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Development of Electronic Speech Supporting Device for Dumbed Pharmacy Sales Person Using Intelligent Controller

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ABSTRACT

There are many inventions carried out specially challenging person. The main objective of proposed work is to create a solution for problem faced by dumb people all around the world. It is the application specific where we sort out the problems of a dumb medical shop attender. The main idea of the proposal is to create an instrument which acts as a electronic speech device answer customer's questions in the medical shop. The proposed work consists of a Raspberry PI 3, keypad, and the speaker. The text to speech coder is deployed in the Raspberry PI. Depending on the customer question and dumbed person has to enter the answer through keypad. The pressed key equivalent value is converted into audio output. The time taken for the response is 2.6 seconds.

Keywords— Raspberry pi, python, text-to-speech

I. INTRODUCTION

In this world, many people are struggling with various kinds of disabilities. One among them is being not able to communicate as easily as others(dumb). Such persons feel it so difficult to express their thoughts and quires to others especially when they are in their working places dealing with customers. Here we provide a solution for this, by taking a specific application. A medical shop attender who suffers with such a condition feels difficult to face his customers. This helps him to recover from his disability using Raspberry pi kit. The number input such as 1 to 10. produces respective speech outputs that are internally decided frequent statements.

II. LITERATURE REVIEW

Rajesh Kannan et al (2019) [9] have proposed Voice Enabled Donation Box implementation of eSpeak facilities and usage of Pygame and it' s functions for loading the files, playing the audio files, controlling it's volume. Chucai Yi et al (2013) [1] have proposed a method that extracts moving object region by a mixture-of-Gaussians-based background subtraction method. It explains a novel text localization algorithm by learning gradient features of stroke orientations, distributions and arrangements of edge pixels in a model. Vasanthi.G et al (2014) [2], proposed a system that ensures to read printed text on objects for helping blind persons. In order to solve the common problem for blind users, a motion-based method to detect the object that is projected, while the blind user just shakes the object for a couple of seconds. Jayasankar et al (2015) [3] tells about Nonspeaking Individuals with problems can overcome it by their fine motor skills can also use text-to speech aid implemented using FPGA. This kit is helped with the Zneo power Architecture.

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Pallavi Varma, Shimi.S.L, Richapriyadarshini, ”Design Of Communication Interpreter For Deaf and Dumb person” (2015) [4]is a hand gesture based device for deaf and dumb person. S.B.Shroke, NandarDehpande, Prashant Deshmukh, Sanjay Kumar Mathapati. “Assistive Transulator For Deaf And Dumb People” (2014) [5]. This project aims to facilitate people by means of a glove based deaf-dumb communication interpreter system. The glove has equipped with five flex sensors, tactile sensors and accelerometer internally. For each specific gesture, accelerometer measures the orientation of hand and the flex sensor produces a proportional change in resistance. The sensor output is analog and it is converted to digital. The processing of these gestures happens in ARM processor.

Jayasankar et al [6-7] have proposed Word and Syllable Based Concatenative Model of Text to Speech Synthesis of Tamil Languagee using eSpeak tool. eSpeak uses formant synthesis and the synthetic speech generated is considered to be unnatural (robotic) in the Indian Context. This paper describes the recent investigation on the use of acoustic units by concatenative speech synthesis and discusses the issues of using different types units: words, diphones, and phonemes as a database
Md. Rafiqul Islam, Ram Shanker Saha, AshifRubayat Hossain (2009) [8] have proposed a method to generate almost natural speech from Bangla PDF text. They have proposed a speech synthesizer, which performs two major tasks. One is PDF to unicode text conversion and another is unicode text to speech conversion. It uses text normalization and parsing rules to get syllables which give us scope to produce natural speech. Jakee Indapanya et al (2020) [10] have proposed a method that explains an in-building hospital information and navigation system (called Blue Compass), which is designed and developed as a mobile application. BlueCompass allows its information to be maintained and updated via a web interface.

III. PROPOSED METHODOLOGY

The block diagram of proposed method is shown in the Fig.1. It consists of Key board, Raspberry PI, MIC, Speaker. The each and every part is explained in the following. The text to speech coder is deployed in the Raspberry PI.

