

# International Journal of Innovative Research in Science, Engineering and Technology

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## IOT Based Real Time Communication for Deaf People

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**ABSTRACT:** The biggest challenge faced by deaf people is communication. The main aim of this paper is to develop an advanced method of communication for deaf people with the help of IOT. The proposed system would make good use of new technology that is based on Embedded Linux board named Raspberry Pi with an added advanced feature of converting speech to text in Real Time. Normal person will speak into raspberry pi device and it will detect the sound using speech recognition module. After that the Speech will be converted into text and sent to the deaf person's Mobile Application by using Wifi, Bluetooth or Cloud Server according to the situation.

**KEYWORDS:** IOT, API, Text to Speech, Speech to Text, Raspberry PI, Cloud, GSM Module.

### I. INTRODUCTION

The Internet of Things is the internetworking of physical devices, buildings, vehicles and other items embedded with electronics, sensors, software, actuators and network connectivity that enable each objects to collect and exchange data. Typically, IOT is expected to offer advance connectivity of devices, systems and services that goes beyond machine-to-machine (M2M) communications and covers a variety of protocols, domains and applications.

Communication with deaf people becomes more tough if the distance between them is more. For example, Imagine a scenario in which a normal person wants to communicate with a person having a hearing disability situated at a far distance from him, then he won't be able to exchange his/her thoughts.

According to the World Health Organization, about 285 million people in the world are blind, 300 million are deaf and 1 million are dumb. If two persons are near each other, they can use sign language to communicate, but still this technique is inefficient as both should have deep understanding of sign language. For example, if the deaf person needs water then normal person might be easily able to understand that he needs water but if he is suffering from a disease, say CLAUSTROPHOBIA, then normal person might not be able to understand without proper knowledge of sign language.

Our model proposes the solution of inefficient communication between normal and deaf person by implementing a real time System. The main advantage of our raspberry pi device is portability.

If the distance between the two person is less i.e. around 32 metres (105ft), System will use Wifi or Bluetooth to communicate between them. If the distance between them is more, then System will use GSM module to send data to the cloud which can be retrieved at the other end.

### II. RELATED WORK

Deaf people use sign language for communication which is not easy to interpret for people who are not aware of it. Our system tries to remove the barriers faced in communication between deaf and normal person. In [1] they have proposed a new system-prototype called the SHAROJAN BRIDGE in an effort to bridge the gap in the process of communication between the Blind, Deaf and Dumb people. In [5] they have proposed a system which is based on Raspberry pi which includes camera, vibrator, wireless GSM and Bluetooth. When the visitor presses the doorbell,

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captured image is transferred to the wearable device which helps to know the right person at the door or intruder. After transferring image, wearable device vibrates to notify. Also, the message is sent to the owner through GSM. In [3] The approach focuses on: a) embedding intelligence into sensors and actuators using Arduino platform; b) networking smart things using Zigbee technology; c) facilitating interactions with smart things using Cloud services; d) improving data exchange efficiency using JSON data format. This [2] study introduces the initial step of an automatic translation system able to translate visual speech used by deaf individuals to text, or auditory speech. A such a system would enable deaf users to communicate with each other and with normal-hearing people through telephone networks or through Internet by only using telephone devices equipped with simple cameras. This [7] paper describes the development of an Advanced Speech Communication System for Deaf People and its field evaluation in a real application domain. In particular, for purposes of high availability and disaster recovery, replication of data on cloud storage needs to be implemented efficiently. To that end, in [11] paper, they have investigated the combined problem of uploading IoT data from a set of sensor gateways and efficient replication of data on distributed cloud storage.

### III. FEATURES OF RASPBERRY PI

The Raspberry Pi is a series of credit card-sized single-board computers developed in the United Kingdom by the Raspberry Pi Foundation to promote the teaching of basic computer science in schools and in developing countries. The Raspberry Pi hardware has evolved through several versions that feature variations in memory capacity and peripheral-device support. The Raspberry Pi primarily uses Raspbian, a Debian-based Linux operating system.

