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Speak Via Fingers - Phase I

[1]K. Keran Grace, [2]Dass

[1,2]Department of Electronics and Communication, Saveetha School of Engineering,
Saveetha Institute of Medical and Technical Sciences, Chennai-602105, Tamil Nadu, India
[1]kerangrace767@gmail.com, [2]dass@saveetha.com

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Abstract
The well-known method of correspondence for the quiet is through gesture based communications. The fundamental test looked by the quiet is to pass on what they think impeccably to ordinary individuals who need information in gesture based communications. To beat this test, we have thought of a mechanical strategy where the alphanumeric code can be detected from the sources of info given through the fingers and handled to deliver the alluring yield. These codes are commonly spoken to in numbers from 0 - 9 related with individual letters in order. The code can be produced for every letters in order and this can be handled and changed over to voice. The yield can be gotten in the speaker. This is progressively similar to a quiet individual having the option to talk through their fingers. This technique sets aside less effort to create the yield. This can help the simple-minded to communicate their perspectives too. This undertaking would improve the work openings, imparting capacities for the individuals with different handicaps.

***Keywords*:** Text to speech, disability communicator, Translate, SMS, LCD

1. Introduction

The statistics states that the ratio of people who are mute, blind and lack the capability to hear is 10:1million. That is approximately about 11% of the worldwide population. Communication is the most important aspect to convey our views or thoughts to another person which is very much essential. People with multiple disabilities have scarce languages or modes of communication, hence they find it difficult to communicate between themselves and with the others. Sign languages are mostly evolved from North American regions and are largely used by the mute and deaf. It is a mode communication in which the information is generally expressed by gestures, actions and lip movement which is quite understandable for the opposite person. However, the types of sign languages that have been evolved is still tentative and it varies with region to region. The sign language is being widely taught in deaf and mute schools. And there has been no easier alternative for sign languages yet. There are basically 3 sign languages which are widely accepted. They are American Sign Language (**ASL**), Pidgin Signed English (**PSE**), Signing Exact English (**SEE**).

To overcome this methodology of sign languages which cannot be understood by the other humans, the solution is formulated. This proposal is a technological aid which helps the blind, deaf and mute to communicate in an easier way using latest technology. The inputs are given by tapping fingers which are processed to produce the output. The format of keypad used here is 'Alphanumeric keypad'. This is somewhat like keypads that can be found in old 'type' mobile phones. Since the alphanumeric keys are quite familiar and can be easily taught to the user, it has been considered. The alphanumeric keypad has been used over years in many applications like laptops, phones, ATM pins etc. The alphanumeric key dictionary has been defined (Fig 1.2) and it is interfaced with the GPIO pins of the RPi ZERO. The process is based on giving input by two methods.

First method is called multitap keypad method. The alphanumeric keypad used here consists of 12 keys which are assigned for a function, say, the number 3 has three alphabets 'd', 'e' & 'f'. Depending upon the number of times the button is pressed, the corresponding alphabet is obtained. To obtain 'e' the user must press3 (twice).

The second method is called 'T9 Predictive text' method. T9's objective is to make it easier for the user to give the textual input. It allows words to be entered by a single keypress for each letter, as opposed to the multi-tap

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approach used in conventional mobile phone text entry, in which several letters are associated with each key, and selecting one letter often requires multiple key presses. But here, a combination of single taps of desired numbers (that contains desired alphabets) is enough to create the whole word.

There are cases where the user needs to communicate to a person who is not in his/her locality or is very far from the user. To deal with this, the system is also provided with an option of sending SMS to any desired phone. The user can follow the same procedure to give the textual input a she/she did before. The message can be sent to any phone number specifies by the user. This process does not require any extra hardware component. It, however, requires internet connection.

The RPi ZERO is a mini computer which has AVD processor. The input taken from user (by tapping the buttons) will be decoded from numbers to alphabets by programming code. These alphabets will be processed in the 'Text-to-Speech' application which is developed by Google, where the text will be synthesized to speech. The translator option is also provided where English can be translated to any regional language and be delivered as speech so that even a person who can't understand English can understand what the multi- disabled person is trying to express.

If the user is in a noisy environment, the opposite person cannot hear the voice output. So, to overcome this problem, a small is display is attached to the device. Thereby, the opposite person can read the text output and understand what the user is trying to express.

