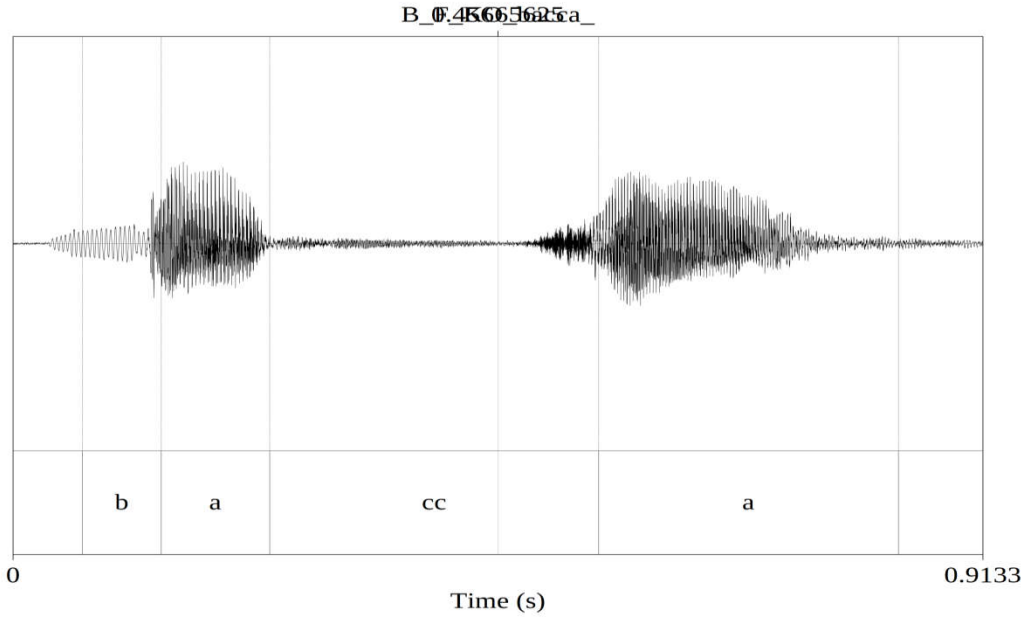
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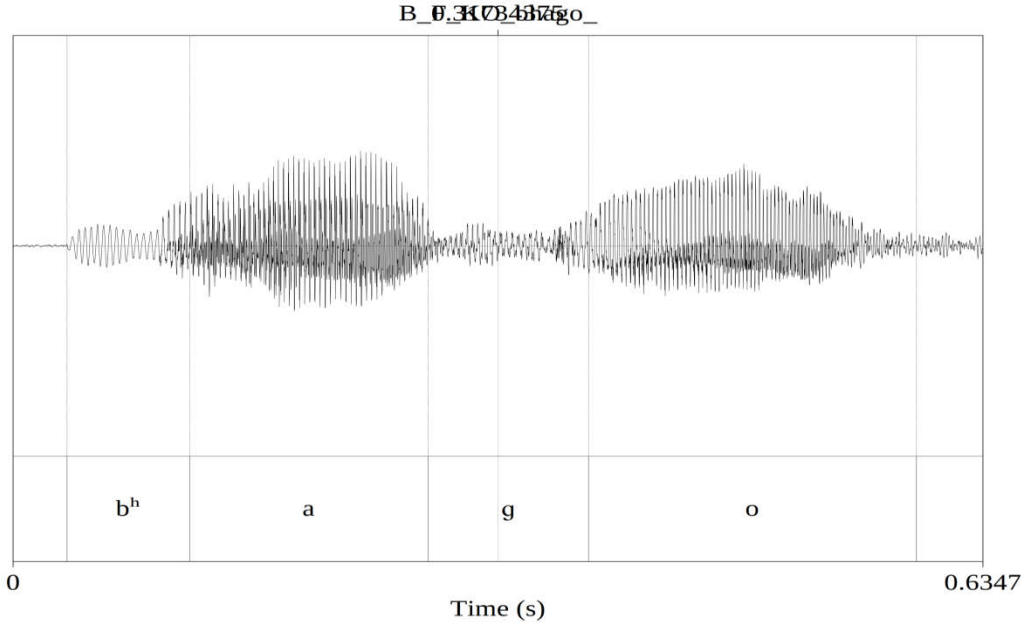
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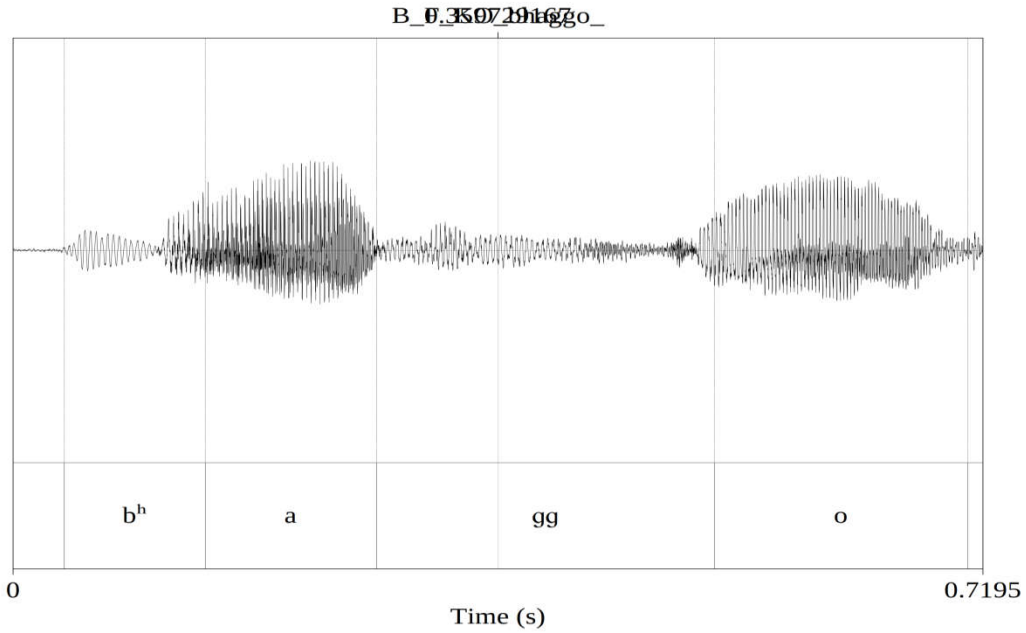
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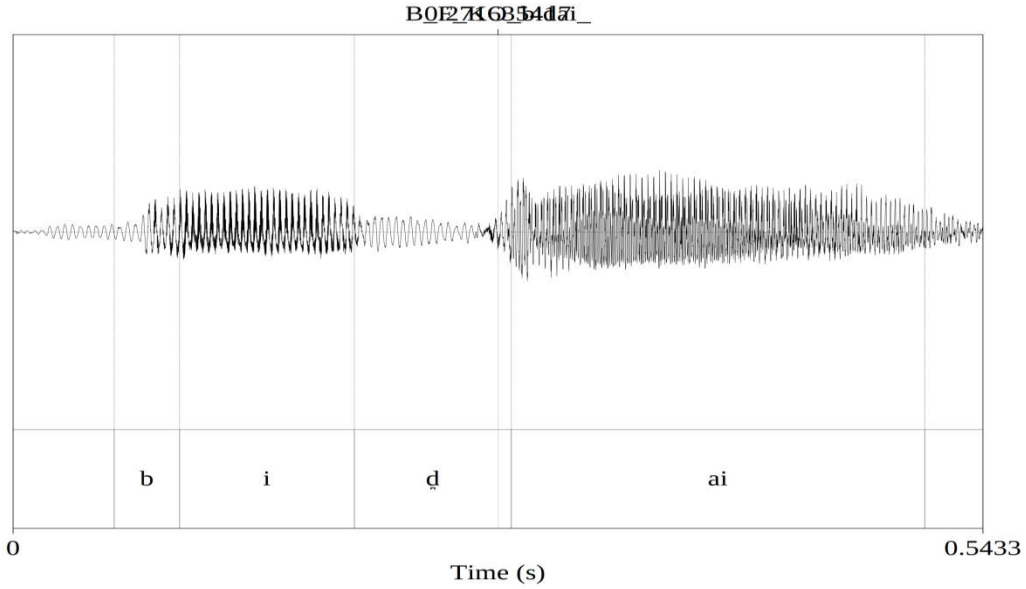
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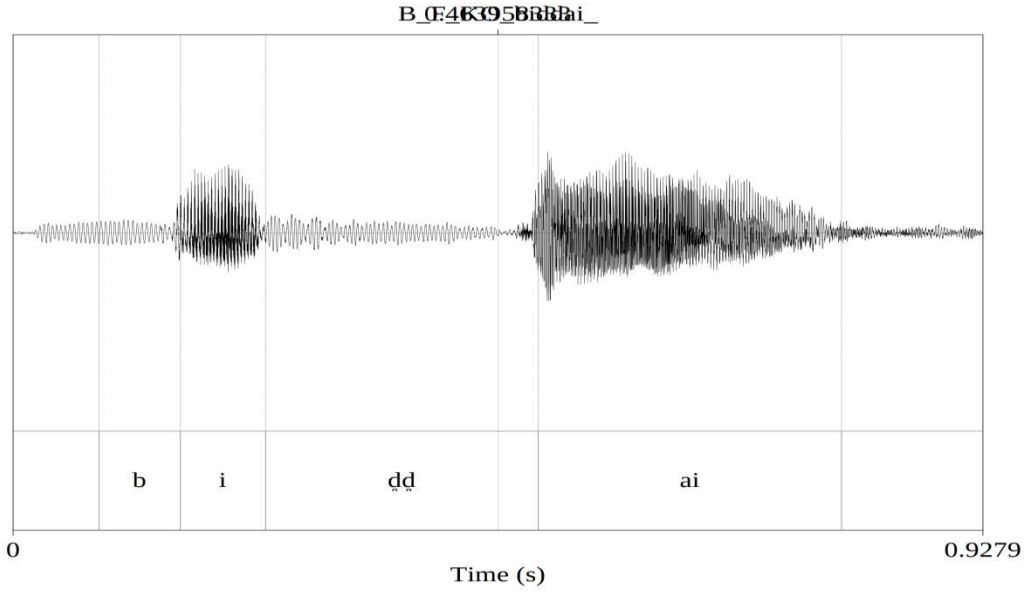
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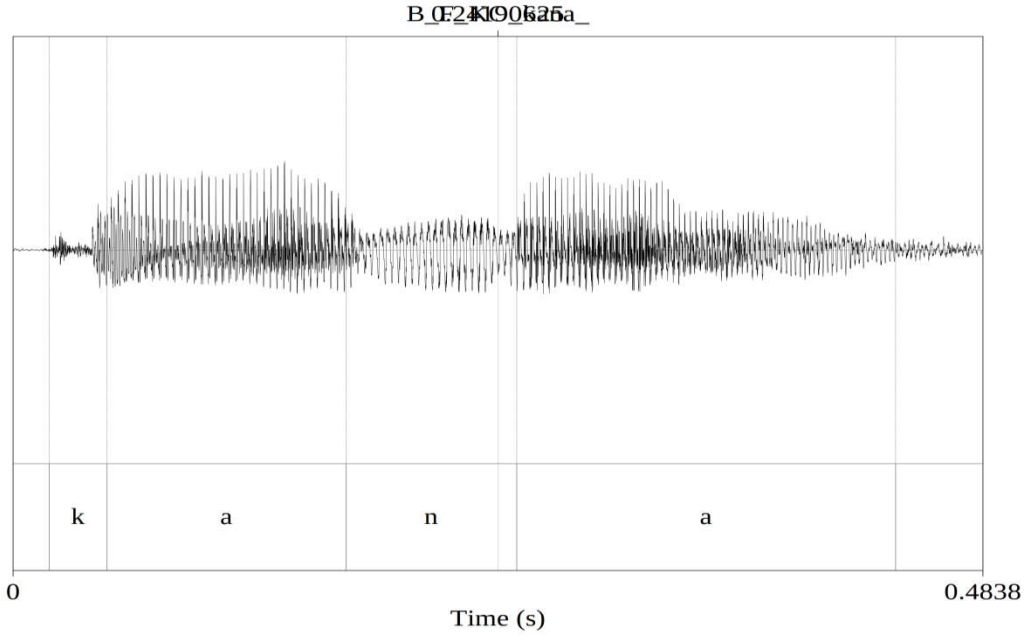
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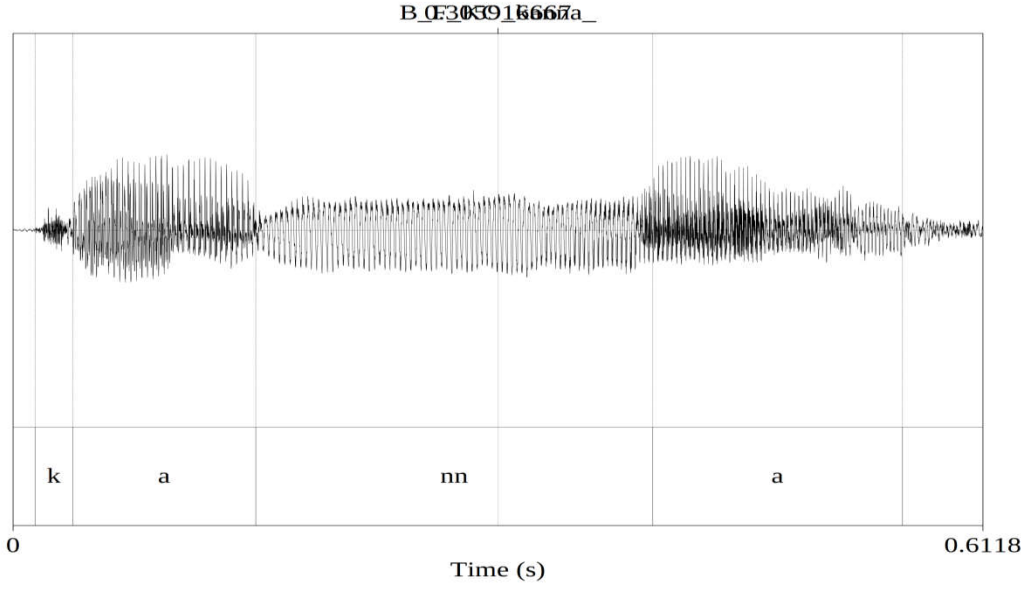
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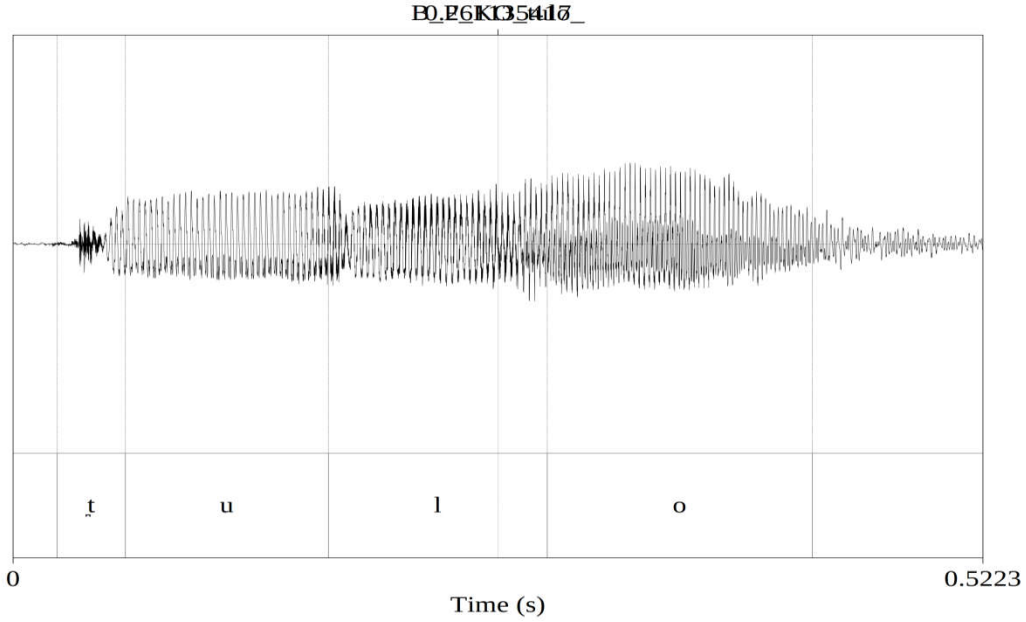
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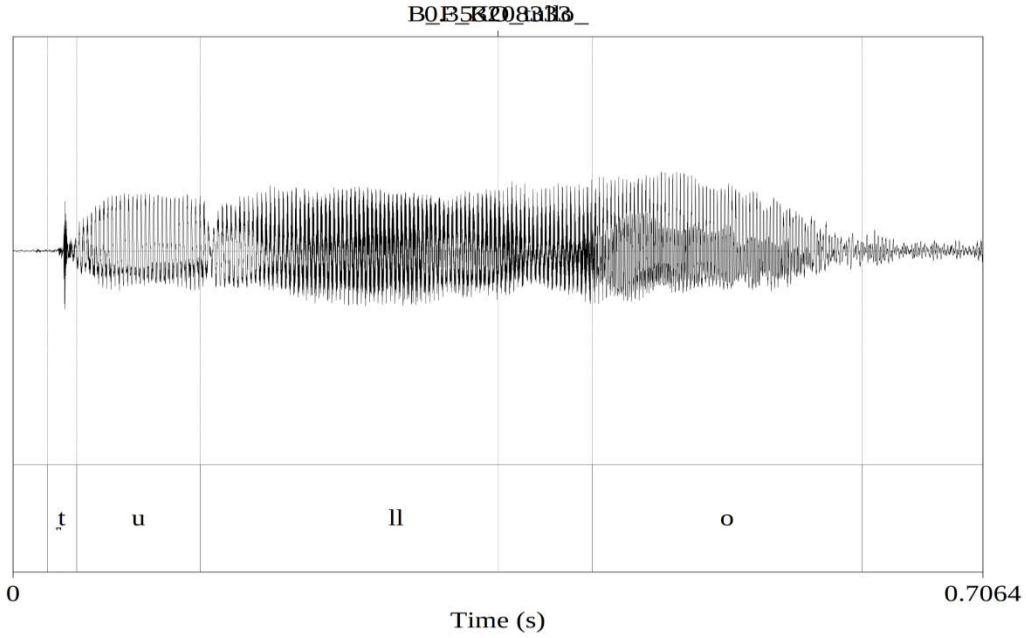
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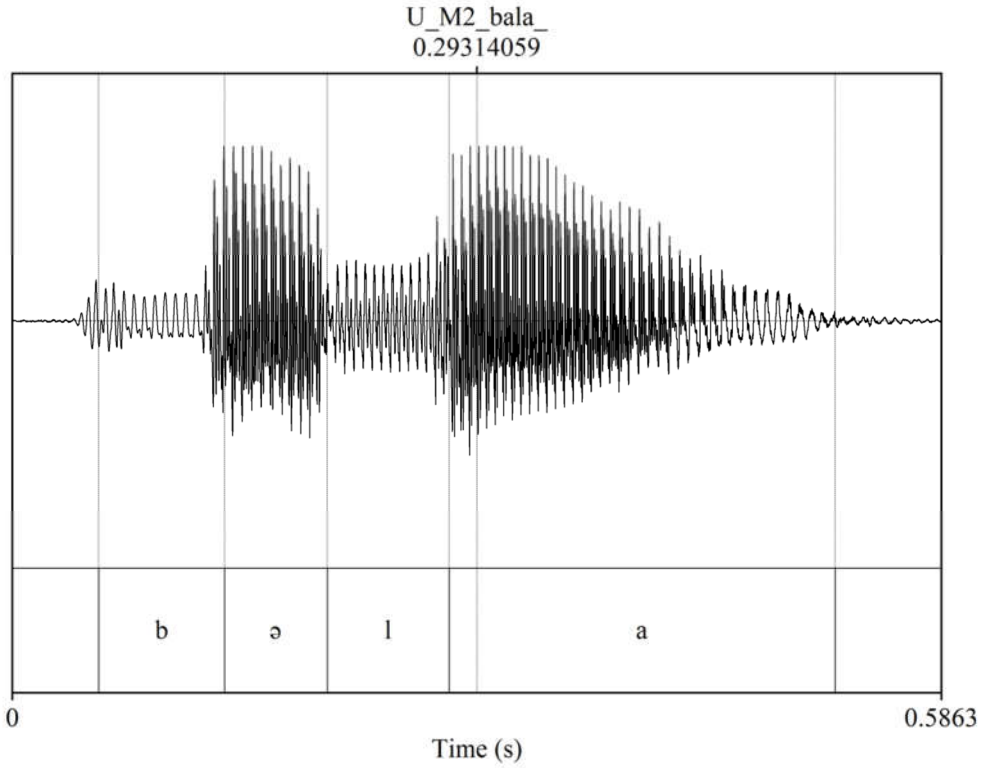
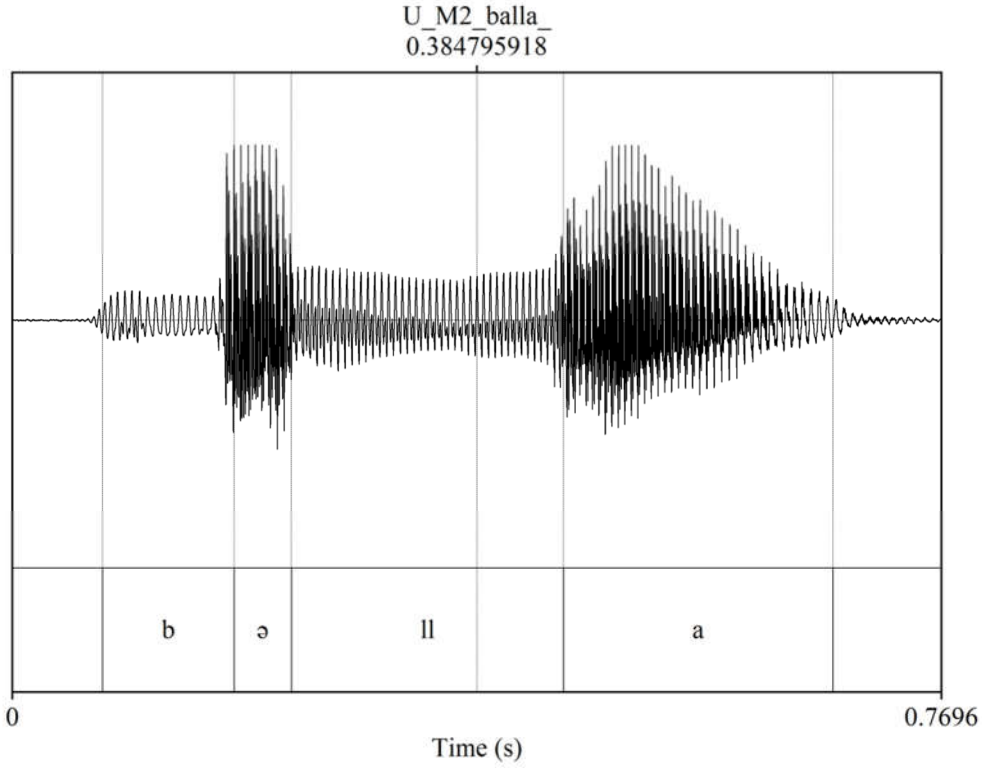
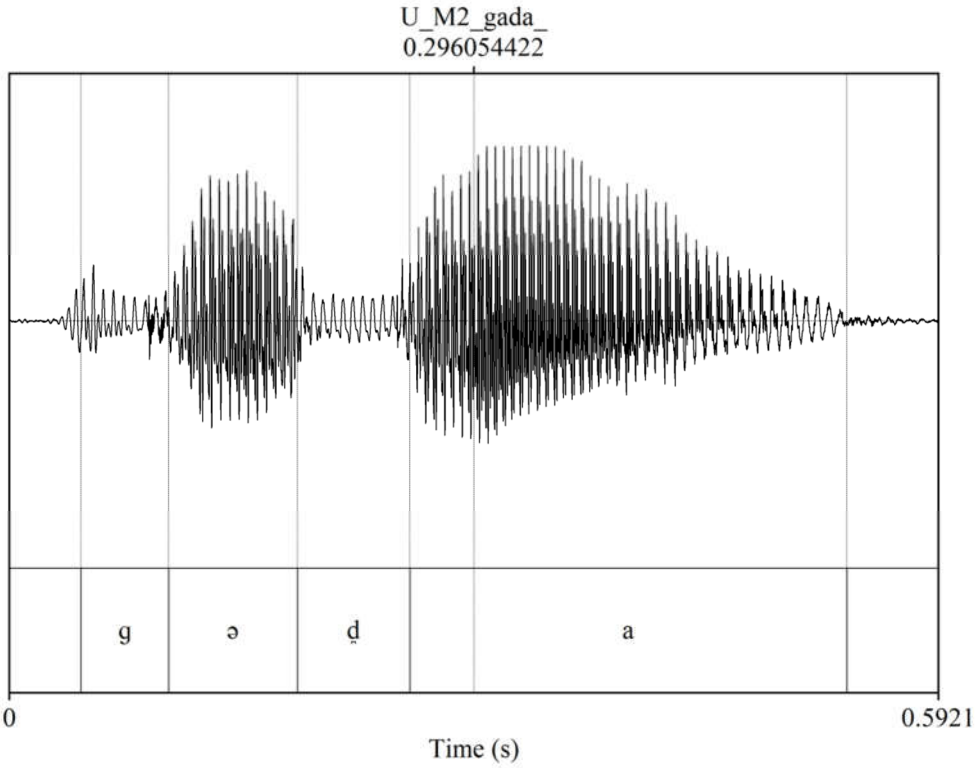
Spectogram or wave pictures of Urdu.



