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ASSISTIVE DEVICE FOR DEAF, DUMB AND BLIND PEOPLE

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Focusing and addressing the problems faced by the differently abled people such as visually, audibly and vocally challenged, through a single device is a tough job. A lot of research has been done on each problem and solutions have been proposed separately. But not all of them are addressed together. The aim of the project is to create a single device solution in such a way that is simple, fast, accurate and cost-effective. The main purpose of the device is to make the differently abled people, feel independent confident by seeing, hearing and talking for them. The paper provides a Google API and python based aid for the blind deaf and dumb people. The proposed device enables visually challenged people to read by taking an image. Further, Image to text conversion and speech synthesis is done, converting it into an audio format that reads out the extracted text translating documents, books and other available materials in daily life. For the audibly challenged, the input is in form of speech taken in by the microphone and recorded audio is then converted into text which is displayed in the form of a pop-up window for the user in the screen of the device. The vocally impaired are aided by taking the input by the user as text through the built-in customized on-screen keyboard where the text is identified, text into speech conversion is done and the speaker gives the speech output. This way the device speaks for the user.

KEYWORDS Google API system, Braille Converter, Customized on-screen keyboard, Text into speech conversion.

I.INTRODUCTION

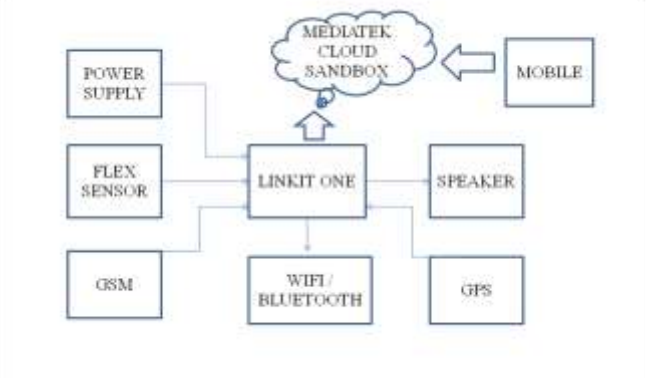
Many physically challenged people in this world are deprived of controlling things around them and they are not able to lead a normal life like normal human beings. About nine million people in the world are vocally challenged. How often we come across these people communicating with the normal world.

The communication between the vocally challenged with others poses to be a serious problem compared to communication between blind and visual person. This creates a very little room for them with communication being a fundamental aspect of human life. The blind people can talk freely by means of normal language whereas the deaf-dumb have their own manual-visual language known as sign language. Sign language is a non-verbal form of interpose which is found amongst vocally challenged in the world. The languages do not have a common origin and hence difficult to interpret..

Communication with the vocally impaired people requires the listener to be familiar with the sign-language, to perceive the information conveyed by them. This increases the complexity in communication and refrains the vocally impaired from approaching normal people. The aim of this project is to design a portable embedded system to provide a simple solution for detection of hand gestures, by reliable signal acquisition. Recognizing the hand gestures, the algorithm will convert them as audio signals. This eases the speech for the vocally challenged by translating hand gestures to auditory speech.

II. SYSTEM MODELLING

BLOCK DIAGRAM OF THE SYSTEM



The above block diagram explains the sequence of actions involved in converting hand gestures into its equivalent audio signals. The FLEX SENSORS are connected to the analog pin of the LinkIt One. Flex sensors change in resistance depending upon the amount of bend on the sensor. They convert the change in bend to electrical resistance - the more the bend, the more will be the resistance value. They are usually in the form of a thin strip from I "-5" long that vary in resistance from

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approximately 10Kn to 50Kn. They are frequently used in gloves to sense finger movement. The flex sensors are used as input and are placed inside the glove that is to be worn. The sensor is so flexible that it bends easily even with a small bend. As it is very thin and light weight so it is also very comfortable. These sensors are highly sensitive and can detect even a small movement made in the muscles. So, when an action is made, the muscles either expands or contracts, developing a potential difference in them. The resistance value is identified from the sensors. Later, these resistance values are converted into its equivalent electrical parameters and are transferred through to the LinkIt ONE board. The board already has certain voltages and audio output signals corresponding to the voltages, in-built in it. When the board receives an input voltage from the FLEX SENSOR, comparison is done between the in-built voltage and the input voltage and the signal corresponding to the voltage that closely match, is given as audio output. The GSM is connected with the LinkIt One board to send a text message to the parent's mobile in case of emergency. The device is also connected with GPS antenna, so it helps in tracking their location by connecting the device with the MEDIATEK CLOUD SANDBOX.