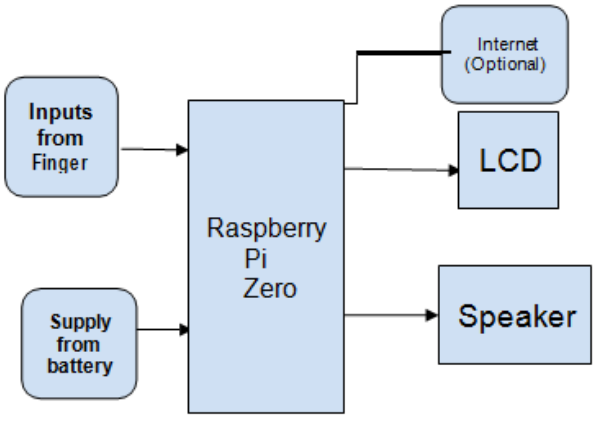

Figure 1.1: Current module

2. Principle

Alphanumeric keypad is basically used in telephones and old mobile phones for sending text messages. To type a letter, the user must press the respective number buttons. The number of times the user should press the button, depends on the position of the alphabet in the number. This method of a text entry system is generally used for phones. The alphabet is printed under each key (beginning on "2") in a three-letter sequence as follows: ABC under 2 key, DEF under 3 key, etc. Exceptions are the "7" key, which adds a letter ("PQRS"), and the "9" key which includes "Z". Spaces are given by pressing"1"button.'#' is used for deleting an input. The system is used by repeatedly pressing the same key to cycle through the letters for that key. For example, pressing the "3" key twice would indicate the letter "E". After entering all the desired input, "0" is pressed for further processing of input, where the numbers are decoded into alphabets and later processed into speech.

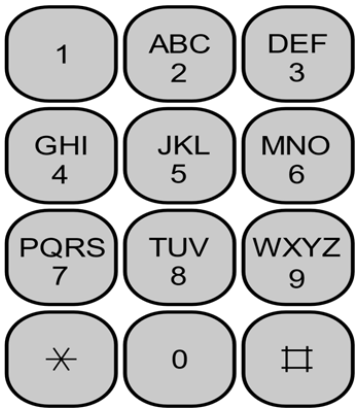

Figure 1.2: Layout of digit

It is commonly used in conjunction with text-messaging services.

The layout of the digit keys is different from that commonly appearing on calculators and numeric keypads.

Number	Letter
0	Enter
1	SPACE
2	ABC
3	DEF
4	GHI
5	JKL
6	MNO
7	PQRS
8	TUV
9	WXYZ
#	DELETE

Figure 1.2.1: Key Pad Description

3. Components and Software

(I) Raspberry PiZERO:

The Raspberry Pi (RPi ZERO) is a bargain basement priced, flash drive sized computer which can be easily

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plugged to a display. We utilize a standard keyboard. It is a minute device that enables people of all ages to research computing, and to learn how to program in languages like Scratch and Python. It can do everything we would expect a desktop information processing system to perform, surfing from the net and playing high-definition videos, to making databases, word-processing, and live games. RPi has the capability to intercommunicate with the exterior world and has been used in a spacious array in digital projects, from music equipment and sensors to weather stations and chirping birdhouses with infrared cameras.

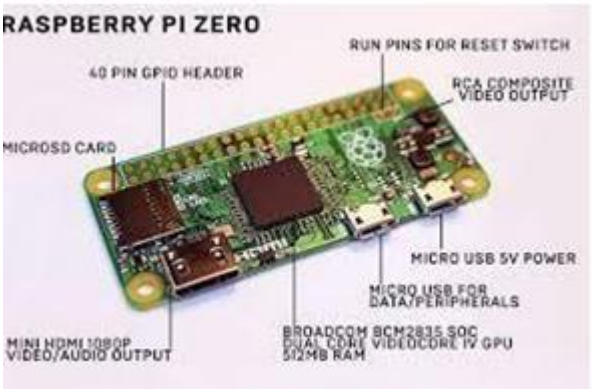

Figure 1.3: Raspberry pie zero

The PiZERO is much smaller than the other RPi models. The RPi ZERO uses a Broadcom BCM2835 SoC with a 1 GHz single-core ARM1176JZF-S processor, with 512 KB shared L2 cache. The RPi was designed for the Linux operating system, and many Linux distributions now have a version optimized for the RPi. This microprocessor can perform many functionalities. In our case we employ RPi for the following reasons,

- Accepting numeric inputs from the user by means of GPIO pins and storing it in its memory.
- Decoding these to numbers stored to actual alphabets by using the proposed algorithm.
- Storing the decoded English message to a text file.
- Performing text to speech analysis on the text file.
- Storing the analysed speech output sound to a file.
- Playing the output file by means of sound amplifier (Speakers).
- Sending the textual data to connected LCD.
- Sending SMS containing text to any desired number using internet connection

(II) Text-to-Speech:

Google TTS (Text-to-Speech) open-sourced API enables developers to convert text to audio by applying powerful neural network models in an easy to use API. The API recognizes over 110 languages and variants, to support your global user base. The intent of this API is to provide an easy way to use text-to-speech output by Google on your RPi. The script supports reading from standard input, plain text files, and highlighted text. Google imposes a 100-character limit on their speech synthesis service that makes it hard to use their TTS system for anything other than short sentences.