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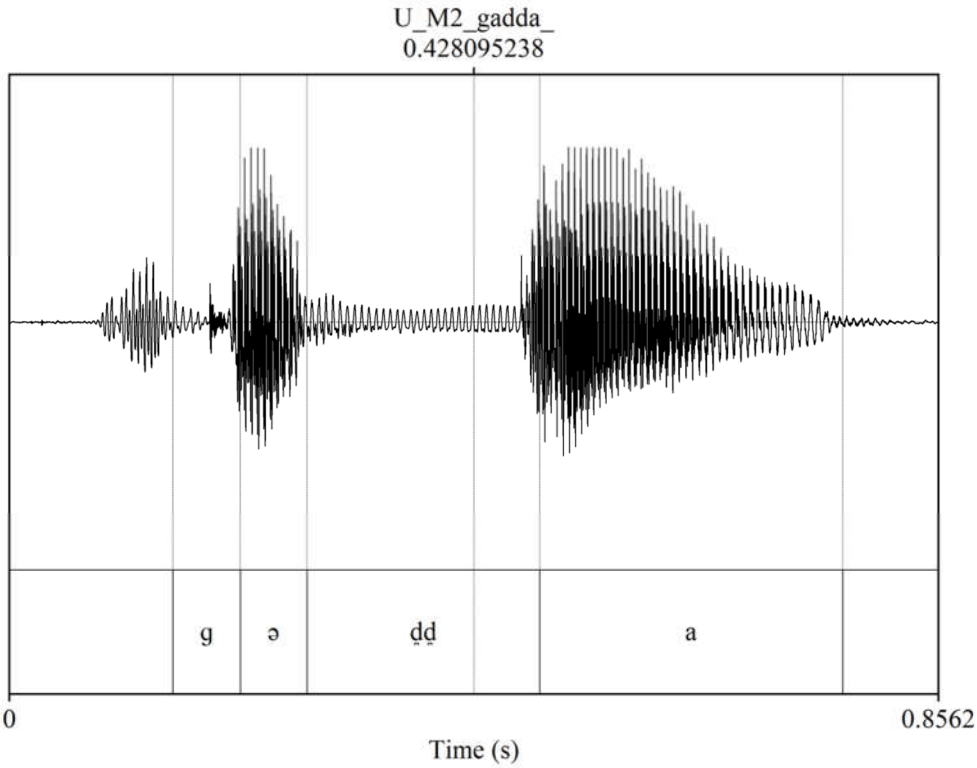
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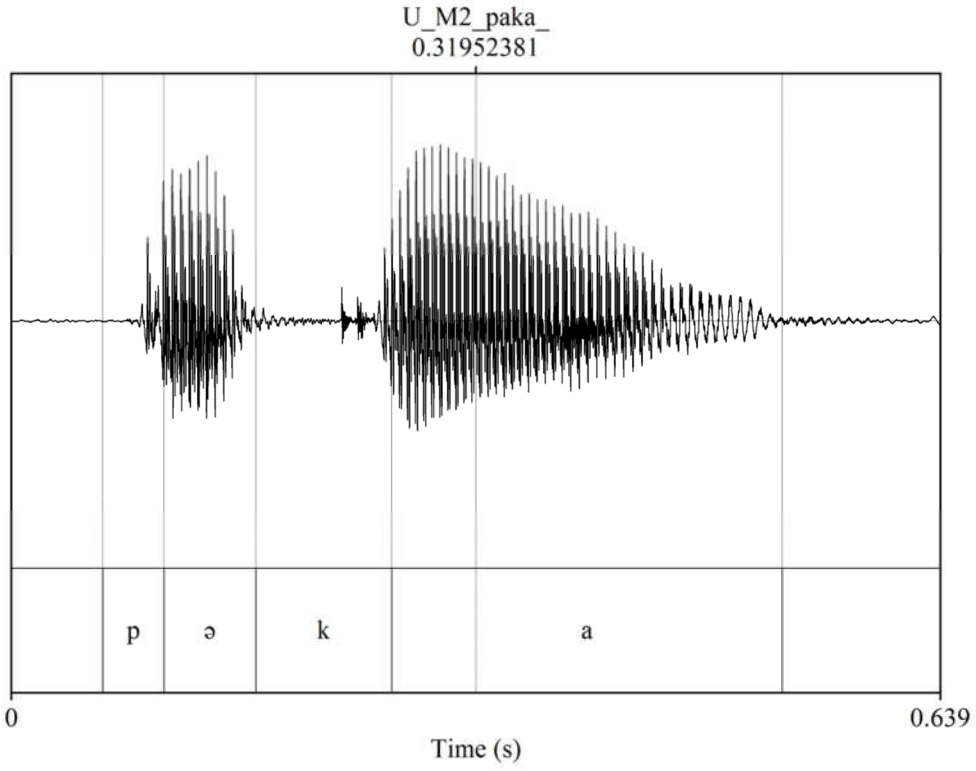
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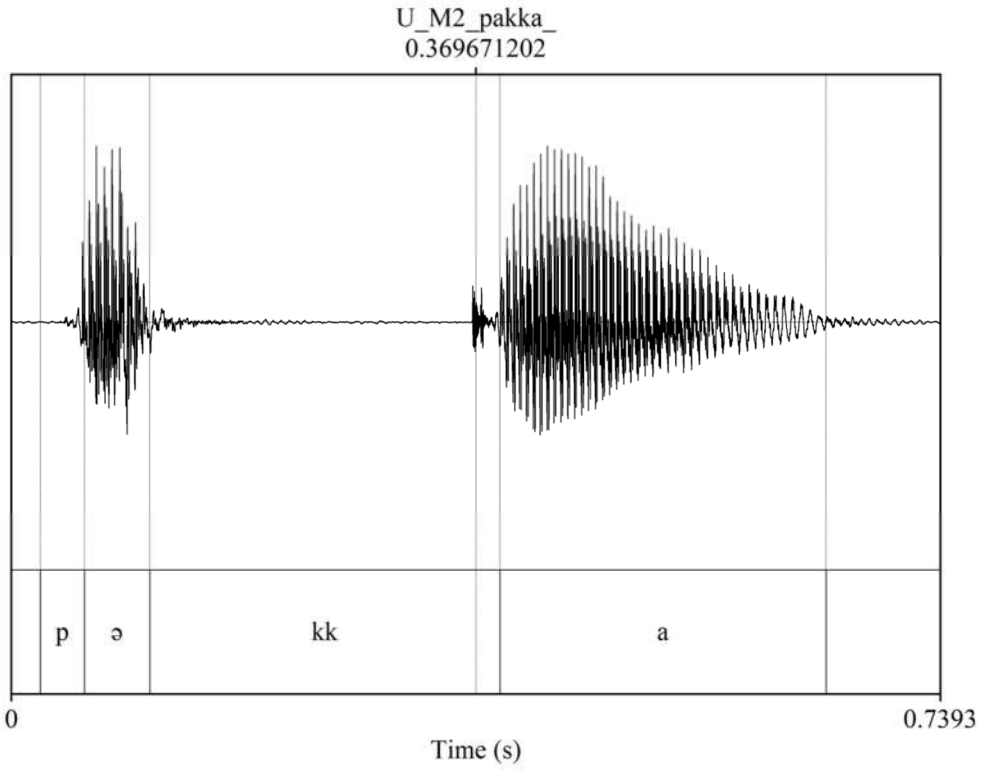
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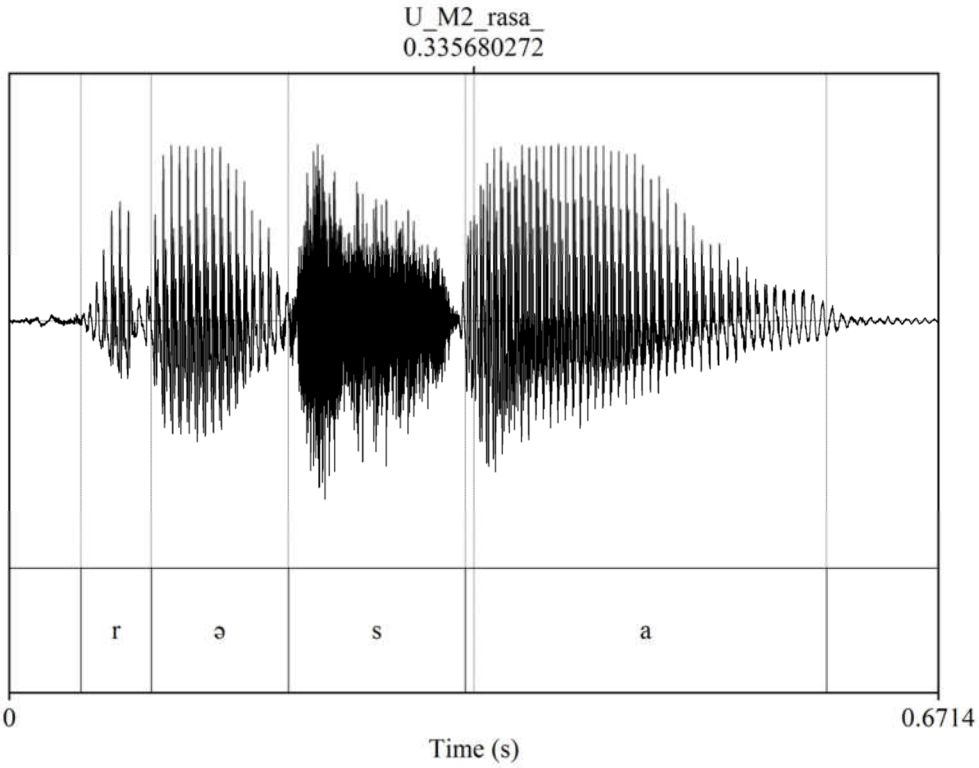
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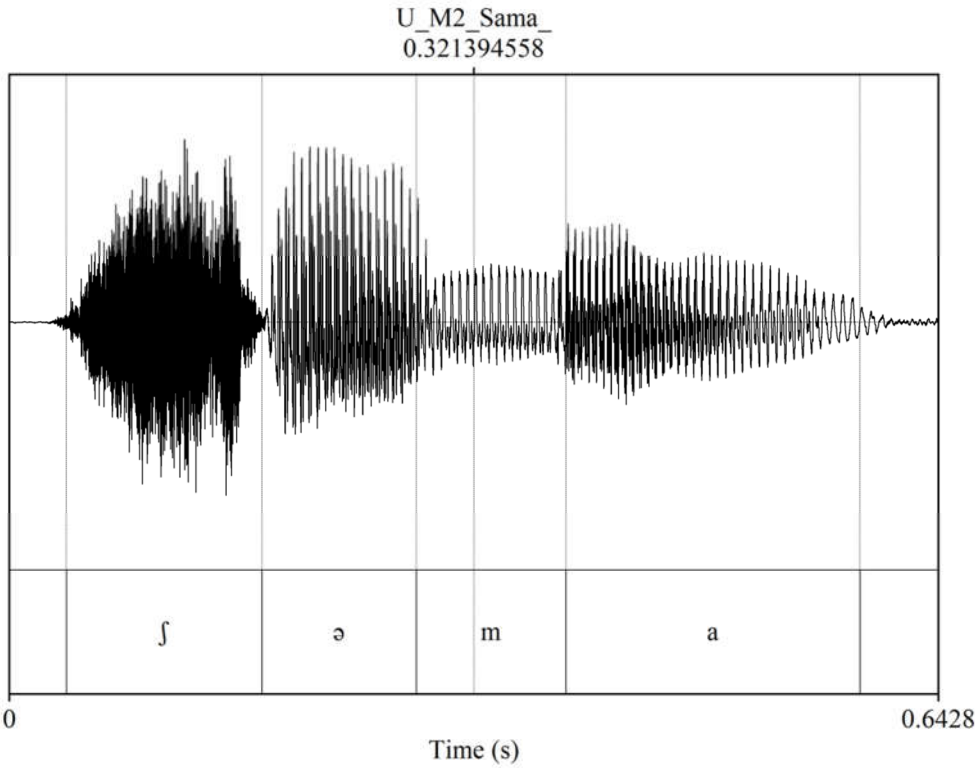
