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Smart Flight Passenger Hospitality System Using Arduino

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ABSTRACT

As various civilizations started coming into existence, many innovative ideas came to the minds of the people special birds and human messengers were employed to meet these challenges. As ages rolled by, post system developed and transportation vehicles like trains and ships were used to maintain link between people miles apart. But by the turn of the nineteenth century, a great leap in communication system was observed when wireless communication was introduced. After the advent of wireless communication huge change has been observed in the lifestyle of people. Wireless communication which was initially implemented analog domain for transfer has is now a day's mostly done in digital domain. This project was designed to provide a user friendly communication system for deaf, dumb and blind people travelling by airplanes using Bluetooth technology. In our project we are using HC-05 Bluetooth module. The android apps are installed in mobile phones. Here we are using mobile phone touch screen to display the items which are required for passengers in the airplane. The touch screen in mobile phones was designed for deaf and dumb people.

INTRODUCTION

The main aim of this project is to construct a user friendly multi language communication system for the hospitality for people travelling by air lines. It can also be useful for the illiterate people. So in this project we are building a device that helps passengers in expressing their needs with the airhostess i.e., request them if they need anything in the flight like coffee, drinks etc. Communication [1] is one of the important aspects of life. With the advancement in age and its growing demands, there has been rapid growth in the field of communications. Signals, which were initially sent in the analog domain, are being sent more and more in the digital domain these days. Presence of guard band in this system deals with the problem of inter symbol interference (ISI) and noise is minimized by larger number of sub carriers. But the large Peak to Average Power Ratio of these signal have some undesirable effects on the system [2]. Since the very genesis of man, communication has been one of the main aspects in human life .Previously various methods like sign languages were implemented for this purpose.

The voice recognition system was designed for blind people. Deaf and dump can get their needs by clicking the icon in touch screen and blind people get their needs by voice recognition. The information from the transmitter reaches the receiver using Bluetooth technology [3]. The information which is received from Bluetooth will be converted in to hex code by Arduino. If the hex code matches with the decoded database then respective output will be displayed on touch screen. The system acquires speech at run time through a microphone and processes the sampled speech to recognize the uttered text. The recognized text can be stored in a file. We are developing this on android platform using eclipse workbench.

Our speech-to-text system directly acquires and converts speech to text. It can supplement other larger systems, giving users a different choice for data entry. A speech-to-text system [4] can also improve system accessibility

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by providing data entry options for blind, deaf, or physically handicapped users. Voice SMS is an application developed in this work that allows a user to record and convert spoken messages into SMS text message. User can send messages to the entered phone number. Speech recognition is done via the Internet, connecting to Google's server. The application is adapted to input messages in English. Speech recognition for Voice uses a technique based on hidden Markov models (HMM - Hidden Markov Model) [5].

It is currently the most successful and most flexible approach to speech recognition. Mobile phones have become an integral part of our Everyday life, causing higher demands for content that can be used on them. Smart phones offer customer enhanced methods to interact with their phones but the most natural way of interaction remains speech. Android is a software environment for mobile devices that includes an operating system, middleware and key applications.

Arduino is a single-board microcontroller to make using electronics in multidisciplinary projects more accessible. The hardware consists of a simple open source hardware board designed around an 8-bit Atmel AVR microcontroller, or a 32-bit Atmel ARM [6]. The software consists of a standard programming language compiler and a boot loader that executes on the microcontroller. Arduino is a tool for making computers that can sense and control more of the physical world than your desktop computer. It's an open-source physical computing platform based on a simple microcontroller board, and a development environment for writing software for the board. Arduino can be used to develop interactive objects, taking inputs from a variety of switches or sensors, and controlling a variety of lights, motors, and other physical outputs. Arduino projects can be stand-alone, or they can be communicated with software running on your computer (e.g. Flash, Processing, and Max MSP.) [7]

The boards can be assembled by hand or purchased preassembled; the open-source IDE [8] can be downloaded for free. The Arduino programming language is an implementation of Wiring, a similar physical computing platform, which is based on the Processing multimedia programming environment. Feature Schematic design of the open source development interface free download, and also according to the needs of their own changes Download the program is simple and convenient. Simply with the sensor, a wide range of electronic components connection (such as: LED light, buzzer, keypad, photo resistor, etc.), make all sorts of interesting things. Using the high-speed micro-processing controller (ATMEGA328).The development of language and development environment is very simple, easy to understand, very suitable for beginners to learn.

