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A Study on Language Computations by preserving them as audio Documents

A. Das[1*], B. Choudhury[2]

[1]Department of Computer Science & Information Technology, Cotton University, Assam, India
[2]Department of Sanskrit, Visva Bharati University, West Bengal, India

[*]*Corresponding Author: anupam.cotton@gmail.com, Tel.: +9435216070*

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***Abstract*—** In this article, we made a study about the various aspects of the computing techniques such as acoustic, phonetics, phonetic-structures, language computation on linguistic perspective and so on. The study confines with the dimensions of the population ratio of languages, some phonetic structures of languages, acoustic devices and their specifications. It is important to study the languages as the spoken langauges are being lost at some rates and it is our resposibility to give stress on this topic so that human culture can be preserved and as well as the language.

***Keywords*—**Acoustic, phonetics, phonetic-structures, language-computation, linguistic

I. INTRODUCTION

Languages spoken by human beings are being lost at rates exceeding the global loss of biodiversity. With the disappearance of a language we lose unique dimensions of culture and as well as the human history and the evolution of linguistic diversity that was provided by the language. Language or "Bhasha" is the heart of a culture and the communicating tool to bring people together and link with their identity to unify as group. Language is nothing but sounds that follow a morphology to form a language. These sounds can preserve their lives as long as the language spoken of that particular group is in the society.

In records, there are about 7,000 languages in the world today, but there will probably be only 3,000 or so in 100 years time. Most languages are spoken by comparatively few speakers. Over half the 7,000 languages are spoken by less than 10,000 speakers, and more than a quarter of them by less than 1,000 speakers. These are too small numbers to ensure survival. The big languages that will swallow them up are really big – over 48% of the world's population are first language speakers of one of the world's top 10 most spoken languages: Standard Chinese, English, Spanish, Bengali, Hindi, Portuguese, Russian, Arabic, Japanese, and German. The most alarming situation of the language extinguishing is that out of 10000 languages before 100 years already 3000 languages are extinguished as it is forgotten by people, and now out of 7000 languages 3500 languages are spoken by a little group of people consisting of around 10000 and around 2100 languages are spoken by a mere 1000 people. So the rate of extinguishing the languages are really alarming in the sense that these languages are no longer give any evidence to their existence.

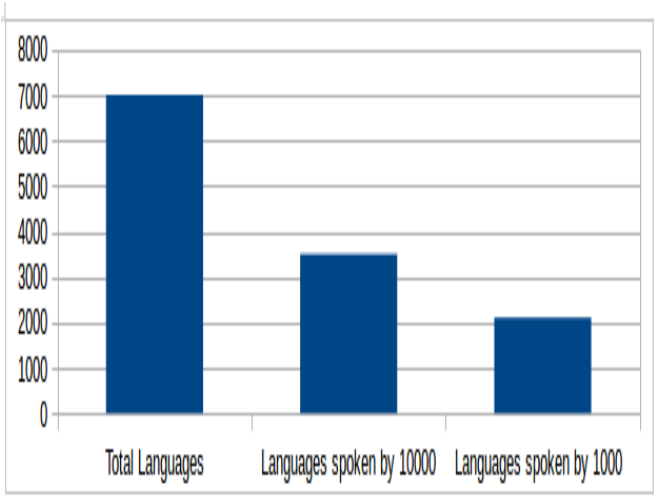


Fig.1

The following table shows the distribution of world population spoken top 30 languages in the world [source: world languages and cultures]

Table 1

Sl No	Language	Native in million	2nd in Million	Total
1	Chinese	873	178	1051
2	Hindi	370	120	490
3	Spanish	350	70	420
4	English	340	170	510
5	Arabic	206	24	230
6	Poetugese	203	10	213
7	Bengali	196	19	215
8	Russian	145	110	255
9	Japanese	126	1	127
10	German	101	128	229
11	Panjabi	60	28	88
12	Javanese	76	0	76
13	Korean	71	0	71
14	Vietnamese	70	16	86
15	Telegu	70	5	75
16	Marathi	68	3	71
17	Tamil	68	9	77
18	French	67	63	130
19	Urdu	61	43	104
20	Italian	61	0	61
21	Turkish	60	15	75
22	Persian	54	0	54
23	Gujrati	46	0	46
24	Polish	46	0	46
25	Ukranian	39	0	39
26	Malayalam	37	0	37
27	Kannada	35	9	44
28	Oriya	32	0	32
29	Burmese	32	10	42
30	Thai	20	40	60