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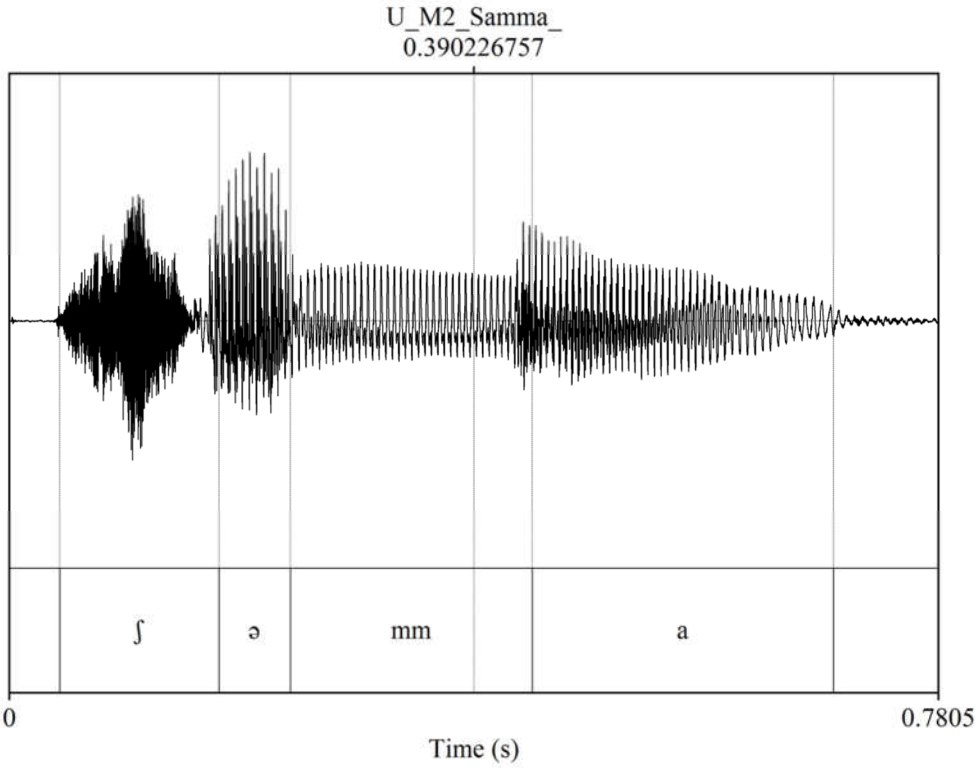
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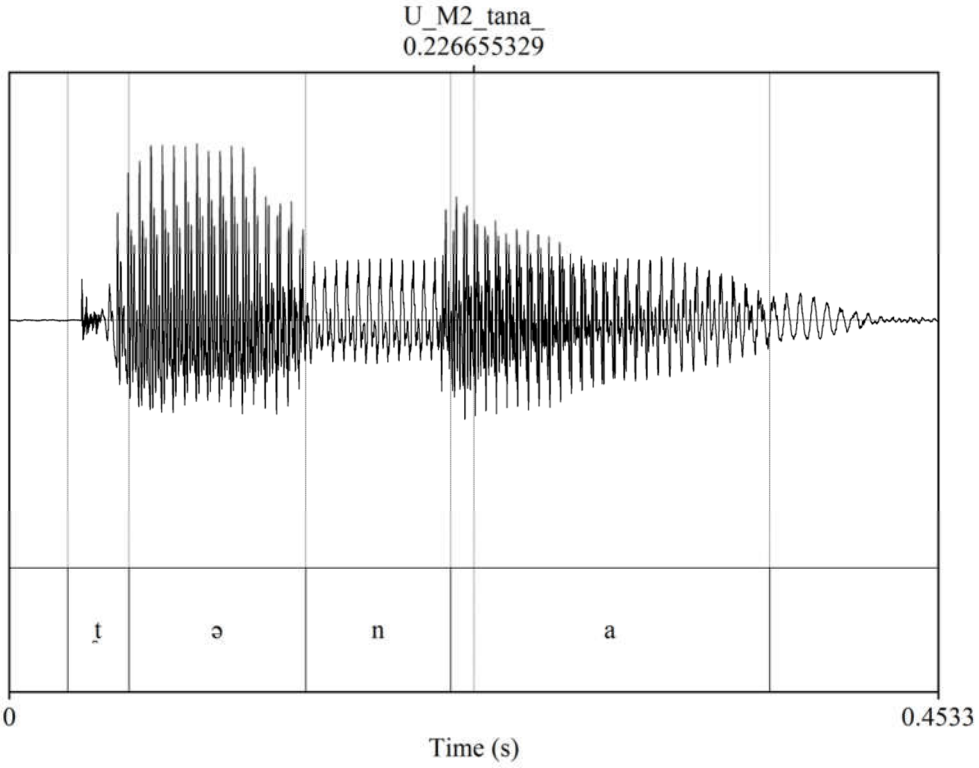
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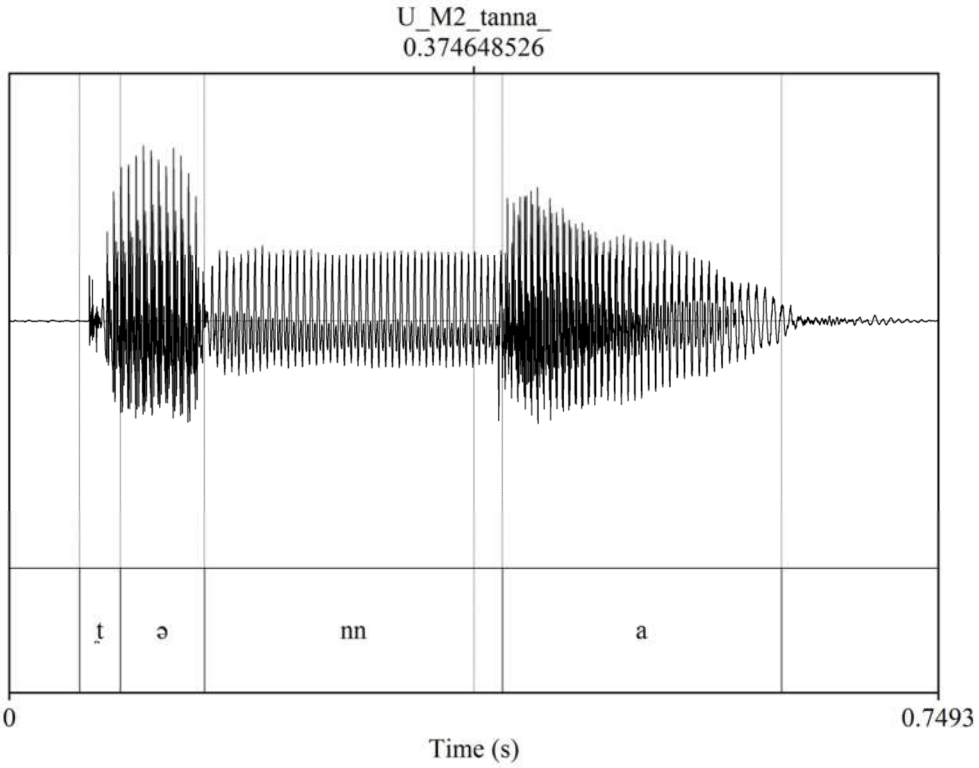
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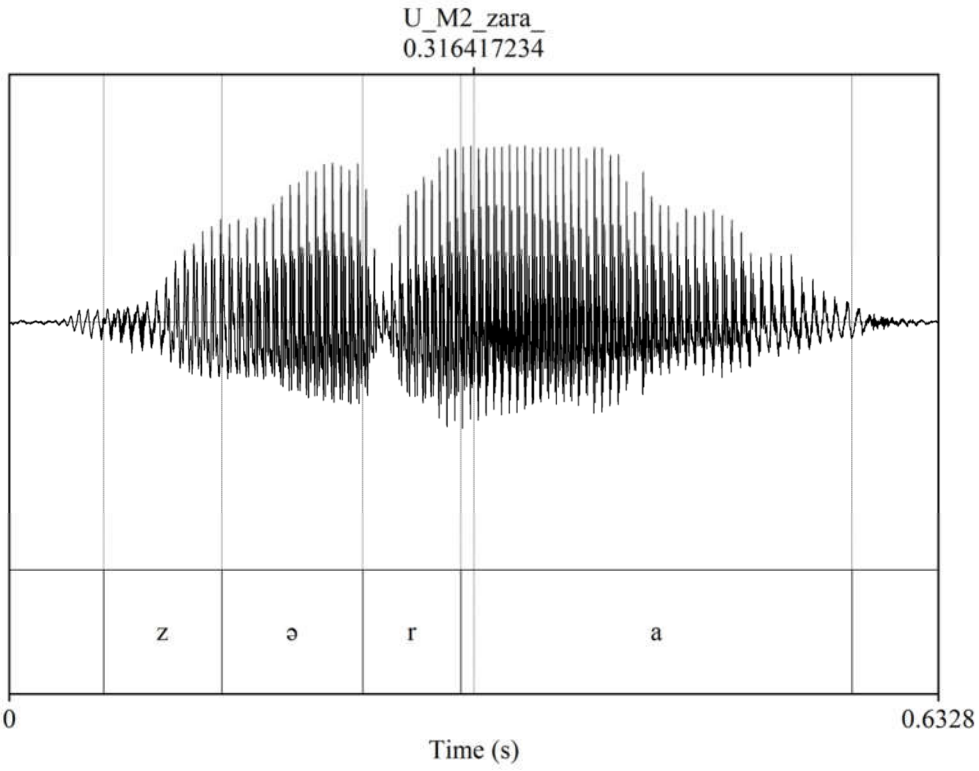
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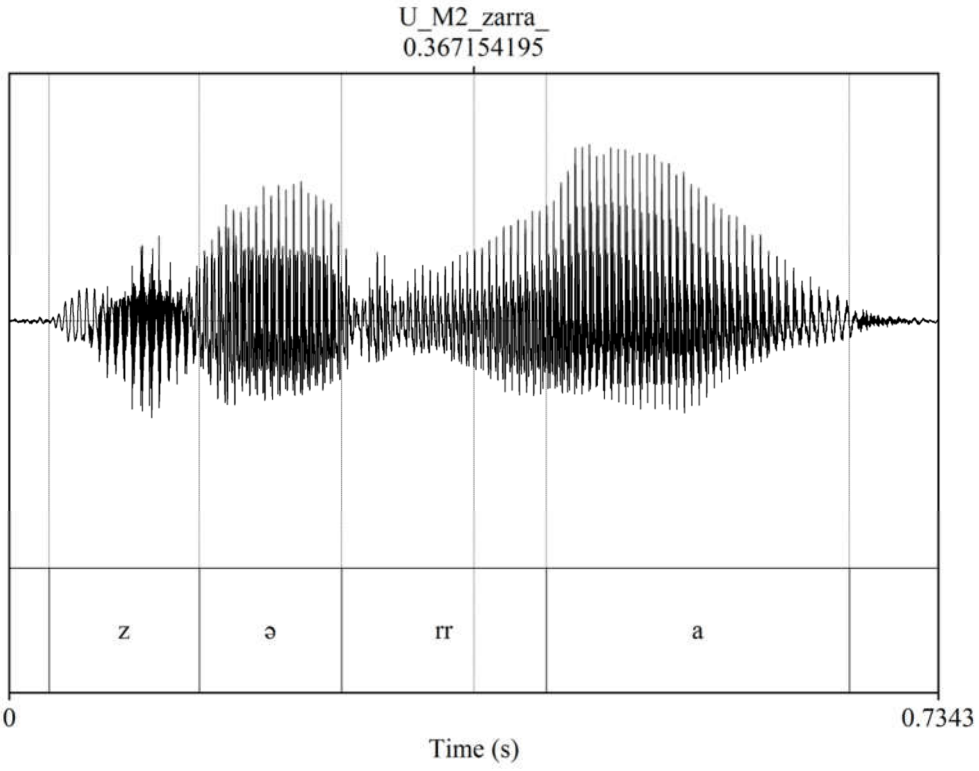
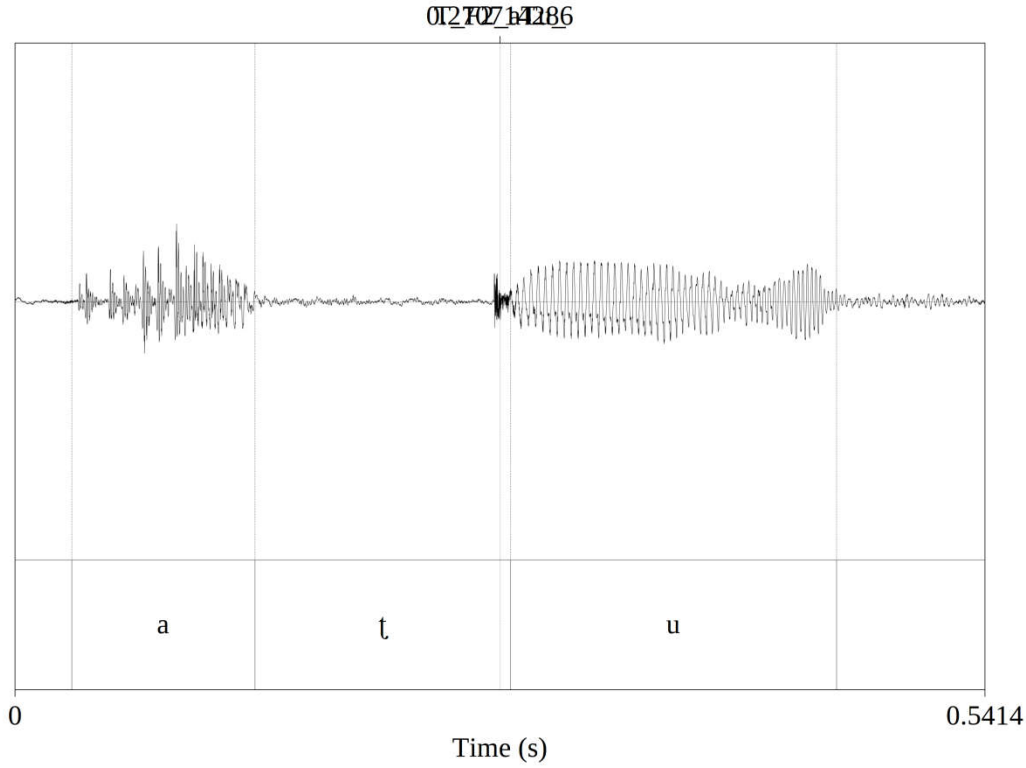
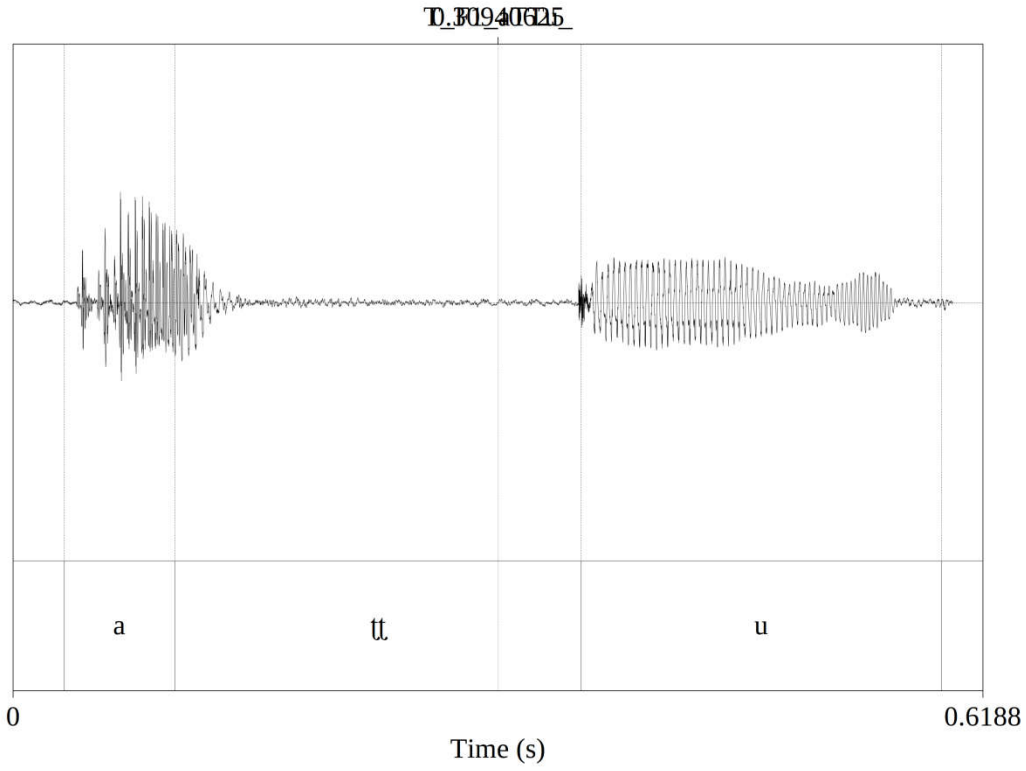