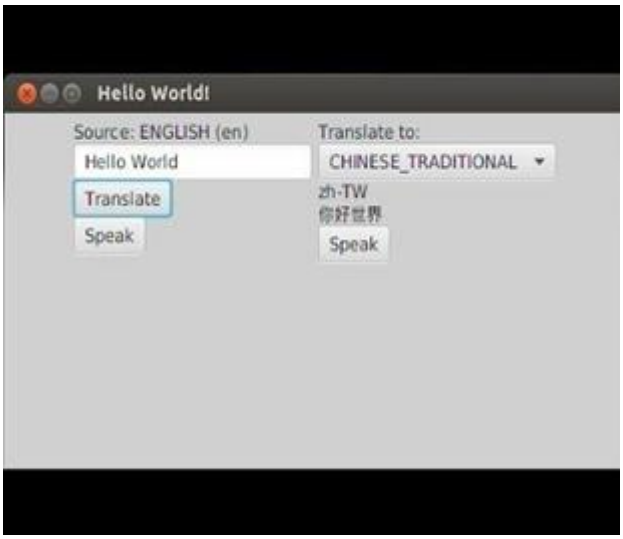

Figure 1.4: Translation

But, our API works around this limitation by breaking the text input down into appropriate chunks. These chunks are set intelligently based on punctuation and syntax of the text. Having processed all chunks, it then concatenates the speech fragments into one audio file while truncating segments of silence at the start and end of each fragment. The one remaining problem with this approach is that the waiting time between user input and voice playback scales drastically with the length of the text. So, instead of passing the text directly, we first break down the input into paragraphs. The paragraphs are then processed one by one with each paragraph being played back while the next one is synthesized. Any length of text can be parsed with reasonable speed in this manner.

This API, as said before, recognizes over 110 languages. So, by invoking proper commands, one can synthesize text (From the available 110 languages) into speech with natural voice. The voice model can also be customized.

Translate:

Translate Shell is a command-line translator. Translate shell API provides a simple programmatic interface for translating an arbitrary string into any supported language using Neural Machine Translation. Translate shell API is highly responsive, so RPi can integrate with Translate shell API for fast, dynamic translation of source text from the source language to a target language (e.g., English to Tamil). This API scans the decoded text (which may be in any language) from the RPi and translates it to the target language. The processed output is stored in another file.

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(IV) SMS:

Usually, SMS is sent using GSM or by using any other hardware component. But, here the system uses only a third-party API to send the desired text message to any desired phone number at zero cost. The device is programmed to accept both text message and phone number through the gloves buttons. However, this process requires internet connection.

4. Working

As the RPi boots up, a program is started which is aimed to accept numeric inputs from the user. The system is provided with a switch, where the user can select any mode or method of giving input (Multi tap method or T9 predictive text method). The device is also facilitated with the option to select any language of voice and display output. As soon as the numeric button is pressed by the user, the system is programmed such that the pressed number is recognized and written to a text file. "Spaces" between words are given suitably by pressing "1" button. Consequently, as the user enters a combination of numbers (With reference of the dictionary provided), the text file (with numbers) is now ready to be decoded. If the user feeds the system with undesired or wrong inputs, it can be deleted by pressing the 'Delete' Key. Using the decoder program, the system decodes the alpha numeric numbers into meaningful English sentences. This output is saved to another text file. Optionally, as mentioned earlier, if the user wants the output speech and display to be in any other language, the translate program is invoked. This will employ the "Translate shell" API. This API will take the decoded message stored in text file as the input. The text is the nup loaded to its servers and the translated text is returned to RPi. It is stored to another text file.

The RPi tests whether the device is connected to internet. If True, the "Google TTS" is triggered. The text (Text in Decoded text file) is sent to Google's servers to generate the speech file which is then returned to your RPi and played using player. This means you will need an internet connection for it to work, but the speech quality is excellent. If there is no internet connection, "Pico TTS" is triggered. Pico TTS has the same functionalities of Google TTS, but it does not require internet connection. The quality of voice is slightly reduced. The files required for TTS processing is locally available. So, the process is even faster than Google TTS. The output is played through speakers connected to the RPi. And additionally, the corresponding English text output is displayed in LCD.

If the user wants to send the decoded text message to any phone number, he/she needs to press the "SMS" button. As soon as the "SMS" button is pressed, the system will be ready to accept the recipient phone number. After entering the phone number, using similar input method as used before, the 'Send' button is pressed. The SMS with the text message is sent to the desired phone number

5. Conclusion

The conclusion of the paper is to do future development. The entire procedure doesn't utilize console, mouse or screen. The gadget works headless. Each phase of the interpreting and orchestrating process is summoned naturally and doesn't require human mediation. The framework is intended to begin the necessary projects at boot. When the necessary projects are booted at fire up, we hear an asserting message through speakers. This will be helpful for the client to affirm that he/she is prepared to give the contribution for handling

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