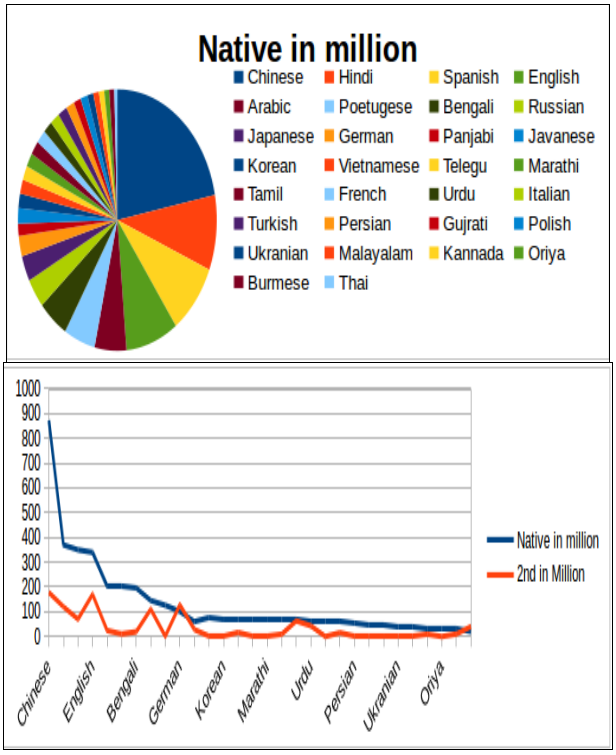


Fig.2

Languages spoken by human beings die because their children no longer speak their mother's tongue. Obvious reason is that their mothers don't speak their spoken languages to them. The disappearance of a language is a loss of a resource for the scientific study of human speech communication. The idea to have a possible human langauges is characterized through the concepts of marked or unmarked spoken languages. To get the actual form of such languages, the study of phoentic structure is a must. In linguistic, recording different languages and study them and then comparing them with their phonetic structures give the actual formats of the languages. During this, the phonological study is also important to have actual frameworks to get the diffrences among these languages.

II. METHODOLOGY

The phonetic srtuctures of a language can defined only when the consonnets and vowels are recorded in any language. As consonents and vowels are required to form words, therefore they are defined as the smallest entities in langauges. In common parlance, the initial task in explaining the phonetic structures of language is to have the comparative characteristics of phonemes which are very minimum in similarity. It will be good quality input for exemplifying the phonetic structrures from the words which are used regaularly in common with no artificaility. In realilty, the parsed strutures of any language does not give perfect phnoetic structures as people often utter sentences in different forms without bothering on grammars. The task is difficult but not impossible.

2.1 RECORDING

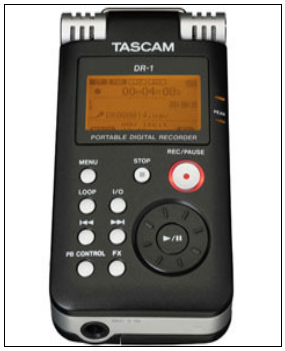
Recording is the main component for getting data for phonetic structure of any language. The DAT (Digital Audio Tape) is one of the formats of recording file. Earlier recording files were stored in some other forms like analog tape or cassette recorders, but dat, mp3, mp4 etc are the current form of audio files which are easy for computing. One more benefit of DAT format or current formats like mp3, mp4 etc is that the replica and storage are very easy and 100% quality assuarance guaranteed. There are so many mechanical ways to record voices and get the best form of audio file.

2.2: TECHNIQUES FOR RECORDING:

Accoustic analysis based on the recording files. There are some techniques by which accoustic analysis can be done for audio file recorded for language computing. The following are some devices and their specifications are given:

2.2.1. Olympus WS-300 series dictation recorder: Recording Format: WMA (Windows Media Audio): Memory: Built-in 512 MB flash memory, Recording Time: Stereo Extra High Quality (ST XQ) 8h, 50min , PC Interface: USB Direct 2.0 high speed, Sampling Frequency: 44.1kHz, Frequency Response: ST XQ 50-19,000Hz, Microphone Jack: Mini 1/8″ stereo jack, Earphone Jack: Mini 1/8″ stereo jack, Power Supply: One AAA battery, Battery Life: Approx. 21 hours, Size: 3.7″L x 1.5″W x 0.4″D, Weight: 1.7 oz, OS Supported: Microsoft Windows