Spectogram or wave pictures of Telugu.

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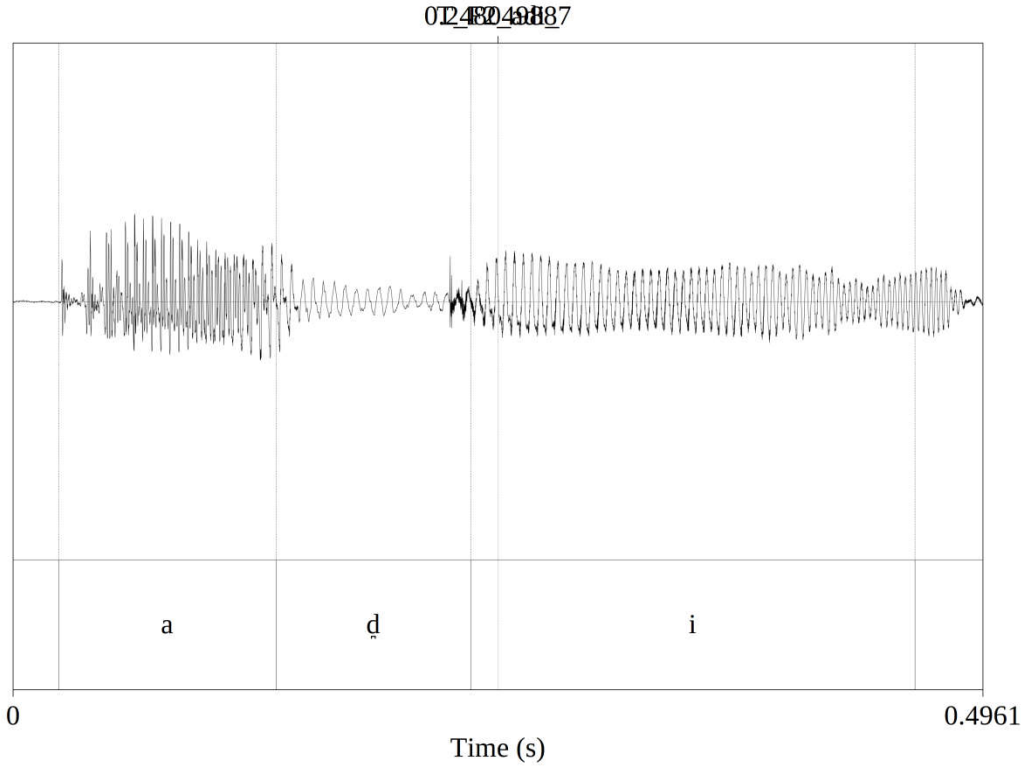
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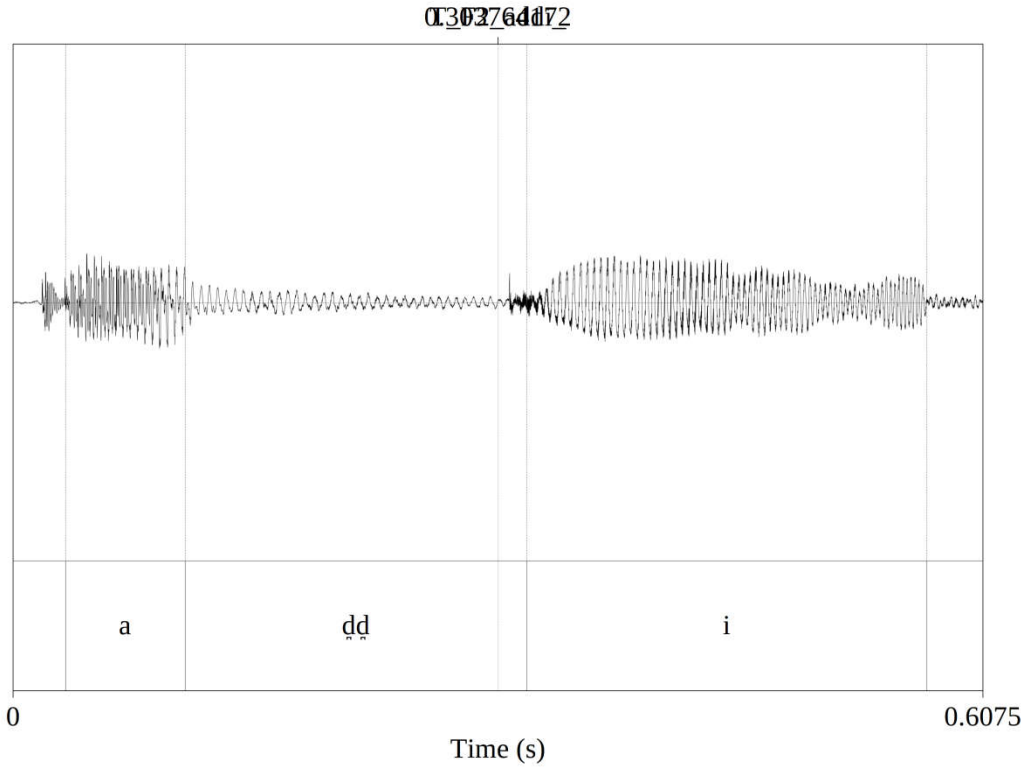
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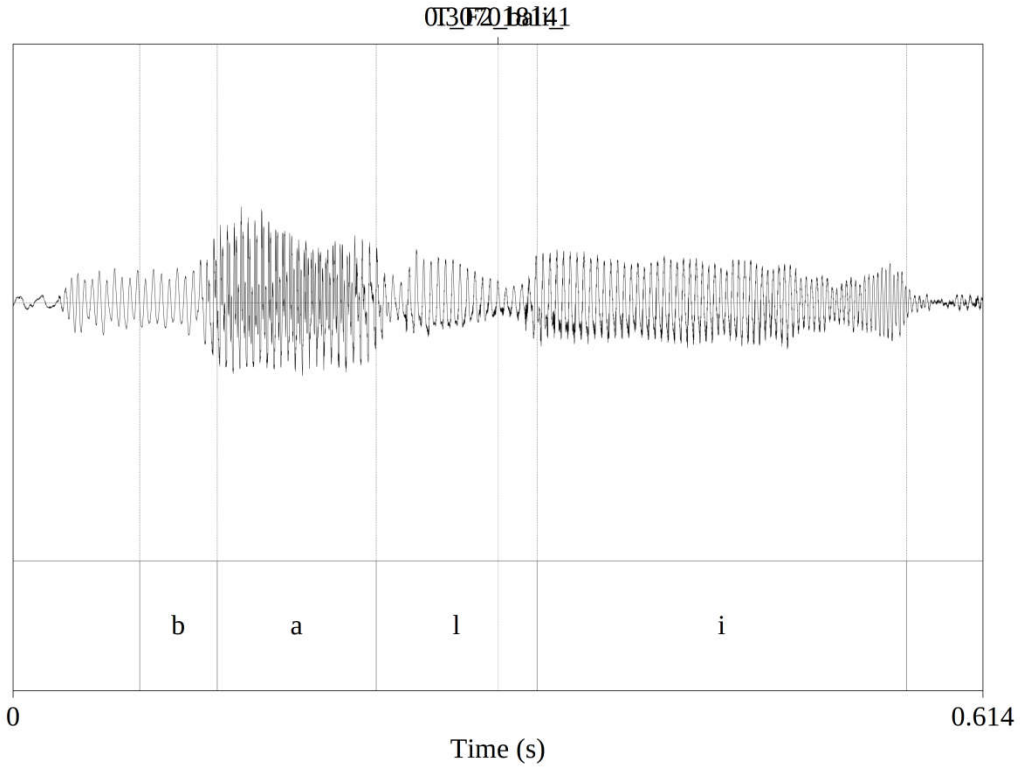
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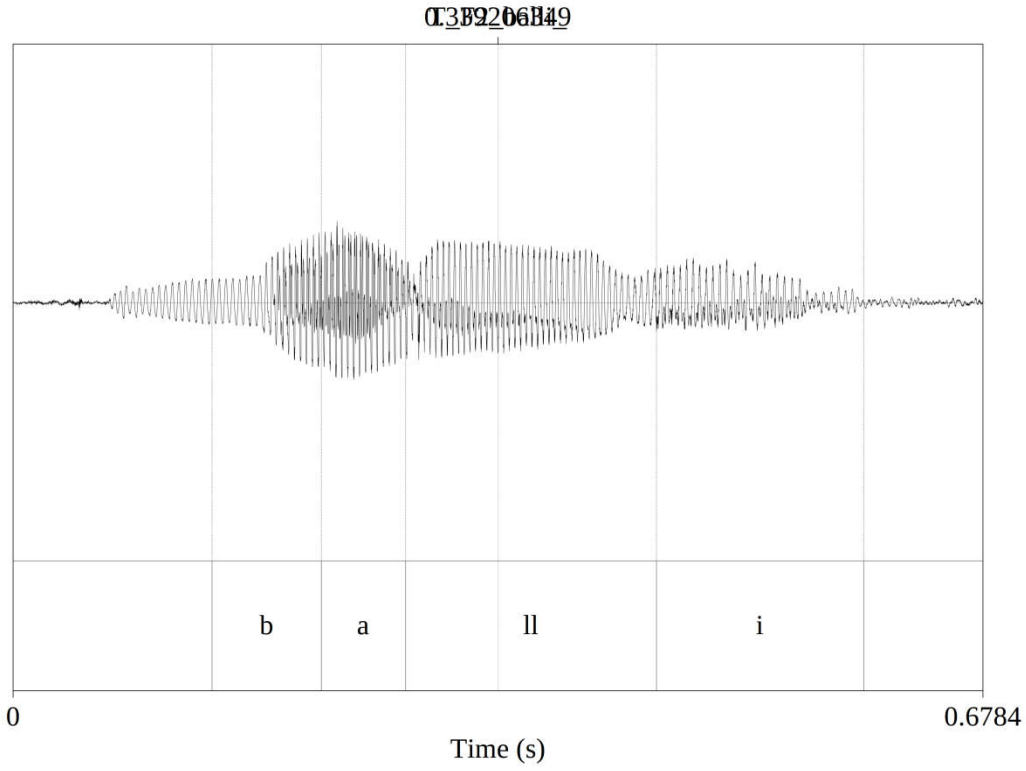
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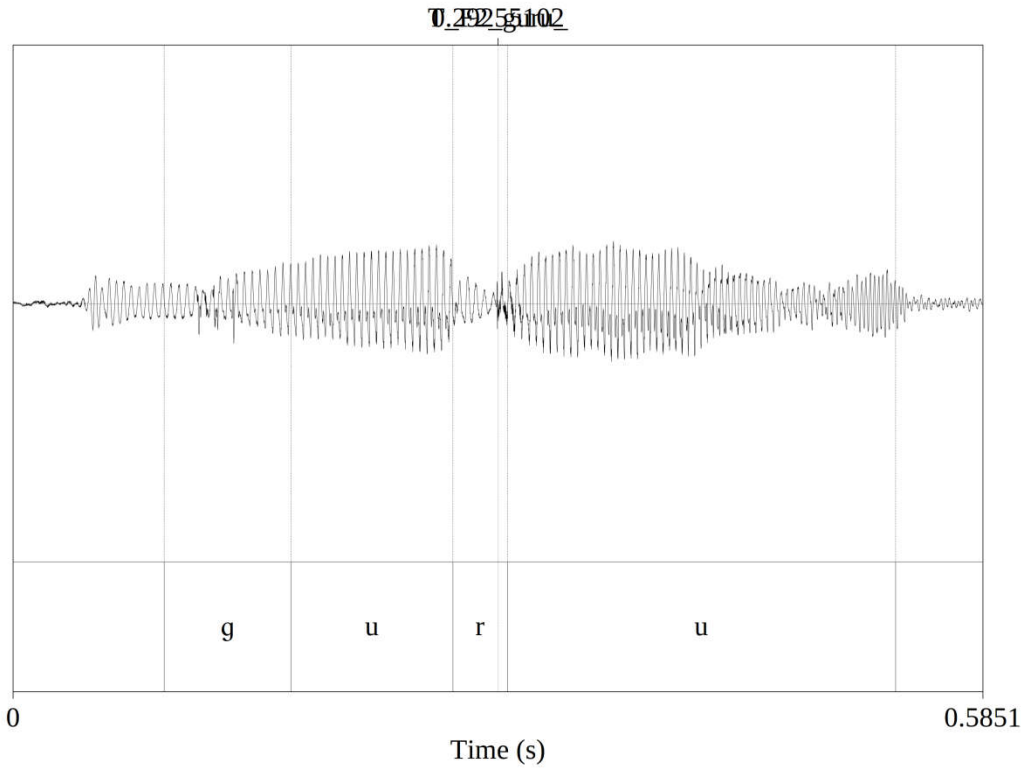
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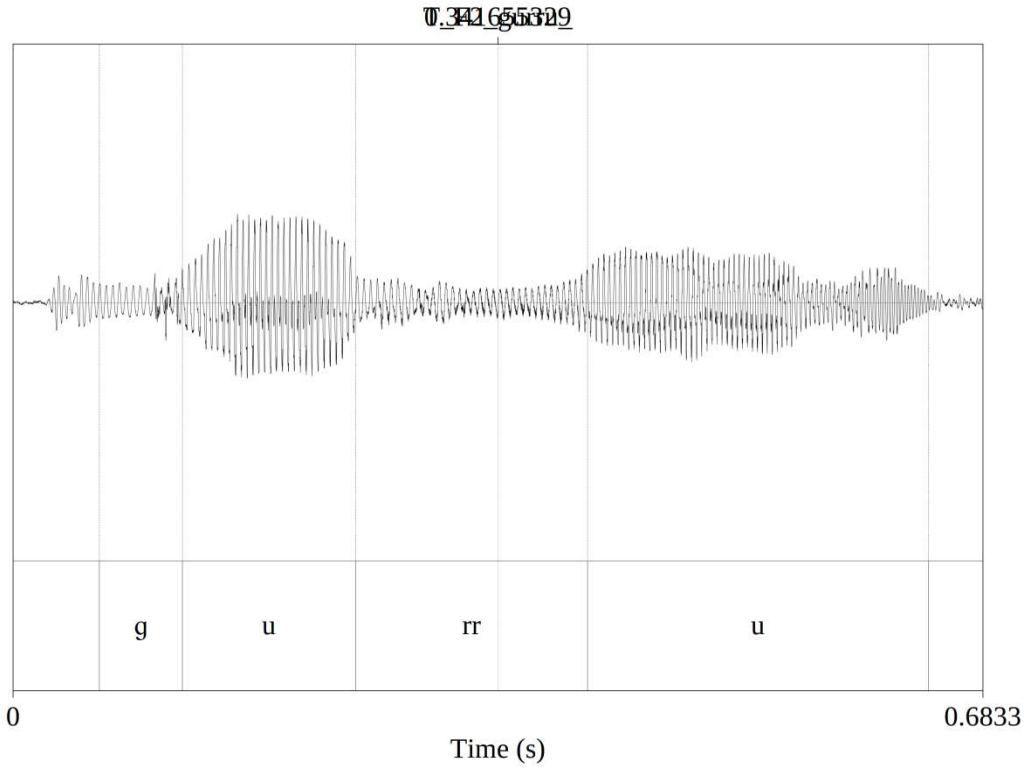
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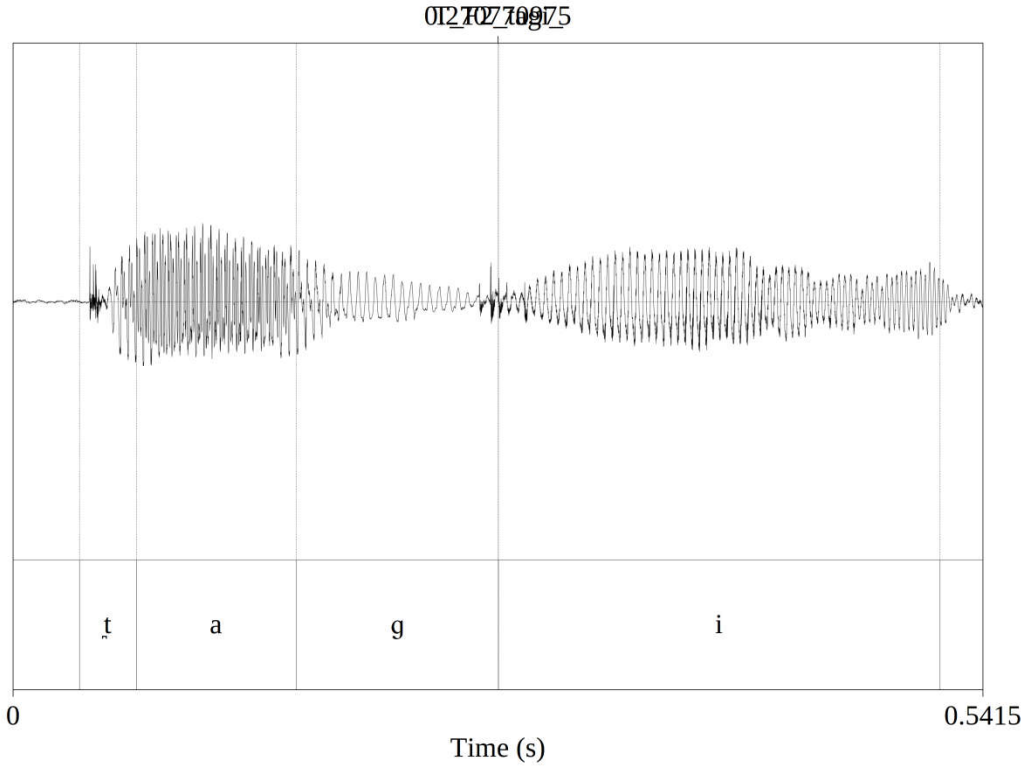
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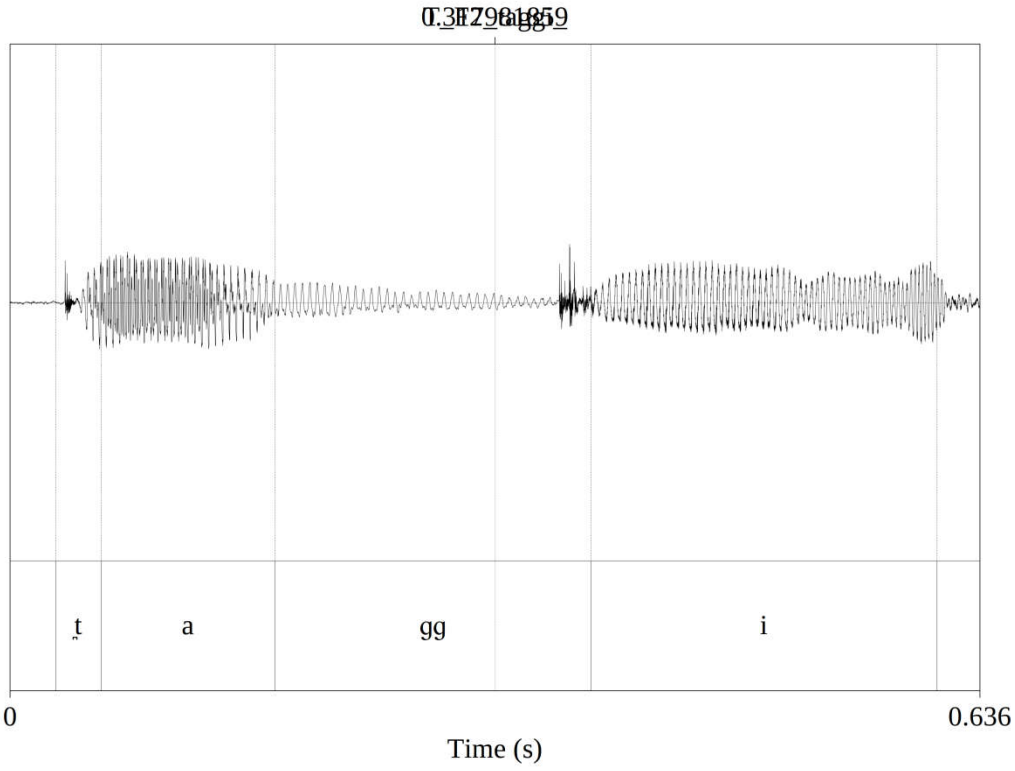
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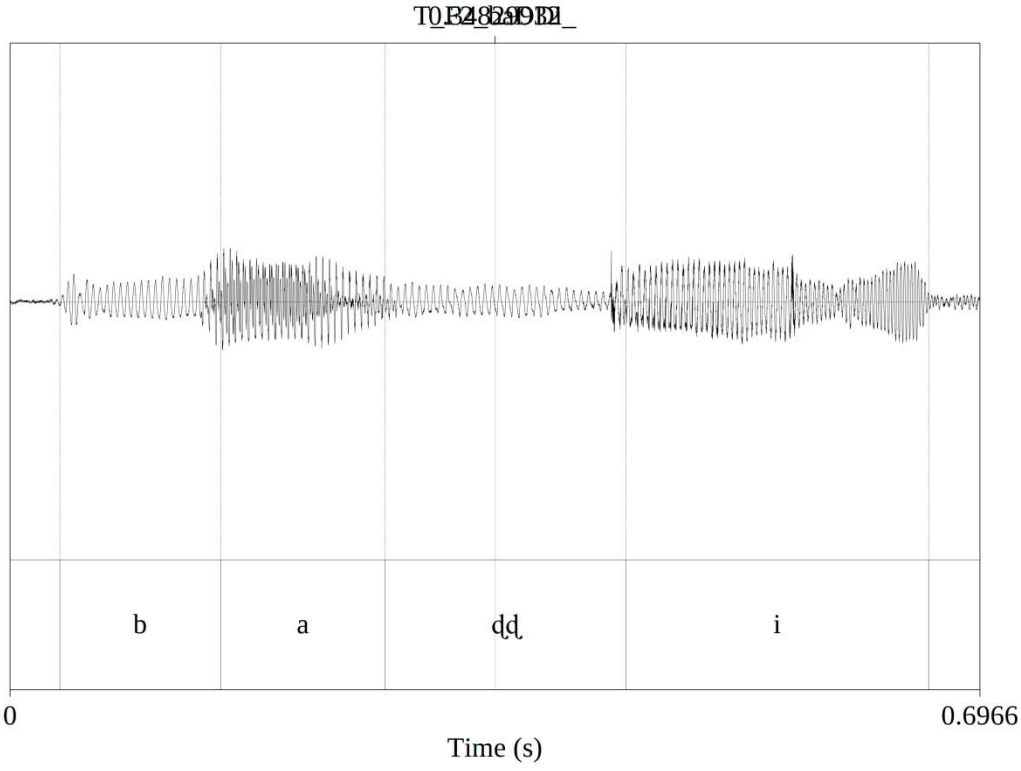
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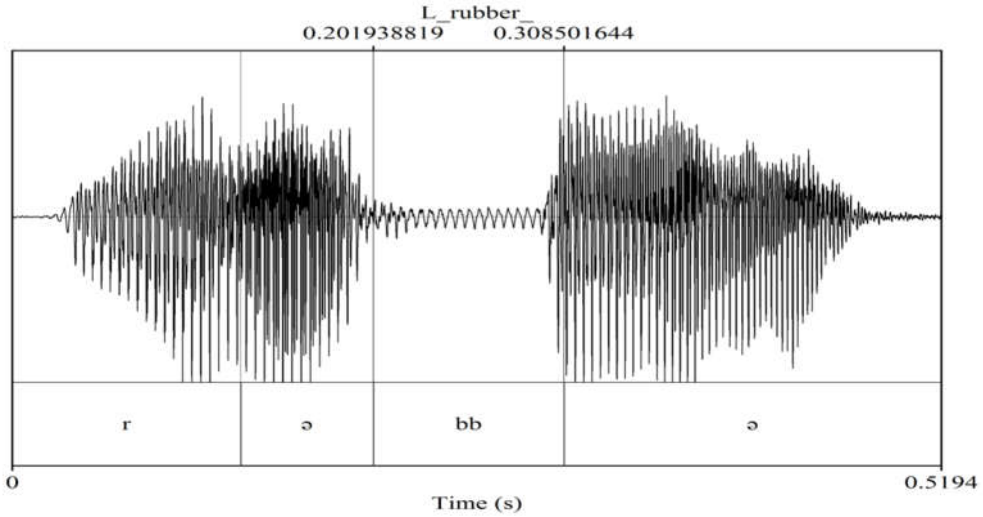
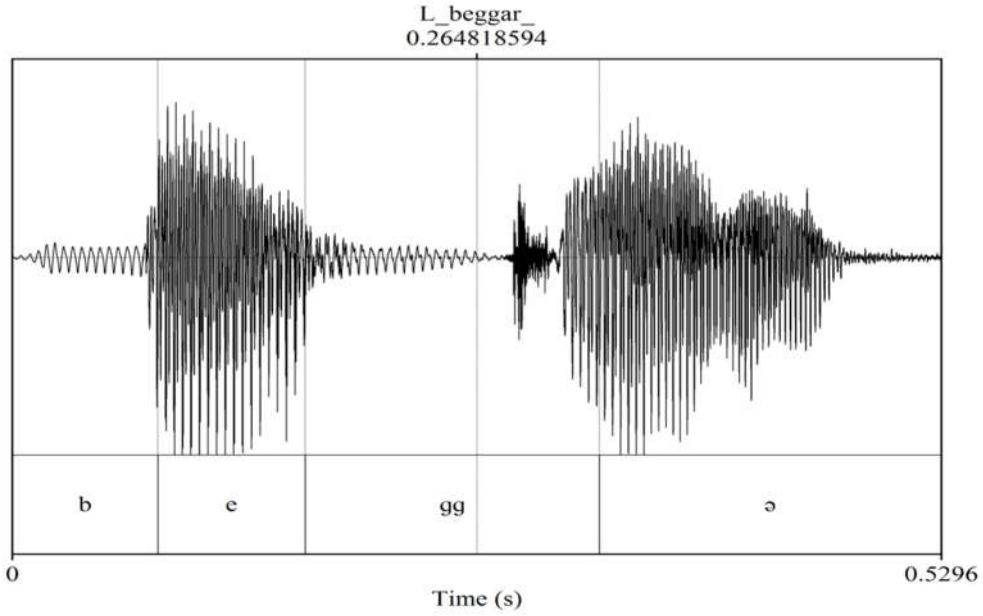
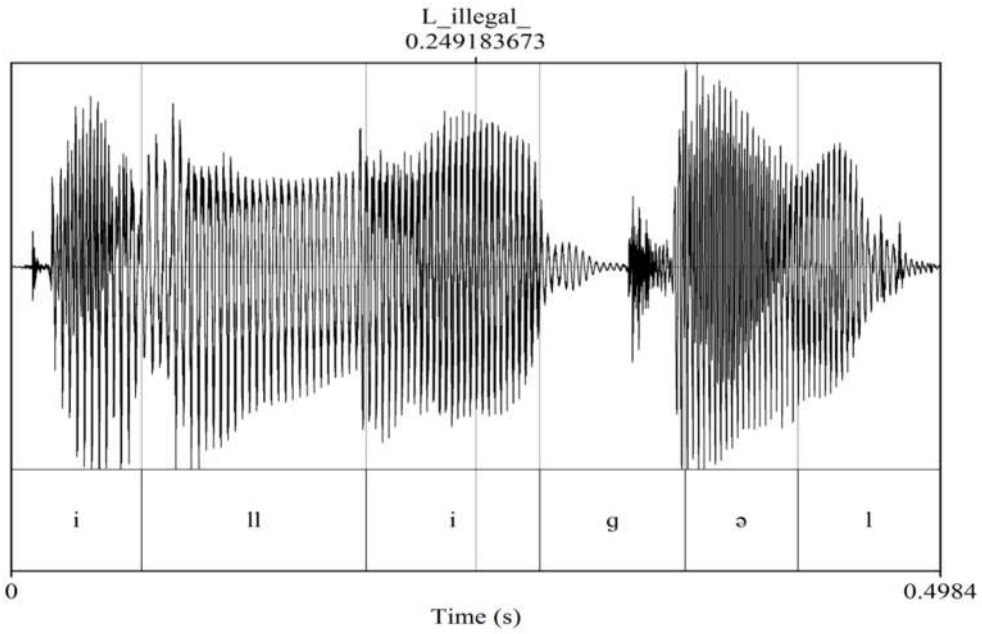
Spectogram or wave pictures of Telugu variety of English.