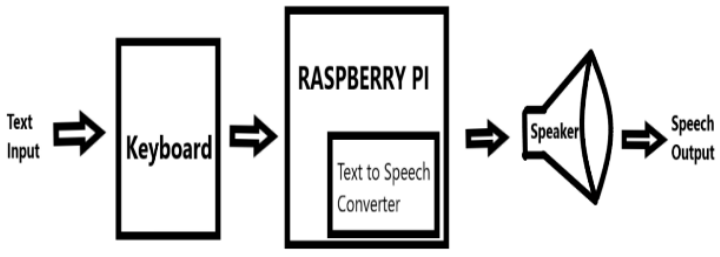

Fig.1 Block diagram of Proposed method

A. Keyboard

The matrix board is mainly to input the text as numbers with respect to which the speech output will be delivered. We generally use 4 x 3 matrix keypad. It is the most preferable dimension in python module. The key switch diagram is shown in the Fig.2. It consists of numbers from 0 to 9 with special characters like ‘#’ and ‘*’ [14].

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Fig.2. Keyswitch matrix pad

B. Raspberry PI

The Raspberry Pi is an open-source, Linux based, credit card sized computer board as shown in the Fig.3. The Pi is an exciting and accessible tool by means of improving computing and programming skills for people of all ages. It has two models namely A and B. The Model B consists of 512 MB RAM, BCM2385 ARM11, 700 MHz System on chip processor [13]. It has two USB ports, HDMI out, audio output jack and Ethernet port for internet access and the USB sound card is needed to interface with pi model because it has only audio output jack .

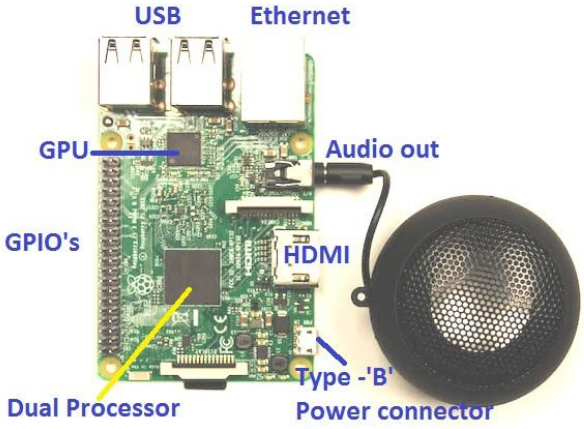

Fig.3 Raspberry PI-3 board

The components involved in Raspberry pi. It consists of connectors like,

- Ethernet.
- Audio Output.
- GPIO Connector.

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- Camera Connector.
- Display Connector.
- Memory Card Slot.
- Processor.
- GPU.
- Memory.
- Operating System.
- Power.
- BCM43143 Wi-Fi on board.
- Bluetooth Low Energy (BLE) on board.

C. Operation system:

We need an operating system to start using our Pi. An operating system is a vital software which acts as a computer manager [12]. There are many types of OS, like

- Raspbian
- Pidora
- OpenElec
- Windows 10 IoT
- RaspBMC
- RISC OS
- Arch Linux

The proposed method uses Raspbian Operating System. Raspberry Pi OS (Raspbian OS) is a Debian-based operating system for Raspberry Pi. Since 2015 it has been officially provided by the Raspberry Pi Foundation as the primary operating system for the Raspberry Pi family of compact single-board computers.

D. Speakers

The speaker and the GPIO expander is shown in the Fig.4. The speaker is just a basic tool to deliver the speech output. It works in such a way that it outputs the statement programmed for a particular input text (number) from the keyboard.