2.2.2 Samson Zoom H1: Recording Format: WAV, MP3, Memory: Micro SD or SDHC, Recording Time: 4 hours at 44.1kHz with 4gb card, PC Interface: USB Direct 2.0 high speed, Sampling Frequency: 96kHz/48kHz/44.1kHz at 16-bit or 24-bit, Microphone Jack: Mini 1/8″ stereo jack, plugin power, Earphone Jack: Mini 1/8″ stereo jack, Power Supply: One AA batteries, Battery Life: Approx. 10 hours, Size: 2.5 x 4.3 x 1.25″, Weight: 3.8 oz, OS Supported: MS Windows, Mac OSX 10.5



2.2.3: Tascam DR-1: Recording Format: WAV, MP3, Memory: SDHC, PC Interface: USB Direct 2.0 high speed, Sampling Frequency: 44.1/48kHz 16-bit 24-bit, Microphone Jack: TRS, Plugin Power, Earphone Jack: Mini 1/8″ stereo jack, Power Supply: Rechargable Lithium-Ion, Battery Life: Approx. 4-5 hours, Size: 2.8″L x 1.1″W x 5.5″D, Weight: 7.34 oz, OS Supported: Microsoft Windows, Mac OSX

2.2.4: Samson Zoom H4n: Recording Format: WAV, MP3, Memory: SDHC card, Sampling Frequency: 44.1kHz, 48kHz, Channels: 4 channels of audio, two from mic inputs, and two mics built in, Microphone Jack: XLR or TRS, Plugin/Phantom Power, Earphone Jack: Mini 1/8″ stereo jack , Power Supply: Two AA, Battery Life: Approx. 4 hours, Size: 2.75 x 6 x 1.38″, Weight: 1.7 oz, OS Supported: Microsoft Windows, Mac OSX 10.4 (10.5 with firmware update)

2.2.5: M-Audio Microtrack II: Recording Format: WAV, MP3, Memory: CF Card, Sampling Frequency: 44.1kHz, 48kHz, Frequency Response: 20kHz – 20,000Hz, Microphone Jack: TRS, Plugin/Phantom power, Earphone Jack: Mini 1/8″ stereo jack, RCA Output, Power Supply: Non-remvable rechargeable battery, Battery Life: Approx. 3-4 hours, Size: 7.4 x 6.9 x 2.2″, OS Supported: Microsoft Windows, Mac OSX.

2.2.6: Marantz PMD 620: Recording Format: WAV, MP3, Memory: SD/SDHC, PC Interface: USB Direct 2.0 high

speed, Sampling Frequency: 44.1kHz, 48kHz, Frequency Response: 20 – 20kHz, Microphone Jack: Mini 1/8″ stereo jack, plugin/phantom power, Earphone Jack: Mini 1/8″ stereo jack, Power Supply: Two AA batteries, Battery Life: Approx. 5 hours, Size: 2.5″L x 4″W x 1″D, Weight: 4 oz, OS Supported: Microsoft Windows.

2.2.7: Edirol by Roland R-09: Recording Format: WAV, MP3, Memory: SD/SDHC, PC Interface: USB Direct 2.0 high speed, Sampling Frequency: 44.1kHz, 48kHz, Frequency Response: 20 – 22kHz , Microphone Jack: Mini, plugin power , Earphone Jack: Mini , Power Supply: Two AA batteries , Battery Life: Approx. 4 hours , Size: 4″L x 2.5″W x 1.18″D , Weight: 6 oz , OS Supported: Microsoft Windows, Mac OSX.

2.2.8: Olympus LS-10: Recording Format: WAV, MP3, WMA ,Memory: SD card ,Recording Time: 3hours with 2gb built-in mem, expandable memory, PC Interface: USB, Sampling Frequencies: 22.05kHz, 44.1kHz, 48kHz and 96kHz, Frequency Response: 20 Hz – 10 kHz, Microphone Jack: Mini 1/8″ stereo jack, plugin power, Earphone Jack: Mini 1/8″ stereo jack , Power Supply: Two AA batteries, Battery Life: Approx. 12 hours , Size: 5.17 x 1.89 x 0.88″, OS Supported: Microsoft Windows, Mac OSX.