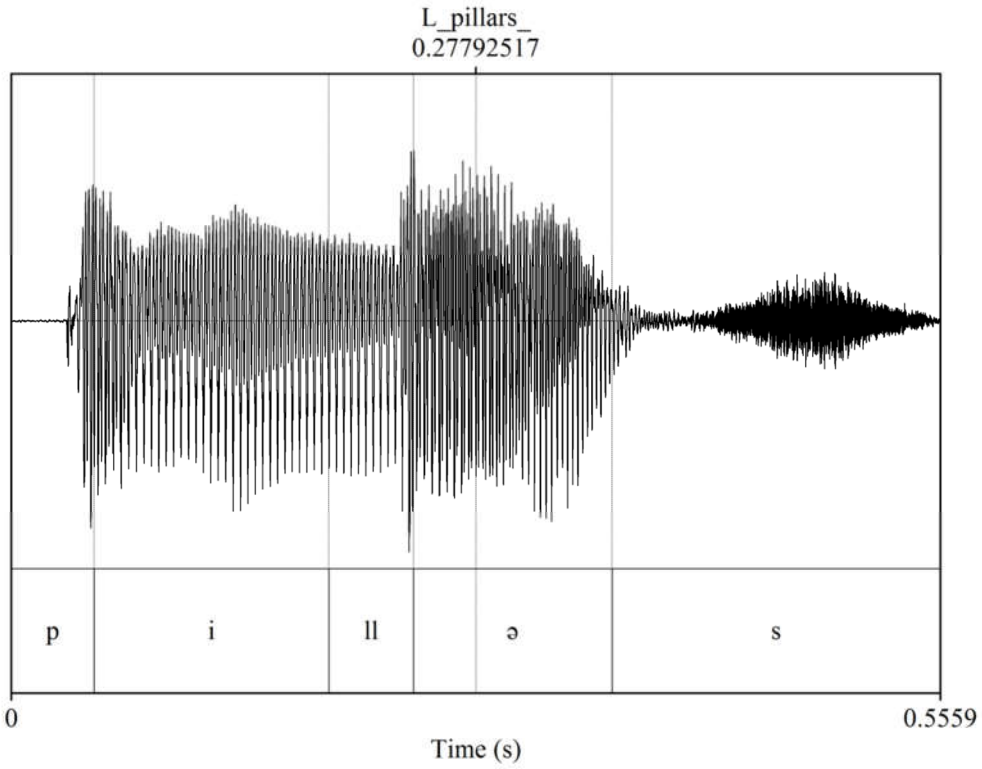
1. Diagram showing the waveform of voiced bilabial geminate plosive in the word /ˈrəb.bər/ in Telugu English.