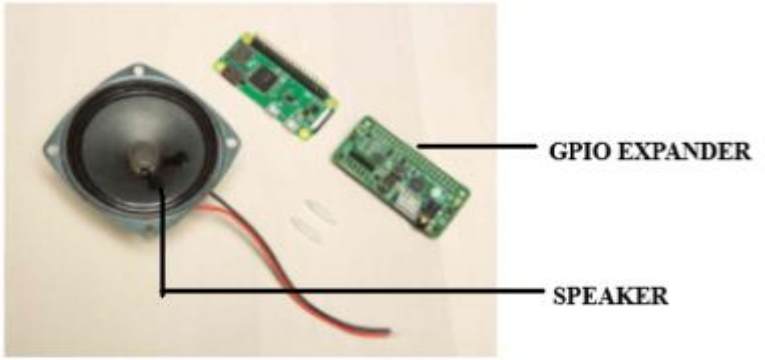

Fig. 4. Speaker and GPIO expander

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E. *Text to speech coder*

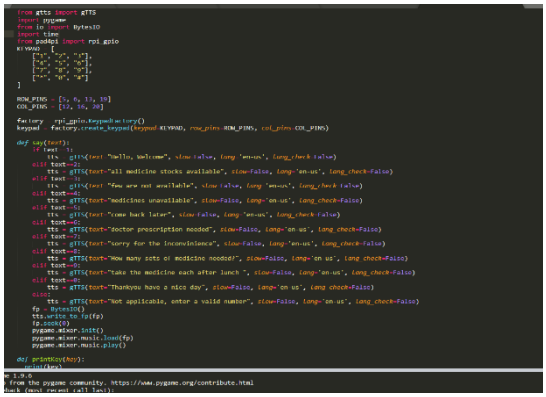

Fig. 5. Python programming environment

Python is the basic recommended programming language to be used in Raspberry pi with ease. In the proposed method python is preferred to develop the text to speech coder. The programming screen shot of proposed method in python language is shown in the Fig. 5.

For TTS (Text-To-Speech) converter there are some installations of modules needed. The modules are listed below.

- sudo pip install TTS
- pip install pygame
- pip install pad pi
- pip install io
- pip install time

F. Import statements

- from gtts import gTTS
- import pygame
- from io import BytesIO
- import time
- from pad4pi import rpi.gpio.

gTTS is an easy to use tool which converts the text entered, into audio which can be saved as a mp3. Pygame is a cross-platform set of Python modules which is used to create video games. It contains computer graphics and sound libraries designed to be used with the Python programming language.

Pygame was written officially by Pete Shinners in order to replace PySDL. Pygame is suitable to create client-side applications that can be potentially wrapped in a standalone executable [11]. The time module provides many ways of representing time in code, such as objects, numbers, and strings. It also provides functionalities like waiting during code execution and measuring the efficiency of code, other than representing time.

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The RPi.GPIO Python library allows us to configure and read-write the input/output pins easily on the Pi's GPIO header within a Python script. The pad4pi is an interrupt-based python library for reading matrix keypad key presses using Raspberry pi's GPIO pins. It tested on the board with 4*3 dimension, yet it works also for 4*4 matrix boards. The import statements are used to implement the text-to-speech code.

G. Pseudo Code

The deployed and tested code is given below in the form of pseudo code. Initially it reads the value of keypad. As based on the pressed values the response is observed in the output.

```
KEYPAD = [
          ["1" , "2" , "3" , "A"]
          ["4" , "5" , "6" , "B"]
          ["7" , "8" , "9" , "C"]
          ["*" , "0" , "#" , "D"]
         ]

If text is "1" :
Print("Hello, Welcome");

If text is "2" :
Print("Here wait a minute, the medicines are available");

If text is "3" :
Print("Ooops!  Few medicines are not available now");

If text is "4" :
Print("Sorry, Medicines unavailable");

If text is "5" :
Print("Please come back later");

If text is "6" :
Print("Doctor prescription needed");

If text is "7" :
Print("Beware of COVID -19. Please maintain the social distancing");

If text is "8" :
Print("How many sets do you need?");

If text is "9" :
Print("Take the medicine each after lunch");

If text is "0" :
Print("Thank you");

If text is "*" :
```

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Print("Have a good day");

If text is "#" :
Print("Wrong key pressed");

If text is "A" :
Print("Wearing a mask is mandatory");

If text is "B" :
Print("Sanitize yourself before and after pharmacy visit");

If text is "C" :
Print("Visit the nearby clinic in case of cough or fever.");

If text is "D" :
Print("Wash your hands often");

When he presses number 1 from the keyboard, It says "Hello, Welcome". When he presses number 2, it says "All the medicines stocks are available". Similarly, for all numbers from 1-9 there is some content to say. If the input is not a number, it says "Please type your own message". This helps the differently able attender in a medical shop to show his expression and thoughts towards the customers. This is application specific, but it can be implemented in several other applications also as successful as this model.

IV. RESULTS AND DISCUSSION

The pharmacy sales person has the electronic machine which consists of Keypad input. As based on the customer question sales person may enter the keys. The keys and the corresponding response are shown in the Table-1. The system is tested by pressing the keys with the specific text in the audio ouput.