III.DATA ACQUISTION

To start with our research, on obtaining a bio-signal from the Fingers, which require obtaining a signal proportional to the movement of the fingers. Fingers are able to interpret different hand gestures, research showed that many haptic devices used in prosthesis utilized the conventional method of using EMG signals.

Following is the list of possible methods which could be used to sense the hand's movements

• EMG (Electromyography)
• MMG (Mechanomyogram)
• Load cell
• Deterioration of fiber optic cable
• Sliding fiber optic cable
• Strain gauge tactile sensor
• Flex Sensor

After analyzing all of the above methods for signal acquisition the best solution to use flex sensor in this project as it is comparatively reliable and a cost effective solution.

IV.SIGNAL TRANSFER VIA BLE

All the signals acquired must be transferred to the LinkIt ONE board for processing. So BLE4.0 is used for this purpose.LinkIt ONE provides built-in Bluetooth Serial Port Profile (SPP) support for one-to-one connections. The Bluetooth API uses this feature to enable connection of two Bluetooth devices and the data exchange between them. When acting as a server, LinkIt waits for the Bluetooth SPP client before sending data data and receiving data.

When acting as a client, LinkIt will do the following:

- Scan for Bluetooth devices and connect to a designated server device.
- Send data to and receive data from the connected server device.

LinkIt ONE also provides built-in Bluetooth 4.0 Generic Attribute Profile (GATT) to transmit arbitrary data between devices. The GATT profile is a general specification for sending and receiving short pieces of data known as "attributes" over a Bluetooth connection. All Bluetooth 4.0 application profiles are based on GATT.

This module allows you to create a Bluetooth 4.0 central device or a peripheral device. A central device is created with Client and a peripheral device is created with LGATT Server.

Typical steps to build a Bluetooth 4.0 peripheral device are as follows:

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1) Inherit and implement one or more LGATT Service, which defines attributes of each service

2) Call LGATT Server. begin() with service objects as input parameter

3) In the loop() function, call handle Events() to process incoming Bluetooth 4.0 events and requests

4) The call-back functions in LGATT Service is called on corresponding events

Typical steps of call sequence to build a Bluetooth 4.0 peripheral device are as follows:

1) Create a LGATT Clientobject

2) Scan for nearby Bluetooth 4.0 devices and retrieve their addresses and RSSI values

3) Enumerate each scanned device and their available services

4) Connect to the desired device once the required services and profiles are found

5) Read attributes and write attributes according to defined profile behaviour.

V.FLEX SENSOR

Fig. FLEX SENSOR

Flex sensors change in resistance depending upon the amount of bend on the sensor as shown in Fig. They convert the change in bend to electrical resistance - the more the bend, the more will be the resistance value. They are usually in the form of a thin strip from I "-5" long that vary in resistance from approximately 10Kn to 50Kn. They are frequently used in gloves to sense finger movement.

The flex sensors are used as input and are placed inside the glove that is to be worn. The sensor is so flexible that it bends easily even with a small bend. As it is very thin and light weight so it is also very comfortable. Its characteristics are described

- Size- approx 0.28" wide and 1"/3"/5"long
- ResistanceRange-1.5-40K ohms depending on sensor. Flex point claims a 0-250K resistance range.
- Lifetime- Lifetime Greater than I million life cycles
- Temperature Range -35 to +80 degrees Celsius
- Hysteresis- 7%
- Voltage- 5 to 12 V

Inside the flex sensor are carbon resistive elements within a thin flexible substrate. When the substrate is bent the sensor produces a resistance output relative to the bend radius. Pragmatically deflection of 00, 200, 400, 450, 500, 700 and 900 will give 10Kn, 14.5Kn, 18.8Kn, 20Kn, 21.1Kn, 25.5Kn and 30Kn of resistances respectively.

VI.LINKIT ONE BOARD

fig. LINKIT ONE BOARD (FRONT VIEW)

The LinkIt ONE development platform is an open source, high performance board for prototyping wearable and IoT devices. It is a SoC based device that is embedded with Media Tek Aster-MT2502 combined with high performance Wi-fi-MT5931 and GPS-MT3322 chipsets, providing wide range of experimenting and access to the users. It also provides pin-out

features to Arduino boards, making it easy to connect various sensors, peripherals and Arduino shields.