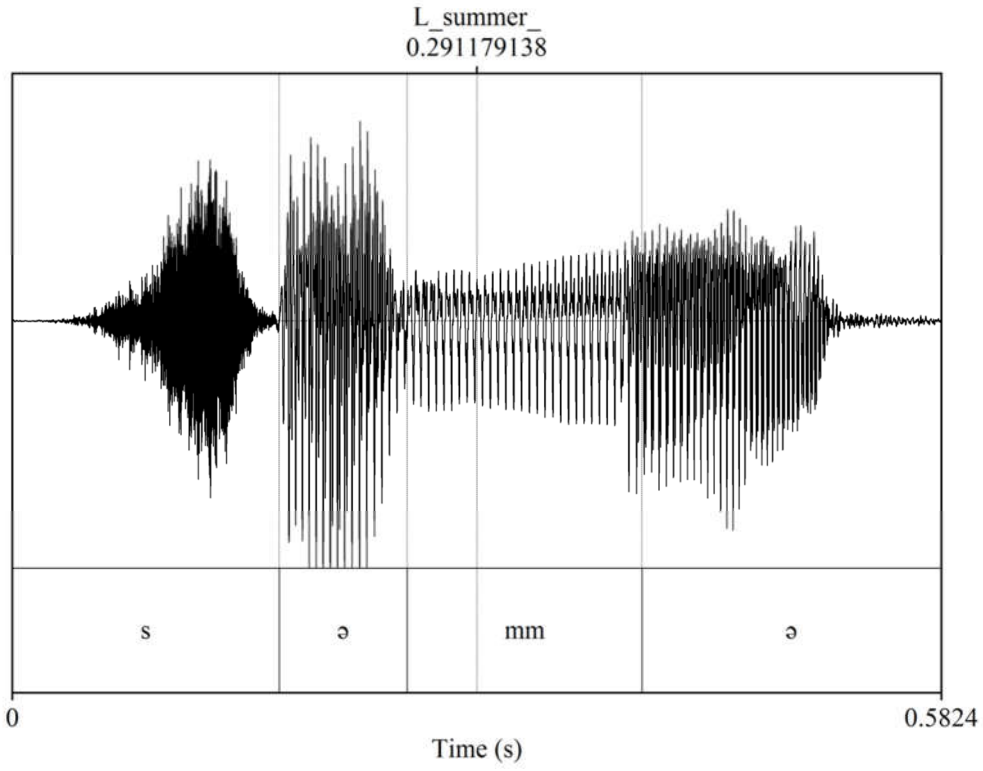
2. Diagram showing the waveform of voiced velar geminate plosive in the word /ˈbeg.gər/ in Telugu English.



