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Adaptive Technology for Morse Code using Hindi Language

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Abstract - *Morse code has been a way of communicating confidential information since the early nineteenth century, using dots and dashes as a way of transmission. Communication has always been difficult for people with disabilities, causing barriers while interacting. Morse code has been proven effective as an assistive technology to help people with motion disabilities communicate, given that they have at least some control over their movements. Our project focuses on minimizing the hurdles disabled people undergo and aiding them with an easier way of connecting with people. We also introduce a text to speech module to make the delivery smoother.*

Key Words: **Natural Language Processing, Adaptive Technology, Text Prediction, Morse to Hindi Conversion.**

1. INTRODUCTION

Morse code, as defined by the web Merriam-Webster dictionary is "either of two codes consisting of variously spaced dots and dashes or long and short sounds used for transmitting messages by audible or visual signals". Morse Code was a way of early communication powered by the usage of dots and dashes or long and short sounds that corresponded to every letter of the Latin alphabets. These messages were usually sent with the help of an electric telegraph or using light signals. The Morse code that was first was called the American Morse since it had originated from America. But now we come across various renditions of Morse like the Japanese version is called the Wabun code or SKATS, which is the Korean Morse code.

Morse Code essentially requires input in either a dot or a dash, which proves to be an efficient way for the users to communicate given that they have knowledge of the Morse Chart. Taking inspiration from the Morse charts made in various other languages, we were motivated to provide users having Hindi as one of the languages of expertise, a way of communicating with the help of Morse.

1.1 Problem Statement

With an increasing number of opportunities in fields of education, communication, entertainment, civic participation, etc., functions are moving either primarily or exclusively online, causing an immense amount of activity on the Web and Internet-enabled mobile technologies, threatening to exclude people who experience forms of disabilities, from the information society. In this project, we will look at how we can adapt the benefits of Morse Code to enabling technology. We will explore what is currently available, and then present the prototype for a useful product that we have designed and our proposed way of solving this problem.

1.2 Scope and Motivation

The scope of the project is to make the process of communication easier for people with disabilities. People with disabilities meet barriers of all types. However, technology is helping eliminate many of these barriers by using adaptive Morse code for better communication in our project. Morse code has been employed as assistive technology, helping people with native languages and people with a variety of disabilities such as neuromuscular diseases. The implementation of Morse code in various languages like Arabic, Japanese, Korean, etc. has been the motivation behind the process of our project.

1.3 Project Objectives

The objective of this project is to develop a prototype of Morse Code Reader that can detect Morse code and convert it to text and allow the exchange of information between users. In the search for ways to enable communication between users and their computers in new manners, Morse Code has emerged as one of the most exciting and flexible protocols. The main objective is to effectively communicate and convey the message with ease for a group of people with certain disabilities. The project also aims to make communication better by eliminating language obstacles for Indian citizens, as the project conveys messages in Hindi. The other objective of our project is adding a text to speech module which makes the application more interactive. The very simple nature of its input language allows for some very inventive input devices. Users who are constrained by a disability or the way in which they need to use a computer have been able to use Morse Code quite effectively.

1.4 Existing System

Hello Morse is an application offered by Google which helps the users interact in Morse. Google also offers Gboard, an input method in devices that works as a keyboard application. The user can type in dots and dashes and the message would be translated in English and sent to the receiver. It also works when the Android device is connected

with an external electronic device to enter the dots and dashes. It aims to relieve the usage of commonly used QWERTY format keyboards, allowing the drafting of the message on the user's end to expedite and to provide a way for people with disabilities to share text messages and make use of the latest technology while doing so.

2. LITERATURE REVIEW

This section presents the significant approaches that guided us in a certain way to reach our goal, aspects like the literature survey of the project and the projects that are already existent and have been used in the market, which we took the inspiration from and thus decided to go ahead with this topic.

2.1. Adaptive word processor based on Morse code Question Paper Generation

Adaptive open learning technology provides adaptive methods of interacting with the technology used in open learning. Since most online learning systems are computer-based, adapting the keyboard for people with special needs will be of great effectiveness. This article presents an adaptive keyboard technology based on Morse code that will enable users with a physical disability or functional limitations to access the proposed interface and interact fully with the given system with minimal input keys. The proposed adaptive Word processor allows preparing text documents such as letters, memos, research paper, homework, and other correspondence for people with limited functionality by facilitating the interaction between the person with muscle weakness and the computer providing the learning interface. [1]

2.2. A fuzzy-logic based Morse code entry system with a touch-pad interface for physically disabled persons

Touchpads, haptics, and gestures are becoming popular user-interfaces in modern electronic gadgets. In this project, we propose to use a touchpad to construct a HAM radio interface. Low-power, short-range wireless communication interfaces that have become available with modern microcontrollers enable the construction of such systems which can allow users to exchange information within buildings. While Morse code was invented for telegraphy, its simplicity allows a person with a physical disability to use it more effectively than a keyboard-based interface. Thus, such an interface can be useful in rehab centers, old-age homes, and hospitals. Security systems are yet another domain where Morse code can be gainfully employed. Since the user must make use of touch, drag, and release operations for Morse code signaling, it is difficult to prescribe any strict guidelines on the length of the drag or the time gap between two drags. Multiple users of the system will use the system at different speeds. [2]

3. PROPOSED SYSTEM

We explain our perspective of the solution with respect to the problem statement with the help of our proposed system. We have prepared a dictionary for the Hindi equivalent of Morse which the user will refer to while communicating. We used the reference of Latin based equivalent of Hindi while preparing the dictionary. The user can simply type in dots and dashes with the built-in keyboard of their system or attach an electronic device to do the same.