2.2.9: Sony PCM D50: Recording Format: WAV, MP3, Memory: SD card (not SDHC), Recording Time: 6hours at 44.1kHz with 4gb card, PC Interface: USB, Sampling Frequencies: 22.05kHz, 44.1kHz, 48kHz and 96kHz, Frequency Response: 20 Hz – 10 kHz, Microphone Jack: Mini 1/8″ stereo jack, plugin power, Earphone Jack: Mini 1/8″ stereo jack, Power Supply: Four AA batteries, Battery Life: Approx. 4 hours, Size: 2 7/8″ x 6 1/8″ x 1 5/16″, OS Supported: Microsoft Windows, Mac OSX.

2.2.10: Marantz PMD 660: Recording Format: WAV, MP3, Memory: CF Cards, PC Interface: USB Direct 2.0 high speed, Sampling Frequency: 44.1kHz, 48kHz, Frequency Response: 16,000Hz, Microphone Jack: XLR, phantom power, Earphone Jack: Mini 1/8″ stereo jack, Power Supply: Four AA batteries, Battery Life: Approx. 4-5 hours, Size: 7.2″L x 4.5″W x 1.9″D, Weight: 1.1 lbs., OS Supported: Microsoft Windows, Mac OSX.

2.3. TASK OF RECORDING SOUNDS OF ENDANGERED LANGUAGES:

With any of the devices recording can be done for accoustic analysis. Different sounds are different according to phonetiticians if they have different meaning in a language. In the study of computing languages, one should know the parsing, and for getting the proper parsing of any language the vowels and consonents of that language should be recorded systematically and accoustically parsed.

According to recent researches, there are 15 most widely spoken langauges are having consonents of their languages about 120 distinct consonents, but there are about 620 consonents altogether people use in the world. There are some langauges which are endangered as they don't have speakers to preserve those languages or very few speakers are surviving. Getting the total number of vowels use in majority langauges are very difficult tasks. The reason is that many languages have very few number of vowels and some have large number of vowels. The vowels available for surviving languages are confined with the purview of the vowel set {a, e, i, o, u}.

2.3.1: Śikṣā: *Śikṣā* literature of Sanskrit language is represented by the structure that computes and expresses the internal aspects of physiochology, such as, its biochemical constitution, temperature, pressure etc. (the expression of autonomic nervous system). These expressions are channelled via autonomic ganglia. The autonomic ganglion is a cluster of nerve cell bodies (a ganglion) in

the autonomic nervous system. The two types are ganglia and parasympathetic ganglia. In the branches of *Śikṣā*, there are 36 components on each side of the spinal cord.

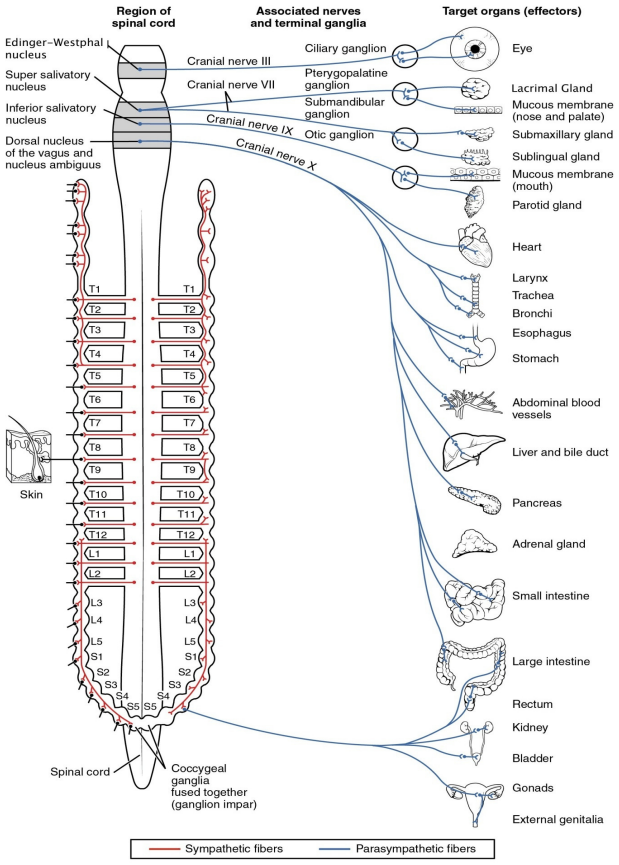


Fig.3

Now these 36 organs are directly and minutely discovered by 36 *Śikṣā* texts amongst 72 *Śikṣā* and *Upaśikṣā* literature. This is a common feature of language utterance. With reference to consciousness, *Śikṣā* comprises the specific sets of laws of Nature that are engaged in promoting the quality of Ṛṣi (the observer), the witnessing quality — within the Saṃhitā level of consciousness, providing a structure to the eternally silent, self-referral, self-sufficient, fully awake state of consciousness, which is intimately personal to everyone.