This is what the Arduino board looks like.

CONNECTING A BATTERY

For stand-alone operation, the board is powered by a battery rather than through the USBconnection to the computer. While the external power can be anywhere in the range of 6 to 24 V (for example, you could use a car battery), a standard 9 V battery is convenient. While you could jam the leads of a battery snap into the Vin and Gnd connections on the board, it is better to solder the battery snap leads to a DC power plug and connect to the power jack on the board [9]. A suitable plug is part number 28760 from www.jameco.com. Here is what this looks like.

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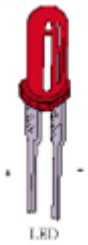
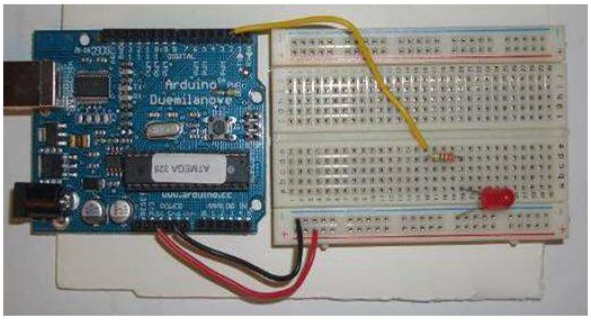
FLASHING AN LED

Light emitting diodes (LED's) are handy for checking out what the Arduino can do. For this task, you need an LED, a 330 ohm resistor, and some short pieces of 22 or 24 g wire. The figure to the right is a sketch of an LED and its symbol used in electronic schematics



Using 22 g solid wire, connect the 5V power pin on the Arduino to the bottom red power bus on the breadboard and the Gnd pin on the Arduino to the bottom blue power buss on the breadboard. Connect the notched or flat side of the LED (the notch or flat is on the rim that surrounds the LED base; look carefully because it can be hard to find) to the Gnd bus and the other side to a free hole in main area of the breadboard Place the resistor so that one end is in the same column as the LED and the other end is in a free column. From that column, connect a wire to digital pin 2 on the Arduino board. Your setup will look something like this



SELECTION OF THE MODULE

The Bluetooth serial module named even number is compatible with each other; The salve module is also compatible with each other. In other word, the function of HC-04 and HC-06, HC-03 and HC-05 are mutually compatible with each other. HC-04 and HC-06 are former version that user can't reset the work mode (master or slave). And only a few AT commands and functions can be used, like reset the name of Bluetooth (only the slaver), reset the password, reset the baud rate and check the version number. The command set of HC-03 and HC-05 are more flexible than HC-04 and HC-06's. Generally, the Bluetooth of HC-03/HC-05 is recommended for the user [10].

INFORMATION OF PACKAGE

The PIN definitions of HC-03, HC-04, HC-05 and HC-06 are kind of different, but the package size is the same: 28mm * 15mm * 2.35mm. The following figure 1 is a picture of HC-06 and its main PINs. Figure 2 is a picture of HC-05 and its main PINs. Figure 3 is a comparative picture with one coin. Figure 4 is their package size information. When user designs the circuit, you can visit the website of Guangzhou HC Information Technology Co., Ltd. (www.wavesen.com) to download the package library of protle version [11].

Fig3.1: HC-06

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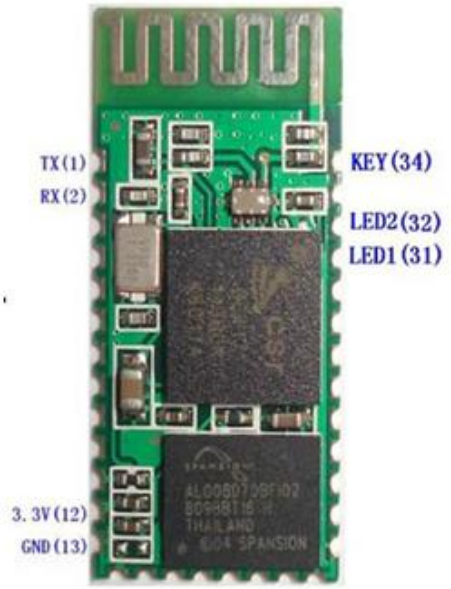