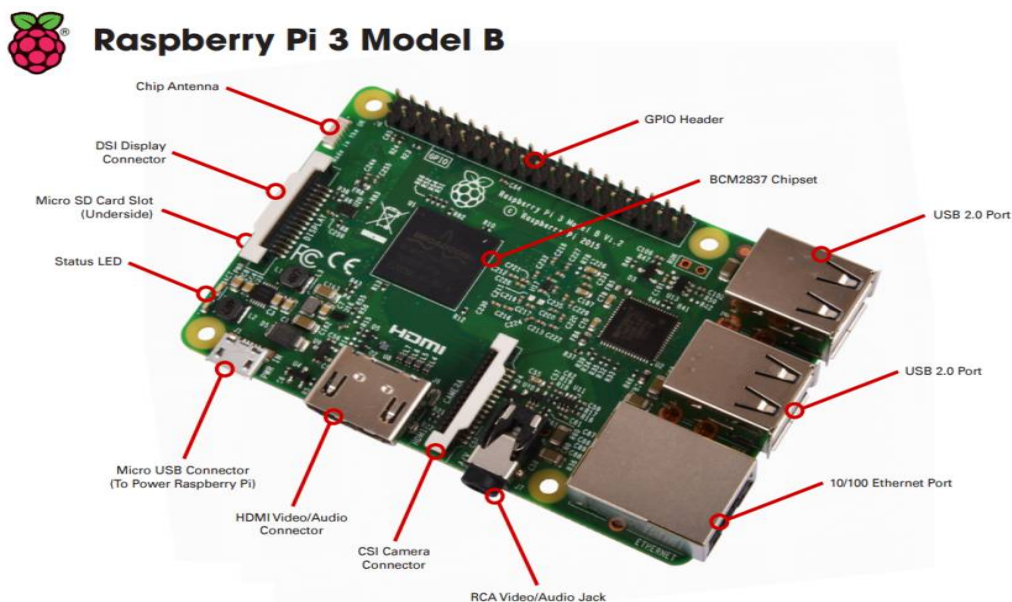


Fig - Raspberry Pi

Specifications:-

SoC: Broadcom BCM2837

CPU: 4× ARM Cortex-A53, 1.2GHz

GPU: Broadcom VideoCore IV

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RAM: 1GB LPDDR2 (900 MHz)

Networking: 10/100 Ethernet, 2.4GHz 802.11n wireless

Bluetooth: Bluetooth 4.1 Classic, Bluetooth Low Energy

Storage: microSD

GPIO: 40-pin header, populated

Ports: HDMI, 3.5mm analogue audio-video jack, 4× USB 2.0, Ethernet, Camera Serial Interface (CSI), Display Serial Interface (DSI)

RDL GSM-GPRS-Sim900A-Modem-with-Stub-antenna-SMA-Connector-MIC-and-Speaker-Socket (GSM

MODULE) is used to communicate between raspberry pi system and cloud server for real time communication.

## IV. CONFIGURATION OF THE SYSTEM

The below diagram describes the arrangement of the proposed system. Here Raspberry Pi has been chosen to be the processing unit of the system because of its features and benefits. The usage of python code is due to its simplicity as compared to the other programming languages.

Here we have used raspberry pi 3 model since wireless or internet or bluetooth connectivity is required.

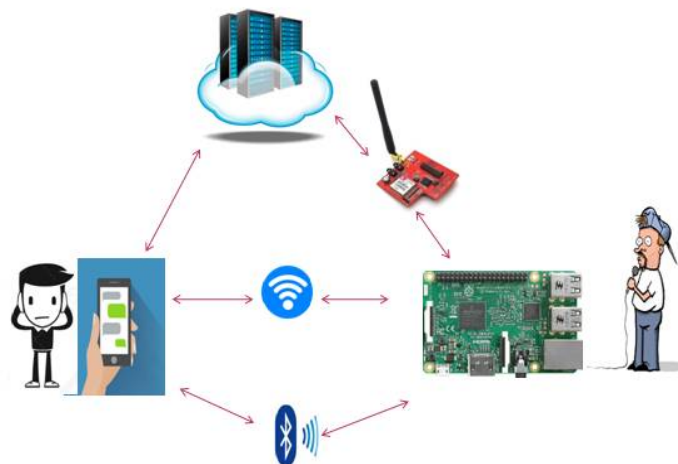


Fig - Configuration of the System

Deaf person will use Android Application for communication purpose. *GSM/GPRS module* is used to establish communication between a raspberry pi device and a *GSM-GPRS* system. Global System for Mobile communication (*GSM*) is an architecture used for mobile communication in most of the countries. Global Packet Radio Service (*GPRS*) is an extension of *GSM* that enables higher data transmission rate.