On the other hand the whole body (especially the hand, head and facial muscles) is engaged at the time of uttering a pitch tone. Pitch tone itself distinguish language and even sub-languages varieties that can be traced through DAT machine and spectrographic system. Pitch intonation itself can classify the pattern of vocal tube usage in a particular language or some branches of language. Such as, those languages who do not have sufficient tone they must use pitch intonation in a different way from those who have sufficient vowels or tones. Some languages also have vowels that differ in the quality of the voice (vocal fold action). They may distinguish a regular voice, a creaky voice and a breathy voice. Many sounds are fairly common but do not occur in the most widely spoken languages. Ejectives sounds are those in which the closed glottis rises and pushes out air. They occur in about 20% of all languages, implosives sounds are those in which the glottis descends and they occur in about 10% of all languages (Peter Ladefoged: "Preserving the sounds of disappearing languages", p. 5). In fact primary examination of pitch intonation with the basic theory of Vedic accentuation system and vocal tube system of *Śikṣā* can sketch out a pattern through which languages can be exemplified and preserved by their marker, toning and expression in a basic way.

2.4: The phonetic structures of

i) English:

a.The syllabic structure of English words
b. The accentual structure of word
c. The intonational structure of English sentences

ii) Hindi:

a. Regular Consonants
b. Semivowels Consonants
c. Sibilant Consonants
d. Fricative Consonants
e. vowels

iii) Sanskrit:

a. Consonents: Sanskrit possesses a symmetric consonantal phoneme structure based on how the sound is articulated, though the actual usage of these sounds conceals the lack of parallelism in the apparent symmetry possibly from historical changes within the language

b. Vowels: The cardinal vowels (*svaras*) *i* (इ), *u* (उ), *a* (अ) distinguish length in Sanskrit. The short *a* (अ) in Sanskrit is a closer vowel than ā, equivalent to schwa. The mid vowels ē (ए) and ō (ओ) in Sanskrit are monophthongizations of the Indo-Iranian diphthongs ai and au.

iv) Bengali:

a. 29 consonants
b. 14 or 15 vowels

v) Chinese:

a. Syllabic consonants: The syllables written in pinyin as zi, ci, si, zhi, chi, shi, ri may be described as having a syllabic consonant instead of a vowel: [ɻ ~ ʐ̩], a laminal denti-alveolar voiced continuant,[a] in zi, ci, si; , [ɻ̩ ~ ʐ̩], an apical retroflex voiced continuant,[a] in zhi, chi, shi, ri. Alternatively, the nucleus may be described not as a syllabic

consonant, but as a vowel: [ɯ], like [u] without lip rounding, in zi, ci, si; [ɨ], similar to Russian ы, in zhi, chi, shi, ri.
b. Vowels: Standard Chinese can be analyzed as having five vowel phonemes: /i, u, y, ə, a/.

III. CONCLUSION

This study brings light on the various aspects of the computing techniques such as accoustic, phonetics, phonetic-structures, language computation on linguistic perspective and so on. The study confined with various dimensions like population-ratio of different language spoken people, some phonetic structures of languages, accoustic devices and their specifications. With this kind of study, the human culture can be presreved and as well as the langauge.

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Authors Profile

A Das completed his Masters in Mathematics and Computer Science from Gauhati University of Assam, India. He has obtained his Ph.D. in Computer Science and Engineering in 2015 from Gauhati University and currently working as Assistant Professor in Department of CSIT, Cotton University of Assam, India since 2007. He is a member of Assam Academy of Mathematics since 2005, International Association of Engineers (IAENG) since 2013 and CSI since February, 2018. He has published more than 15 research papers in reputed international journals and conferences including Springer . His main research work focuses on Network Security, Cloud Security and Privacy, Data Mining, IoT and Computational Intelligence based education. He has 15 years of teaching experience and 8 years of Research Experience.

Ms B Choudhury completed her Master in Sanskrit from Jadavpor University, West Bengal, India, obtained her MPhil from Madras University, Tamil Nadu, India and got awarded by Phd from Visva Bharati University, West Bengal, India in 2017. Currently she is devoting her time in Linguistic research. She has published more than 5 research papers in reputed journals. Her main research work focuses on manuscripts, language, Sanskrit based studies.