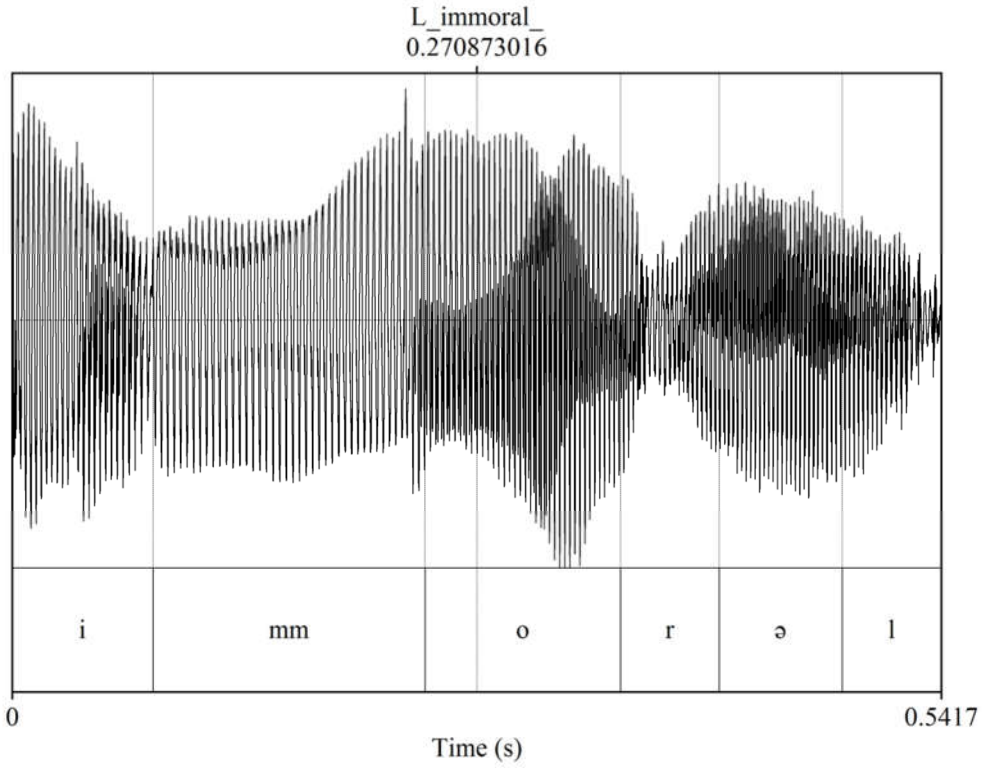
3. Diagram showing the waveform of voiced alveolargeminate lateral in the word /iˈlli.gəl/ in Telugu English.



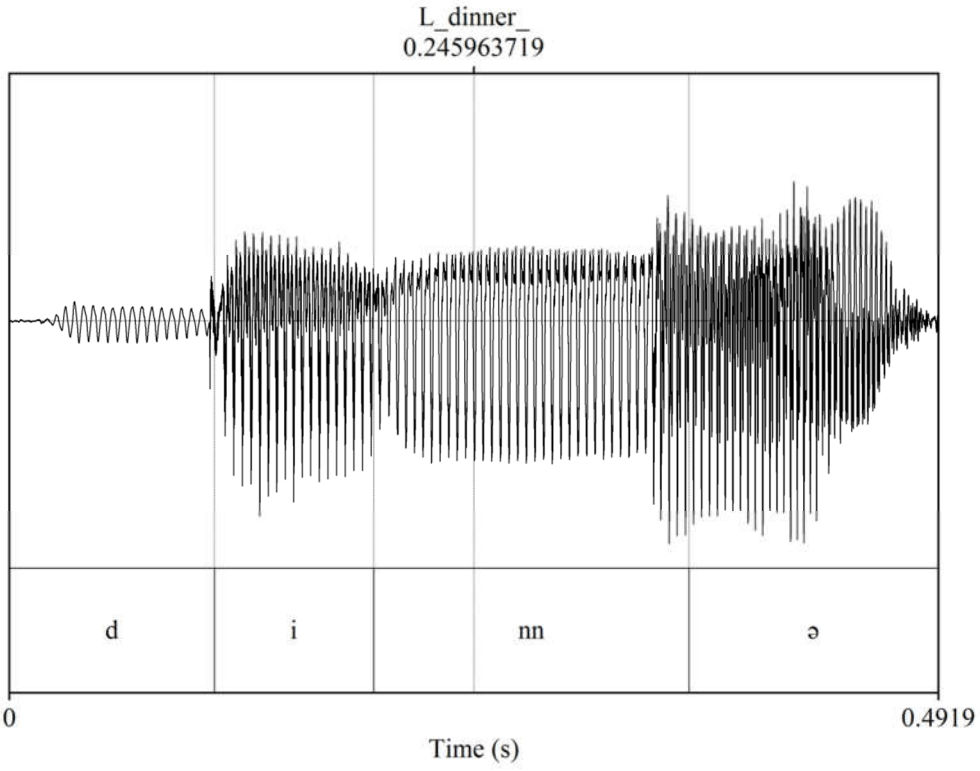
4. Diagram showing the waveform of voiced alveolar geminate lateral in the word /ˈpil.ləs/ in Telugu English.



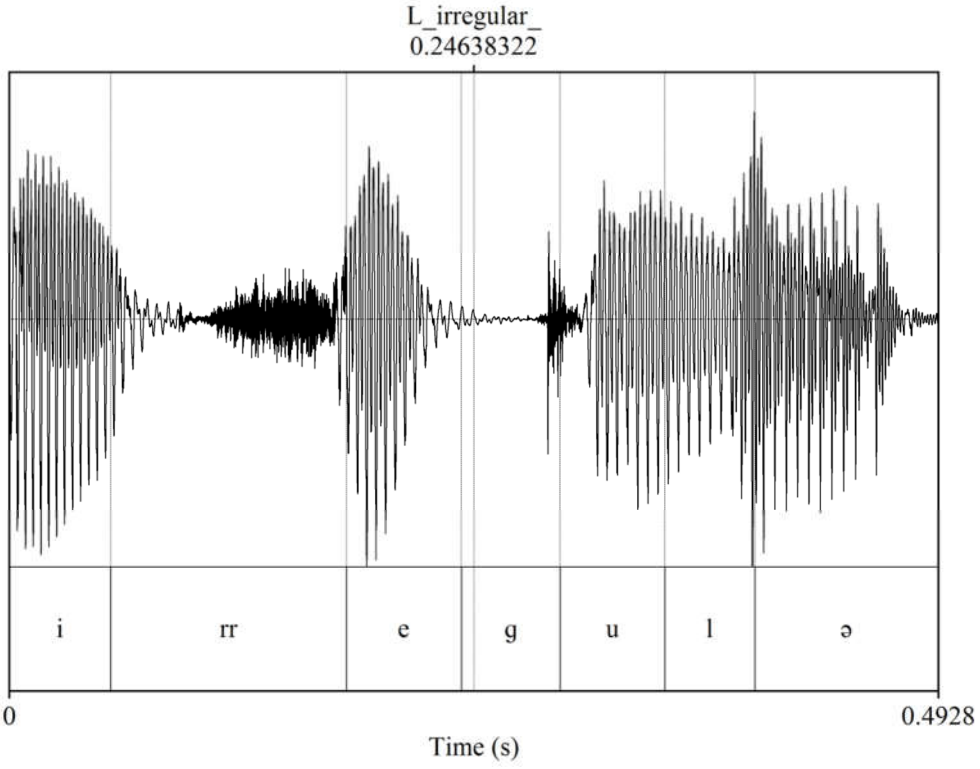
5. Diagram showing the waveform of voiced bilabial geminate nasal in the word /ˈsəm. mɑr/ in Telugu English.



6. Diagram showing the waveform of voiced bilabial geminate nasal in the word /iˈm.mor.əl/ in Telugu English.



7. Diagram showing the waveform of voiced alveolar geminate nasal in the word /ˈdin.nə/ in Telugu English.



8. Diagram showing the waveform of voiced alveolar geminate trill in the word /iˈr.regu.lɑr/in Telugu English.

Bibliography

Abbi, A. (1992). Reduplication in South Indian Languages: An Areal, Typological and Historical Study. New Delhi: *Allied Publishers Ltd.*

Abramson, A. S. (1986). The perception of word-initial consonant length: Pattani Malay. *Journal of the International Phonetic Association*, 16:8-16.

Abramson, A. S. (2003). Acoustic cues to word-initial stop length in Pattani Malay. *In proceedings of the XVth International Congress of Phonetic Sciences*, pages 387-390.

Amena, M. (1994). *A Contrastive Phonological Study of Urdu and English*. Hyderabad: M.Phil Dissertation, CIEFL.

Ansary, H. R. (2013). Patterns of Geminates and Gemination in Indian Languages. JNU M.Phil (unpublished) dissertation, New Delhi.

Bahri, U. S. (2001). Dogri: Phonology and Grammatical Sketch. *Bahri Publications, New Delhi.*

Bakovic, E. (2005). *Antigemination, assimilation and the determination of identity*. Phonology, 22, 279-315.

Balasubramaniam, T. (1981, reprint 1995). *A textbook of English phonetics for Indian students*. Macmillan.

Bansal, R. K. and Harrison, J. B. (1974). *Spoken English for India*. New Delhi: Orient Longman.

Bharati, S. (1988). *Some Aspects of the Phonology of Hindi and English*. Hyderabad: Doctoral Dissertation, CIEFL.

Bhatia, T. K. (1993). Punjabi: A scognitive-descriptive grammar. *London and New York*.

Biggs, B. (1978). The history of Polynesian phonology. In S. A.Wurmand Lois Carrington (eds.), *Proceedings of the Second International Conference on AustronesianLinguistics.* Pacific Linguistics C-61. Canberra: Australian National University. Fasc. 2: 691–716.

Blevins, J. (1995). The syllable in phonological theory. In J. A. Goldsmith, *The handbook of phonological theory* (pp. 206-244). Cambridge, Mass & Oxford:Blackwell.

Blevins, J. (2004). *Evolutionary Phonology: The emergence of sound patterns.* Cambridge: Cambridge University Press.

Blevins, J. (2008). Explaining diversity in geminate consonant inventories: An evolutionary approach. Lecture slides.

Bowden, J & Hajek J. (1999). Taba*. In Handbook of the International Phonetic Association: a guide to the use of the International Phonetic Alphabet*, 143-46. Cambridge: Cambridge University Press.

Cardona, G. (2007). The Indo-Aryan Languages. *London: Routledge*.

Blust. (1990). Three recurrent changes in Oceanic languages. *In J. H. C. S. Davidson (ed.), Pacific island languages: essays in honour of G. B. Milner, 7–28. London: University of London, School of Oriental and African Studies.*

Chang-Kook, S. (1996). *Variation as optimality in Marshallese word-initial geminates*. Proceeding from ESCOL 12: 308-317.

Chatterji, S. K. (1921). Bengali Phonetics. *Bulletin of the School of oriental Studies* , 1-25.

Chatterji, S. K. (1926/1971). *The Origin and Development of the Bengali Language.* London: George Allen and Unwin.

Chatterji, S. k. (1928). *A Bengali Phonetic Reader.* London: University of London Press

Grace E. Oh and Melissa A. Redford : *The production and representation of fake geminates inEnglish.* Oregon: University of Oregon.

Dan, M. (1992). *Some issues in metrical Phonology of Bangla: The indigenous research tradition.* Pune: PhD. Dissertation, Deccan College.

Dasgupta, P. (1982). Phonology and the Bangla Verb. *Indian Linguistics 43* , 17-28.

Davis, S. (2002). On the representation of initial geminates, 93-104. http://journals.cambridge.org/abstract_S0952675799003711

Davis, S. (2011). Geminates. In Marc van Oostendorp, Colin J. Ewen, E. H. and Rice, K., editors, *The Blackwell companion to Phonology.* Vol-2, pages 837-859. Willey Blackwell, Malden, MA and Oxford.

Denton, J. M. (1998). Phonetic perceptives on west germanic consonant gemination. *American Journal of Germanic Linguistics & Literatures, 201-35.Chicago University of Chicago.*

Dey, Pradip. (1979). On Rule ordering in Bengali Phonology. *Indian Linguistics*. Volume. 40, Number 1, Pages 23-34.

Dhongde, R. V. & Wali. K. (2009). Marathi. *Amsterdam/ Philadelphia: John Benjamins Publishing Company.*

Dhillon, B. (1995). *Prominence in Punjabi and Punjabi English*. Hyderabad: M.Phil Dissertation, CIEFL.

Eliezer, J. (1984). *Some Aspects of the Autosegmental Phonology of English and Punjabi*. Hyderabad: M.Lit Dissertation, CIEFL.

Ferguson, C.A. and Chawdhury, M. (1960). The Phonemes of Bengali. *Language*, 36:22-59.

Ghose, T. (1996). *Some Aspects of Vowel Phonology in Bangla and Bangla English*. Hyderabad: M.Phil Dissertation, CIEFL.

Gill, H. S & Gleason, H. A. (1969). A Reference Grammar of Punjabi. *Patiala: Punjab University.*

Gordon, M. (1999). *Syllable wieght: phonetics, phonology and typology*. Los Angels: PhD Dissertation, UCLA.

Gordon, M. (2002). A phonetically-driven account of syllable weight. *Language* 78: 51-80.

Gupta, B. R. (1990). Indian Linguistics: Punjabi Tamil Phonology. New Delhi: *Arina Publishing House.*

Ham, W. (2001). Phonetic and Phonological Aspects of Geminate Timing. New York, Routledge.

Hankamer, Jorge., Lahiri, Aditi and Korenan, Jacques. (1989). Perception of consonant length: Voiceless stops in Turkish and Bengali. Journal of Phonetics. 17.

Haruo Kubozono (2017). The Phonetics and Phonology of Geminates Consonants. Oxford University Press.

Hayes, B. R. (2004). *Phonetically based phonology.* Cambridge: Cambridge University Press.

Hayes, B., Kirchner, R., & Steriade, D. (2004). *Phonetically based phonology.* Cambridge: Cambridge University Press.

Hayes, B., & Lahiri, A. (1991). Bengali intonational phonology. *Natural Language and Linguistic Review 9* , 47-96.

Hayes, B. (1986). *Inalterability in CV Phonology, 321-351*. Linguistic Society of America.

Hume, E., Muller, J & Engelenhoven A. (1997). Non-Moraic Geminates in Leti, 371-402.

Cambridge: Cambridge University Press.

Hyman. (1999). *Lenition and fortition in Bantu*. Paper presented at the Round Table on Lenition and Fortition, Nice.

Ito, J & Mester Armin (2009). Consonant gemination in Japanese loanword phonology. https://www.researchgate.net/publication/229043192_Consonant_gemination_in_Japanese_loanword_phonology?

Jayaprakash, D. (2005). *A Comparative Study of Plosives and Nasals in Telugu and English*. Hyderabad: M.Phil Dissertation, CIEFL.