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### V. EXPERIMENTAL ANALYSIS

#### Raspberry Pi Implementation

**Raspbian OS** :- Raspbian Jessie version is used in this project. It is based on Debian Linux and different Versions of os are named from toy story film characters. This Os is fully revised for the raspberry Pi's hardware. Modifications were made to enhance system processes performance. It runs (Lightweight X11 Desktop Environment) as the desktop environment. Upgrading to raspbian jessie from raspbian wheezy will add a considerable amount of changes and improvements to desktop user interface.

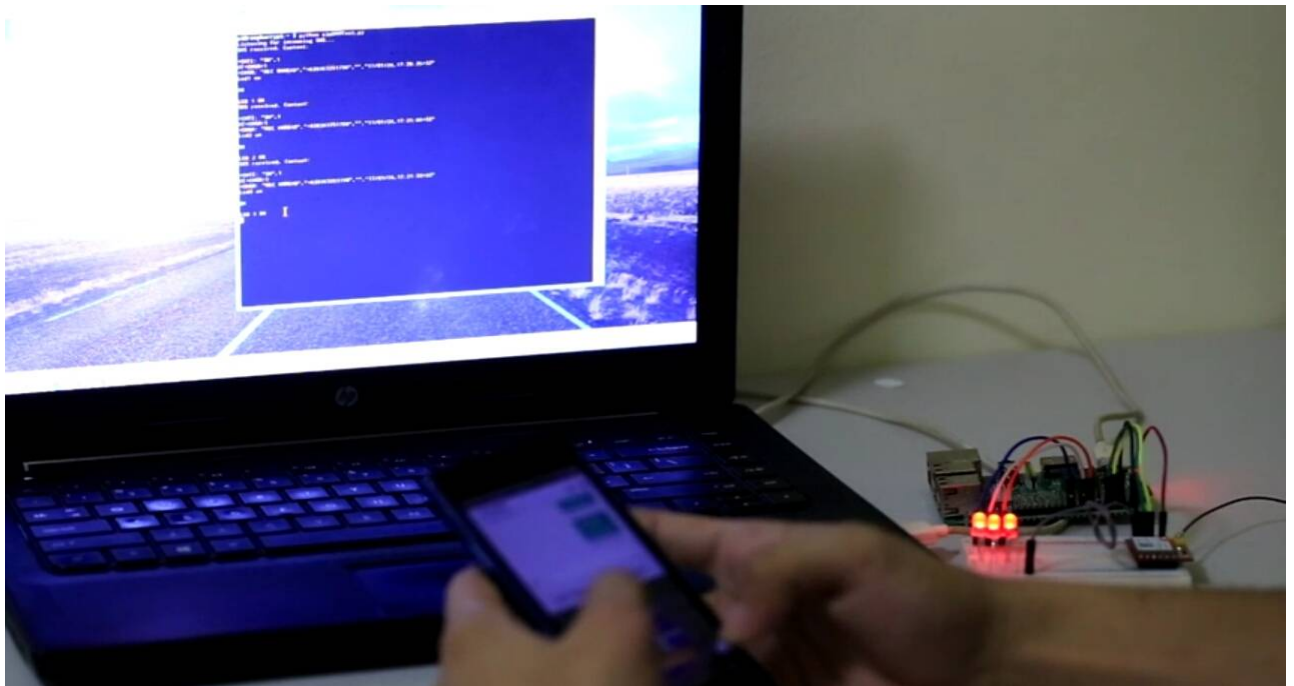


Fig - Implementation of proposed System

Python GUI (Tkinter) application is made on Raspberry pi device through which normal person will send or receive data from Android Application.

Tkinter is Python's de-facto standard GUI (Graphical User Interface) package. Tk/Tcl has long been an integral part of Python. It provides a robust and platform independent windowing toolkit, that is available to Python programmers using the tkinter package, and its extension, the tkinter.tix and the tkinter.ttk modules.