3.1. Dictionary

Since there is no pre-existing chart for Morse to Hindi conversion, we prepared a dictionary of Morse-Hindi correlation with the help of some relevant charts which already existed.

3.1.1. International Chart

The chart given below provides a chart for Morse conversion to the English text, which is globally used and termed as an international standard.

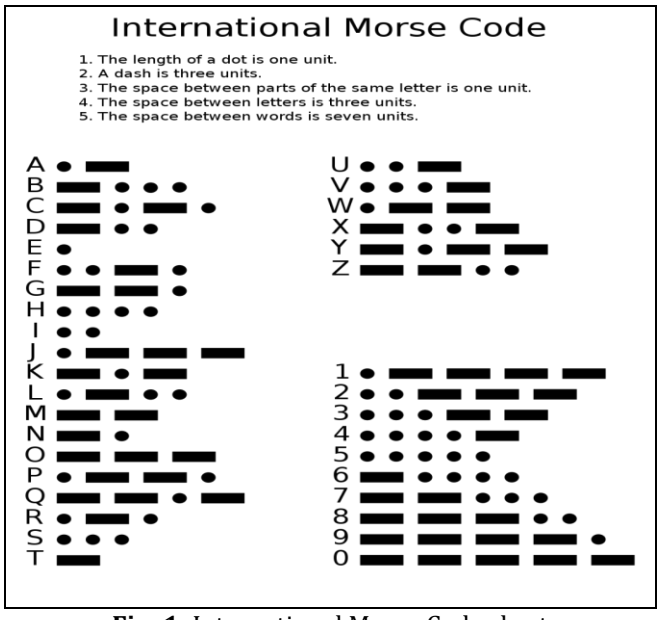

Fig -1: International Morse Code chart

3.1.2. Devanagari-Latin Chart

The following code table is adapted from one given by Ashok Kelkar, where the Latin letters are encoded as per the International Morse code standard. Some variations on this code exist, and there have been some attempts to introduce other telegraph codes to add efficiency and make it suitable for more Indian languages.

Devanagari	In Latin	Devanagari	In Latin	Devanagari	In Latin	Devanagari	In Latin
ा	A	अ	TA	ः	EA	आ	IA
ि	D	इ	TD	ी	ED	ई	ID
ु	U	उ	TU	ू	EU	ऊ	IU
े	F	ए	TF	ै	EF	ऐ	IF
ो	O	ओ	TO	ौ	EO	औ	IO
क	K	क्	TK	ख	EK	ख्	IK
ग	G	ग्	TG	घ	EG	घ्	IG
च	C	च्	TC	छ	EC	छ्	IC
ज	J	ज्	TJ	झ	EJ	झ्	IJ
ट	Ä	द्	TÄ	ठ	EÄ	ठ्	IÄ
ड	Ü	ड्	TÜ	ढ	EÜ	ढ्	IÜ
त	W	त्	TW	थ	EW	थ्	IW
द	Z	द्	TZ	ध	EZ	ध्	IZ
न	N	न्	TN	ं	EN	ँ	IN
प	P	प्	TP	फ	EP	फ्	IP
ब	B	ब्	TB	भ	EB	भ्	IB
म	M	म्	TM	ण	EM	ण्	IM
य	Y	य्	TY	ळ	EY	ळ्	IY
र	R	र्	TR		ER	क्र	IR
ल	L	ल्	TL	ञ	EL	ञ्	IL
व	V	व्	TV	ङ	EV	ङ्	IV
स	S	स्	TS	श	ES	श्	IS
ह	H	ह्	TH	ष	EH	ष्	IH
ृ	Ö	ृ	TÖ	ॅ	EÖ		IÖ
क्ष	Q	क्ष्	TQ	त्र	EQ	त्र्	IQ
ज्ञ	X	ज्ञ्	TX	श्र	EX	श्र्	IX
में	MM	है	TMM	मैं	EMM	हूँ	IMM

Fig -2: Devanagari to Latin Script chart

3.1.3. Morse to Hindi Dictionary

Taking notes from the charts mentioned previously, we created a correlation between Morse and Hindi language while keeping Latin as a language of conversion reference. Some excerpts of the dictionary are mentioned below.

Hindi Letter	English Transliteration	Equivalent Morse code
अ	TA	.-
आ	IA	..-
इ	TD	--..
ई	ID	..-..
उ	TU	.-..
ऊ	IU	...-
ए	TF	.-..-
ऐ	IF	...-.
ओ	TO	----
औ	IO	..---
क	K	-.-
ख	EK	.-.-
ग	G	--.
घ	EG	.--.
च	C	-.-.
छ	EC	.-.-.
ज	J	.---
झ	EJ	..---
ट	Ä	.-.-
ठ	EÄ	..-.-
ड	Ü	..--
ढ	EÜ	...--
त	W	.--
थ	EW	..--
द	Z	--..
ध	EZ	.--..
न	N	-.
प	P	.--.