Fig3.2: HC-05

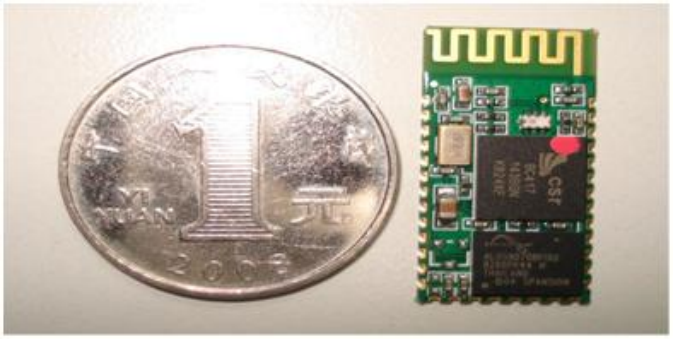
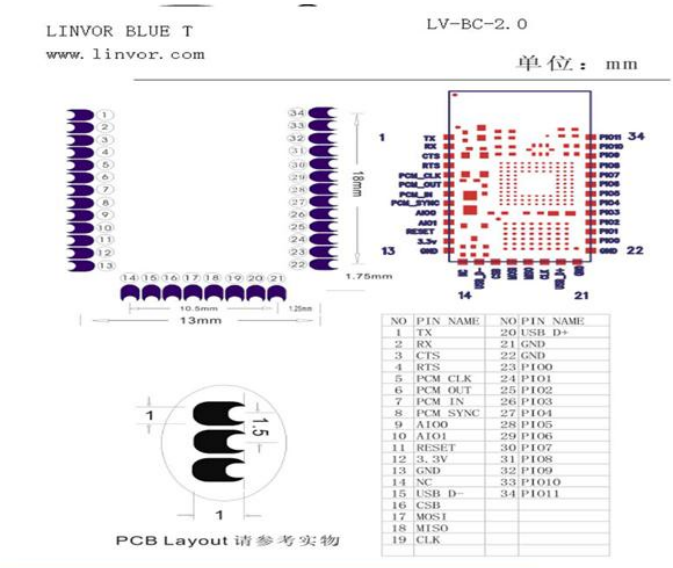


Fig 3.3 Comparative picture with one coin



NO	PIN NAME	NO	PIN NAME
1	TX	20	USB_D+
2	RX	21	GND
3	CTS	22	GND
4	RTS	23	PIO0
5	PCM_CLK	24	PIO1
6	PCM_OUT	25	PIO2
7	PCM_IN	26	PIO3
8	PCM_SYNC	27	PIO4
9	A100	28	PIO5
10	A101	29	PIO6
11	RESET	30	PIO7
12	3.3V	31	PIO8
13	GND	32	PIO9
14	NC	33	PIO10
15	USB_D-	34	PIO11
16	CSB		
17	MOSI		
18	MISO		
19	CLK		

Fig 3.4 Package size information

THE USING AND TESTING METHOD OF HC-06 FOR THE FIRST TIME

This chapter will introduce the using method of HC-06 in detail. User can test the moduleaccording to this chapter when he or she uses the module at the first time.

PINs description:

PIN1	UART_TXD , TTL/CMOS level, UART Data output
PIN2	UART_RXD, TTL/COMS level, s UART Data input
PIN11	RESET, the reset PIN of module, inputting low level can reset the module, when the module is in using, this PIN can connect to air.
PIN12	VCC, voltage supply for logic, the standard voltage is 3.3V, and can work at 3.0-4.2V
PIN13	GND
PIN22	GND
PIN24	LED, working mode indicator Slave device: Before paired, this PIN outputs the period of 102ms square wave. After paired, this PIN outputs high level. Master device: On the condition of having no memory of pairing with a slave device, this PIN outputs the period of 110ms square wave. On the condition of having the memory of pairing with a slave device, this PIN outputs the period of 750ms square wave. After paired, this PIN outputs high level.
PIN26	For master device, this PIN is used for emptying information about pairing. After emptying, master device will search slaver randomly, then remember the address of the new got slave device. In the next power on, master device will only search this address.

(1) The circuit 1 (connect the module to 3.3V serial port of MCU) is showed by figure 3.5.
In principle, HC-06 can work when UART_TXD, UART_RXD, VCC and GND are connected. However, for better testing results, connecting LED and KEY are recommended (when testing the master).