TABLE I. KEYS AND FUNCTIONALITY

S. No	Key No	Key Function
1	1	Hello, Welcome
2	2	Here wait a minute, the medicines are available
3	3	Ooops! Few medicines are not available now
4	4	Sorry, Medicines unavailable
5	5	Please come back later
6	6	Doctor prescription needed

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7	7	Beware of COVID -19. Please maintain the social distancing
8	8	How many sets do you need?
9	9	Take the medicine each after lunch
10	0	Thank you
11	*	Have a good day
12	#	Wrong key pressed
13	A	Wearing a mask is mandatory
14	B	Sanitize yourself before and after pharmacy visit
15	C	Visit the nearby clinic in case of cough or fever.
16	D	Wash your hands often

The output of the system is fully observed and we obtained the desired outputs for the given inputs. Example: if the input text entered is as follows,

Input: Key= 8.
Output: "How many sets of medicine needed?".

In case, when the key is not a number, the output is “Please type your own message in the keyboard”. Similarly, all other inputs and their corresponding outputs are observed and verified.

Consider the following tested scenarios:

A. *Tested scenario 1:*

When a customer asked for a fever tablet like “Tylenol” and when it was available in the shop, the following keys are used by the attender to communicate with the customer,

Input: Key=1
Output: “Hello, Welcome”

Input: Key=8
Output: “How many sets of medicines needed?”

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Input: Key=9
Output: “Take the medicine each after lunch”

Input: Key=0
Output: “Thank you have a nice day”

B. *Tested scenario 2:*

When a customer asked for a set of listed medicines without any prescription paper, the following conversation happens using the keys,

Input: Key=1
Output: “Hello, Welcome”

Input: Key=6
Output: “doctor prescription needed”

And along with it, the attender has to type his own message in his keyboard connected with Raspberry pi as “Get the acknowledgement of any nearby doctor in a prescription sheet”. Before that he must use the key (*/#) to say that he has to type his own message, as

Input: Key=* or Key=#
Output: “Please type your own message in the keyboard”.

C. *Tested scenario 3:*

When a customer asked for some Anagrelide medicine along with a list of doctor prescribed medicines in a sheet, the attender found the Anagrelide medicine and few from the list unavailable. Under such a case, the following keys are used,

Input: Key=1
Output: “Hello, Welcome”

Input: Key=4
Output: “Medicines unavailable”

Input: Key=3
Output: “Few are not available”

Input: Key=5
Output: “Come back later”

D. *Tested scenario 4**:***

When the attender found the shop more crowded especially under such pandemic situations, he had to tell people to maintain distance among them and to wear a face mask compulsorily. In such cases, the following keys are used,

Input: Key=1
Output: “Hello, Welcome”

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Input: Key= 7
Output: “Please maintain the social distancing”

Input: Key=5
Output: “Come back later”

When he wanted to particularly point out someone to wear a mask, he might need to type his own message as “Please wear a mask, it is mandatory to wear a mask so as to get medicines in the shop”. Before that he must use the key (*/#) to say that he has to type his own message, as

Input: Key=* or Key=#
Output: “Please type your own message in the keyboard”. The average response time of system is 2.6 seconds.

E. *Tested Scenario 5**:***

In this COVID scenario, every individual is responsible for spreading awareness among people. So here too there are some sentences available to instruct customers to beware of safety measures and habits.

The keys used are,

Input: Key=A
Output: “Wearing a mask is mandatory”

Input: Key=B
Output: “Sanitize yourself before and after pharmacy visit”

Input: Key=C
Output: “Visit the nearby clinic in case of cough or fever”

Input: Key=D
Output: “Wash your hands often”

V. CONCLUSION

The electronic voice assistance system was developed for pharmacy dumped person. The system was developed using Raspberry PI, keypad, and the speaker. The text input was given to the system. The text to speech converter deployed code inside the Raspberry PI accepts the text input and concerts into audio output. The audio output is published as output using speaker. It is the handheld device to avoid inconvenience with the dump person in pharmacy shop. The deployed codes were developed using python language. The system was tested with the various case studies and successfully the dumped person was able to handle the device. The average response of time of answering is 2.6 seconds.

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