Jose, P.V. (1991). *English Spoken by Malayalam Speakers- A Phonological Study with Reference to Source and Target Languages*. Hyderabad: Doctoral Dissertation, CIEFL.

Kachru, Y. (1998). Hindi. *John Benjamins Publishing Company Amsterdam/Philadelphia.*

Kapoor, K. (1992), teaching English as 'Second Language' in India. In O.N. Koul (Ed). English in India Theoretical and Applied Issues (p.70) New Delhi: Creative.

Kar, S. (2008). *Gemination in Bangla : An Optimality Theoretic Analysis*. Mysore: CIIL.

Kar, S. (2009). *The syllable structure of Bangla in Optimality Theory and its application to the analysis of verbal inflectional paradigms in Distributed Morphology*. Tubingen: PhD dissertation, University of Tubingen.

Kato, Hiroaki, Minoru Tsuzaki, and Yoshinori Sagisaka (1997). Acceptability for temporal modification of consecutive segments in isolated words. Journal of the Acoustical Society of America 101:2311-22.

Katre, S. M. (1966). Formation of Konkani. Poona: Deccan College.

Keer, E. W. (1999). Geminates, The OCP and The nature of Con. *New Brunswick, New Jerse.*

Kelkar, A. R. (1958). *The Phonology and Morphology of Marathi*. University Microfilms, Inc., Ann Arbor, Michigan.

Kenstowicz, M and C. Pyle. (1973). *On the Phonological Integrity of Geminate Clusters*. In M. kenstowicz and C. kisseberth, (Eds.), *Issues in Phonological theory*, Mouton: The Hague.

Kenstowicz, M. (1982). Gemination and Spirantization in tigrinya. *Studies in the Linguistic Science* 12: 103-22.

Khaled M, Zuraiq W.M & Abdel-Ghafer. (2011). Geminates and Long Consonants in Jordanian Arabic. *International Jouranla of Linguistics ISSN 1948-5425. Vol. 3, No. 1: E14.*

Kim, S. (2002). *Aspirates in Korean: Perspectives on Coalescence, CL, and Gemination*. Columbia: M.A. Dissertation, University of British Columbia.

Kiparsky, P. (1973). Phonological representations. In O. Fujimura, *Three dimensions of Linguistic Theory.* Tokyo: TEC.

Kiparsky, P. (1982). Lexical morphology and Phonology. In I. Yang, *Linguistics in the morning calm* (pp. 3-91). Seoul: Hanshin.

Kiparsky, P. (1985). Some Consequenses of Lexical Phonology. *Phonology 2* , 85- 138.

Kirchner, R. (2000). Geminate inalterability and lenition. *Language* 76: 509-45.

Klaiman, M. H. (1987). Bengali. Comrie, B. (ed.), *The world's major languages*. London/Sydney: Croom Helm. 490-513.

Kraehenmann, A. (2001). Swiss German stops: geminates all over the word, 109-145: http://journals.cambridge.org/abstract_S0952675701004031

Krishnamurti, Bh. (1998). Telugu. Steever, S. B. (ed), *The Dravidian Languages*. London and New York: Routledge. 202-240.

Krishnamurti, Bh. (2005). Dravidian Languages. Cambridge: *Cambridge, C U P.*

Ladefoged, P. (2001, 2005). *Vowels and Consonants: An Introduction to the Sounds of Languages.* Oxford: Blackwell.

Lahiri, A., & Hankamer, J. (1988). *The timing of geminate consonants*. Journal of Phonetics, 16, 327-338.

Lahiri, A. (2000). Hierarchical structuring in the creation of Verbal morphology in Bengali and German. In A. Lahiri, *Analogy, Levelling, Markedness: Principles of change in Phonology and Morphology*. Berlin, New York.

LaVoie, Lisa M. (2001). Consonant strength: phonological patterns and phonetic manifestations. New York and London: Garland.

Lisker, Leigh (1958) The Tamil occlusives: short vs. long or voiced vs. voiceless? Indian Linguistics, Turner Jubilee Volume I : 294–301.

Lloret, M.-R. (1997). Oromo phonology. In Kaye, A. S., editor, *Phonologies of Asia and Africa*, pages 493–519. Eisenbrauns, Winona Lake, Indiana.

Lukaszewicz, B. (2007). Polish:deletion, coalescence, metathesis and gemination. 55-82: http://journals.cambridge.org/abstract_S0305000906007707

Mahboob, F. (2010). *Phonology of the Grammatical Categories of Urdu and English*. Hyderabad: M.Phil Dissertation, EFLU.

Majeed, H. Z. (2002). Gemination in Swedish and Arabic with a particular reference to the

preceding vowel duration. An Instrumental and comparative approach*. Journal: Proceedings of Fonetik, TMH-QPSR, Vol. 44. 81-84. http://www.speech.kth.se/qpsr.*

Masica, C.P. (1989). The Indo-Aryan Languages. *Cambridge: University Press,Cambridge.*

McGregor, W. (1990). Functional Grammar of Goonyandi. Amsterdam: *John Benjamins.*

McCarthy, J. J. (1986). *OCP Effects:Gemination and antigemination*. Linguistic Inquiry, 17,

207-263.

Mehrotra R. C. (1980). Hindi Phonology. *Raipur: bhashika Prakashan*.

Miller, A. (1987). *Phonetic characteristics of Levantine Arabic geminates with differing morphemeand syllable structures*. Ohio State Papers from the Linguistics Laboratory, 36, 120-140.

Milner, G. B. (1958). Aspiration in two Polynesian languages. *Bulletin of the School of Oriental and African Studies* 21: 368–75

Mitra, M. (2002). *Prosodic typology and vowel length distinction in Bangla and Bangla English.* Hyderabad: M.Phil dissertation, CIEFL.

Muller, J. (2001). *The phonology and phonetics of word-initial geminates*. Ph.D. dissertation, Ohio State University.

Nagarjan H. (1989). *A Theory of Post-Syntactic Phonology*. Hyderabad: Doctoral Dissertation, CIEFL.

Nagarjan H. (1985). *Some Aspects Features of Tamilian English.* Hyderabad: M.Lit Dissertation, CIEFL.

Nayaki M. T. (2001). Phonological Rules Sensitive to Syntax in Tamil and English. Hyderabad: M.Phil Dissertation, CIEFL.

Obrecht, D. H. (1965) *Three experiments in the perception of geminate consonants in Arabic*. Language and Speech, 8, 31-41

Odden, D. (1988). Antigemination and the OCP, pp-451-475. MIT Press.

Ohala, J. J. (1981). The listener as a source of sound change. Chicago: *Chicago Linguistic Society 17.2* , 178-203.

Ohala, J. J. (1983). the origin of sound pattern in vocal tract constraints. In MacNeilage, P.F., editor, *The production of Speech*, pages 189-216. Springer, New York.

Ohala, J. J. (1990). the phonetics and phonology aspect of assimilation. In Kingston, J. and Beckman, M., editors, *Papers in Laboratory Phonology I: Between the Grammar and Physics of Speech*, pages 258-275. Cambridge University Press, Cambridge.

Ohala, J. J. (1993). Sound change as nature's speech perception experiment. California: *University of California.*

Ohala, M & Ohala J. J. (1998). Correlation between consonantal VC Transitions and degree of perceptual confusion of place contrast in Hindi. ISCA Archives: http://www.isca-speech.org/archive.

Ohala, M. (2007). *Experimental Methods in the Study of Hindi Geminate Consonants*. Oxford: Oxford University Press.

Pajak, B. (2009a). Context-dependent perception of geminates. Poster presented at the 83rd Annual Meeting of the Linguistic Society of America, San Francisco.

Pajak, B. (2009b). Contextual constraints on geminates: the case of Polish. In *Proceedings of BLS*, volume 35, pages 343–356.

Pajak, B. (2012). Non-intervocalic geminates: Typology, acoustics, perceptibility. To appear in San Diego Linguistics Papers.

Pandey, A. C. (1979). Some Aspects of Hindi Phonology. Kanpur: IIT.

Pandey, P. K. (1990). *Hindi Schwa Deletion*. Lingua, 48: 277-311.

Pandey, P. K. (2005) Second language varieties have a life of their own. [Invited paper for Festschrift volume entitled *Essays on Adegbija* edited by Demola Jolayemi (2005, unpublished)]. http://www.academia.edu/4776266/Second Language Varieties Have a Life of Their Own Hindi English.

Pandey, P. K. (2014). Sounds and their patterns in Indic languages. (Vol-I & II*). Cmbridge University Press India Pvt. Ltd.*

Pandharipande, R. V. (1997). Marathi. London and New York. *Routledge Publisher*.

Payne, E. M. (2005). Phonetic variation in Italian consonant gemination*. JIPA. Vol. 35. pp-153-181. http://journals.cambridge.org/abstract_S0025100305002240*

Pitchai, J. A. (1985). *English Spoken in Tamil Nadu- A Phonological Study with Reference to Source and Target Language*. Hyderabad: Doctoral Dissertation, CIEFL.

Podesva, Robert. (2000). Constraints on geminates in Buginese and Selayarese*. West Coast Conference on Formal Linguistics* 19: 343-56.

Podesva, Robert. (2002). Segmental constraints on geminates and their implications for typology. Talk presented at SLA Annual Meeting, San Francisco, January.

Prakash, K. (1992). *English Spoken in South India- A Study of Certain features of Conversation*. Hyderabad: Doctoral Dissertation, CIEFL.

Puglielli, A. (1997). Somali phonology. In Kaye, A. S., editor, Phonologies of Asia and Africa, pages 521–535. Eisenbrauns, Winona Lake, Indiana.

Pycha, A. (2010). *A Test case for the phonetics-phonology interface: gemination restrictions in Hungarian, 119-152*. http://journals.cambridge.org/abstract_S0952675710000059

Rahman, T. (1982). *Sound-Segment and Word-Stress in English Spoken by a Group of Speakers at Raipur, Madhya Pradesh*. Hyderabad: M.Lit, CIEFL.

Rajaram, S. (1972). Tamil Phonetic Reader. Mysore: *CIIL*.

Rao, C. R. (1987). *A generative approach to Telugu phonology*. M.Phil. dissertation. Hyderabad; Osmania University.

Raymond, M & Parker S. (2005). Initial and medial geminate trills in Arop-Lokep, 99-111: http://journals.cambridge.org/abstract_S002510030500188X

Reddy, B. R , Joy & Upadhyaya P.S. (1974). *Kuvi Phonetic Reader*. Mysore: CIIL.

Ridouane, R. (2007). *Gemination in Tashlhiyt Berber: an acoustic and articulatory study, 199-142*: http://journals.cambridge.org/abstract_S0025100307002903

Ridouane, R. (2010). *Geminates at the junction of phonetics and phonology*. In C. Fougeron, B. Kühnert, & E. Delais-Roussarie (Eds.), In Papers in Laboratory Phonology X: Details, change and representation.

Sailaja, P. (2009). Indian English. Edinburgh: *Edinburgh University Press*.

Sanyal, P. (2010). *Prosodic well-formedness and Vowel Licensing in Bangla*. Hyderabad: PhD Thesis, EFLU.

Sarkar, R. (2004). *The Phonetics of Bangla*. Hyderabad: M.Phil Dissertation, CIEFL.

Sastry, J. V. (1972).Telugu Phonetic Reader. *Mysore, CIIL.*

Schein, B. and Steriade, D. (1986). On Geminates. *Linguistic Inquiry* 17, pp. 691-744.

Schuh, R. G. (2005). Degemination, Compensatory lengthening, and Gemination in Gudi Ngamo. *UCLA Working Papers in Linguistics, no. 11, Papers in Phonology 6, Heinz, MArtin & Pertsova (eds.).*

Sharafi, S.Hameeduddin (1986). A History of Urdu Language, An article published is Siasat daily news paper, Hyderabad.

Sharfuddin. M (2010). Urdu English spoken in Andhra Pradesh: A Phonetic study of voice quality and tempo. Hyderbada, M.Phil Dissertation, EFLU, Hyderabad.

Steever, S. B. (1998). *The Dravidian Languages*. London and New York.

Subrahmanyam, P.S. (1974*). An introduction to modern Telugu*. Annamalainagar: Annamalai University.

Takeuchi, M. *The Perception of Geminate Stops by L1 English learners of Japanese*. Indiana Univeristy.

Thoudam, P.C. (1980). A Grammatical Sketch of Meiteilon. New Delhi: PhD Dissertation, JNU.

Thurgood, G. (1993). Geminates: a cross-linguistic examination. *In Papers in honour of Frederick H. Brengelman. Nevis, McMenamin, and Thurgood, eds. Department of Linguistics. California: California State University*.

Thurgood & Demenko. (2001). *Phonetic realizations of Polish Geminate Affricates.* California: California State University.

Topintz, N (2008). *On the existence of moraic onset geminates*.

Tranel, B. (1991). CVC *Light Syllables, Geminates and Moraic Theory, 291-302*. Cambridge: Cambridge University Press.

Trask, R.K. (1996). A Dictionary of Phonetics and Phonology. *London and New York.*

Tryon, D. T. (1970). An introduction to Maranungku. In *Pacific Linguistics* B15. Australian National University, Canberra.

Upadhyaya, U. P. (1972). Kannada Phonetic Reader. Mysore: *CIIL*.

Yadav, R. (1996). A reference grammar of Maithili. *Mouton De Gruyter*.

Zvelebil, K. (1970). Comparative Dravidian Phonology. *Paris: Mouton.*

END NOTES

[i]The same explanation accounts for sound changes like Sindhi *b: > ɓ, since the secondary larynx lowering associated with sustained voicing in *b: may be reinterpreted as a distinctive feature of this sound (Ohala 1983, 1984).

[ii] Podesva (2000, 2002) suggests just this, proposing a constraint, *SS, which prohibits voiceless geminate obstruents.

[iii] Hatam, a language of Iranian Jaya, also has word-initial geminate/singleton contrasts for nasal and oral stops and shows stronger bursts as well as higher F0 at release for some geminates (Reesink 1999: 13-15).

[iv] Estonian data are from Campbell (1998: 53–56)

[v] Podesva (2000, 2002) suggests just this, proposing a constraint, *SS, which prohibits voiceless geminate obstruents.

[vi] /s/ can be geminated in some dialects of Bangala.

[vii] Bh. Krishnamurthi, Telegu, Verbal Bases. Berkeley and Los Angles : University of California Press, 1961.
[viii] Kapoor, K. (1992), teaching English as 'Second Language' in India. In O.N. Koul (Ed). English in India Theoretical and Applied Issues (p.70) New Delhi: Creative.

[ix] In Telugu double consonants are always geminated, e.g. [amma] (=mother), [anna] (=elder brother) and so on.

[x] Sandhi refers to the phonological modification of grammatical forms which have been juxtaposed. The term comes from a Sanskrit word meaning 'joining'