LinkIt ONE is an all-in-one prototyping board for wearable devices integrating GSM, GPRS, Wi-Fi, GPS and Bluetooth features into a basic Arduino form factor. LinkIt ONE board

fig. LINKIT ONE BOARD (BACK VIEW)

can be powered by the micro USB port or by a battery connected to the connector. LinkIt ONE also contains a headphone jack inclusive of stereo and mic, located on the top right of the board. On the back of the board there is a SIM/micro SD card slot and a metallic sheet enclosing the main components MT2502A, Bluetooth and the PMU into the single chip.

CONFIGURING LINKIT ONE

A. Install arduino ide and linkit one sdk

B. Configure the arduino ide

C. Run the test code

LinkIt ONE has been configured and tested successfully.

VII.PROCESSING THE SIGNALS

Once the signals has been transferred to the Link it One via Bluetooth, program has to be written to process the signal. Arduino code is written to program the LinkIt ONE to produce the desired output signal which are obtained from the flex sensor

VIII.GESTURE RECOGNITION

A gesture is a form of non-verbal communication or non-vocal communication in which visible bodily actions communicate particular messages, either in place of, or in conjunction with, speech. Gestures include movement of the hands, fingers, face, or other parts of the body. FLEX SENSORS is one of

fig. GESTURE RECOGNITION

the most efficient hardware used for gesture recognition. When any action is performed, the change in resisitance value is sensed and are converted into its equivalent electrical parameter namely, voltage

IX.IMPORTING AUDIO FILES IN TO THE SD CARD

The LinkIt One board can accept the audio signals in MP3, AAC, AMR and WAV formats. The most widely used format is MP3 for better voice clarity. The MediaTek *LinkIt ONE* development board supports communication with externalmemory, such as an *SD card*, for data storage.The audio signals for various gestures is stored in the SD card and inserted into the LnkIt One board

X.VIRTUAL SPEECH

Virtual speech is obtained as output from the set of speech signals stored in the LinkIt board that is synchronized with the FLEX SENSORS. Each gesture has a resistance value associated with it, to which an audio signal is assigned and saved in the SD card storage, that comes in-built in the LinkIt ONE board. So when a particular gesture is made, the audio corresponding to it is given as ouput to the speakers, connected in the audio jack of the LinkIt ONE board.

XI. LOCATION TRACKING

If the user in trouble , they send a emergency notification to their parents . Since LinkIt One device is connected to the

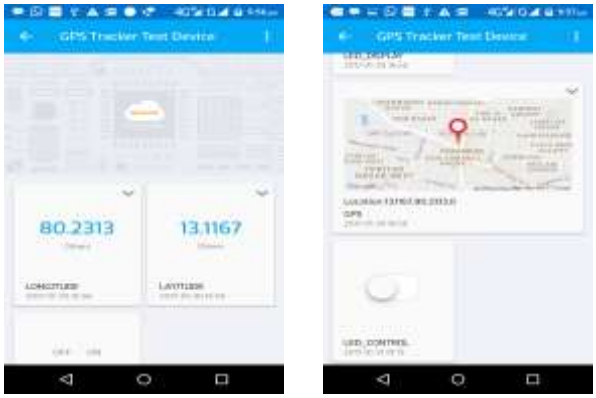

fig. LOCATION TRACKING VIA MEDIATEK CLOUD SANDBOX

MEDIATEK CLOUD SANDBOX, parents can easily track the location of the user by signin to the mediatek cloud website. The notification is delivered to their parents which is indicated to the user by their parents, through blinking a led which is connected to the device. The process is illustrated in the above figure.

XII. CONCLUSION

Thus, our project has taken communication a notch higher where the vocally challenged people get benefited. The physically challenged people who felt deprived can see the world in a new perspective with greater confidence with our device. This system overcomes the difficulties faced by them every day and using this system they can get their basic needs satisfied. Many complexities like communication interruption, expressing emotions, views and ideas have been overcome in our device.

People have always been more comfortable using their mother tongue but have been restrained to use only a single language. Hence our project can be enhanced by incorporating speech in several languages that can be used by people all over the world. On a broader perspective, options can be provided to the user of the device, as to which language they prefer and communication can be made.

Regular updates can be made possible through OTA. Using Bluetooth speakers' confidential information can be easily conveyed to the authenticated person without any leak of privacy, hence our device will be of immense use in defence.

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