**BLUETOOTHGATT API** is used in Android Application for establishing communication via Bluetooth . Android introduces built-in platform support for Bluetooth Low Energy (BLE) in the *central role* and provides APIs that apps can use to discover devices, query for services, and transmit information.

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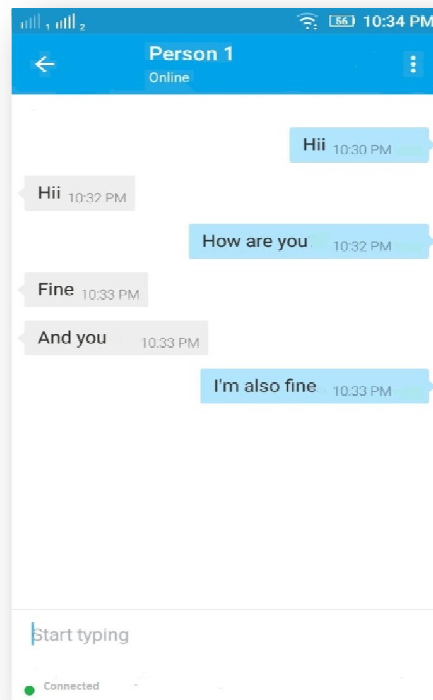


Fig- Mobile Application View

Common use cases include the following:

- Transferring small amounts of data between nearby devices.
- Interacting with proximity sensors like Google Beacons to give users a customized experience based on their current location.
- In contrast to Classic Bluetooth, Bluetooth Low Energy (BLE) is designed to provide significantly lower power consumption. This allows Android apps to communicate with BLE devices that have stricter power requirements, such as proximity sensors, heart rate monitors, and fitness devices.

**Working :-** The voice signal will be inputted into the raspberry pi device through its Audio Jack. This voice signal will be converted into text by using cloud search API and python programming language. The text then goes to Mobile Application on the other end through cloud or Wifi or Bluetooth as per the suitable situation. Our system also includes python code which will convert each word of the text coming from deaf person's mobile to speech which will be outputted through audio jack.



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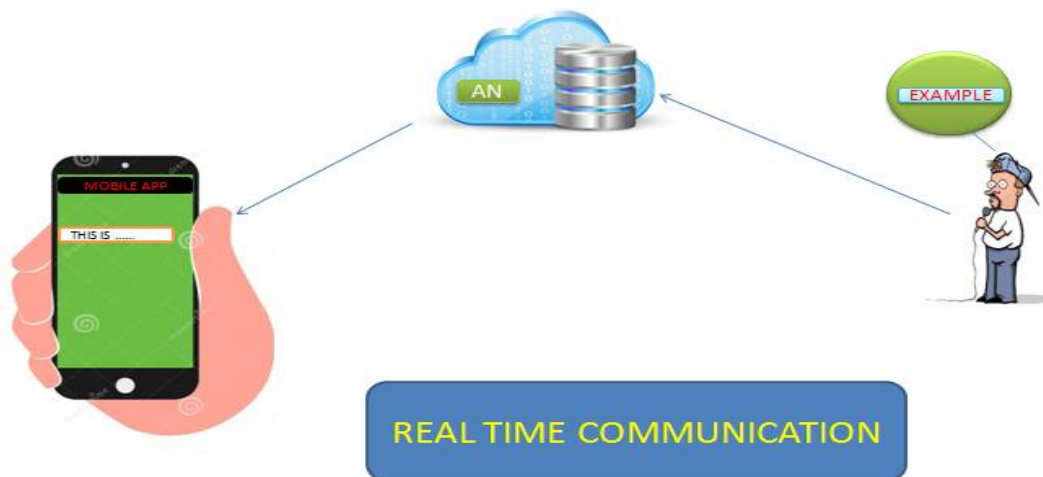


Fig-Real Time Communication

Our system supports 80+ Languages and dialects .The above diagram describes the real time communication. In this diagram, the part of the sentence “this is” has already been received, and the word “an” is being retrieved from the cloud database .The word “example” has just been spoken by the normal person.

### VI. CONCLUSION

Our proposed system supports real time communication which makes it more efficient. On the other hand, it also supports wide range of languages .It is used for short as well as long range communication. Thus our model tries to reduce the difficulties in communication faced by deaf people.

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