Fig -3: Hindi-Morse Dictionary

3.2. System Architecture

The design of our system consists of certain modules which will be shown with the help of the diagram mentioned below. The entire implementation of our system can be viewed in one glance with the help of the chart given below.

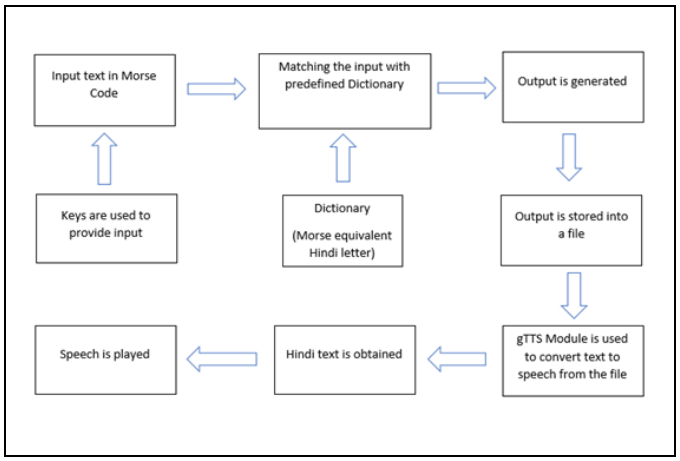

Fig -4: Design of the architecture of our system

4. Implementation

Implementation includes three processes: first is the encryption and decryption process, second is the prediction of text, and lastly text to speech process, these three processes include different functions that combine the implementation of the whole idea.

4.1. Designing Dictionaries

Dictionary is an unordered collection of data values. It holds key-value pairs of the Hindi-Morse correlation we have prepared. It is used to find the equivalent value of the key Dictionary is named as MORE_CODE_DICT. The key in the dictionary is selected for the received input and displayed on the screen.

4.2. Encryption and Decryption Process

One of the implementation processes is encryption process, this process includes a defined function called 'Encryptor' which takes input as the Hindi text and processes it with the help of predefined dictionary which includes key-value pairs and produces the required output which is Morse code, the use of encryption process in this system is limited. The input to this process is Hindi letter or sentence and the output is obtained Morse code.

The process of decryption is more pertinent to our project, this process includes a defined function called 'Decryptor' which takes input as Morse code, this Morse code is obtained from the user, the user will be provided with a manual that helps them type the correct Morse code as required, after this, the text obtained as input is converted into the Hindi text with the help of the predefined dictionary. The final output in Hindi text can be seen on the screen.

4.3. Predictive text

Prediction enables the user to type faster, saving the hassle of typing all the input altogether. In this process, at the event of detection of one letter of the Devanagari script after conversion from Morse, a dictionary is searched and 5 relevant Hindi words are suggested through the use of a regular expression.

4.4. Text-to-Speech module

The last process is converting text into speech for more convenience of the user. In this process, Google text to speech module is used along with file handling. A text file is created in the same directory and the output obtained from the decryption process is stored in a file and by using file handling processes the output is written into the file, after that, the content is read from the file by using gTTS module and speech is played.

5. Results

The outcome of this model makes communication for disabled people specifically of Hindi speaking origin easier and proposes a viable option for communication. Since the model is designed around easy binary inputs namely dots and dashes and provides an output in the form of speech, it turns an old method of communication into an innovative solution. The output obtained when the Morse code is typed can be seen in the diagram below.

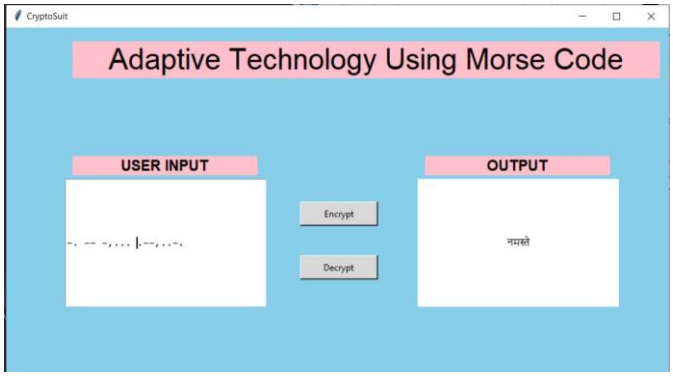

Fig -5: Morse to Hindi decryption

6. CONCLUSION

With the increasing pace of businesses thriving online, it is the need of time to make platforms accessible to people with disabilities too. We have implemented the Morse code using adaptive technology for the Hindi language. The system takes input from the user in the format of Morse, the Morse is then converted to Hindi. The converted text can then be played with the help of the text-to-speech module. The module also provides predictive text to the user to prompt what to say next. This system can be used by people with disabilities with the dictionaries provided.

7. REFERENCES

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