Where, the 3.3V TXD of MCU connects to HC-06's UART_RXD, the 3.3V RXD of MCU connects to HC-06's UART_TXD, and 3.3V power and GND should be connected. Then the minimum system is finished.

Note that, the PIN2:UART_RXD of Bluetooth module has no pull-up resistor. If the MCU TXD doesn't have pull-up function, then user should add a pull-up resistor to the UART_RXD. It may be easy to be ignored.

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If there are two MCU which connect to master and slave device respectively, then before paired(LED will flicker) user can send AT commands by serial port when the system is power on. Please refer to HC-04 and HC-06's data sheet for detailed commands. In the last chapter, the command set will be introduced. Please pay attention to that the command of HC-04/HC-06 doesn't have terminator [12]. Forexample, consider the call command, sending out AT is already enough, need not add the CRLF (carriage return line feed).

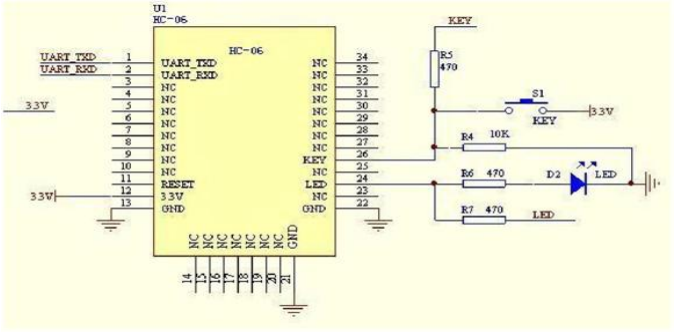

Fig 3.5The circuit 1

If the LED is constant lighting, it indicates the pairing is finished. The two MCUs can communicate with each other by serial port. User can think there is a serial port line between two MCUs.

(2) The circuit 2 (connect the module to 5V serial port of MCU) is showed by figure 3.6

Figure 3.6 is the block diagram of Bluetooth baseboard. This kind of circuit can amplify Bluetooth module's operating voltage to 3.1-6.5V. In this diagram, the J1 port can not only be connected with MCU system of 3.3V and 5V, but also can be connected with computer serial port.

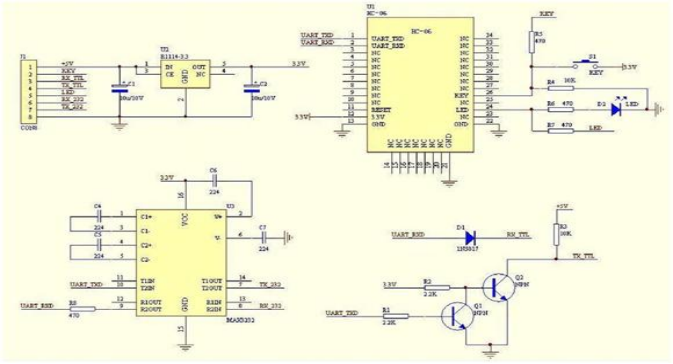

Fig 3.6The circuit 2

SPEECH TO TEXT CONVERSION USING ANDROID PLATFORM

For the past several decades, designers have processed speech for a wide variety of applications ranging from mobile communications to automatic reading machines. Speech recognition reduces the overhead caused by alternate communication methods. Speech has not been used much in the field of electronics and computers due to the complexity and variety of speech signals and sounds. However, with modern processes, algorithms, and methods we can process speech signals easily and recognize the text. In this project, we are going to develop an on-line speech-to-text engine [13].

The system acquires speech at run time through a microphone and processes the sampled speech to recognize the uttered text. The recognized text can be stored in a file. We are developing this on android platform using eclipse workbench. Our speech-to-text system directly acquires and converts speech to text. It can supplement other larger systems, giving users a different choice for data entry. A speech-to-text system can also improve system accessibility by providing data entry options for blind, deaf, or physically handicapped users. Voice SMS is an application developed in this work that allows a user to record and convert spoken messages into SMS text message. User can send messages to the entered phone number. Speech recognition is done via the Internet, connecting to Google's server. The application is adapted to input messages in English. Speech recognition for Voice uses a technique based on hidden Markov models (HMM - Hidden Markov Model). It is currently the most successful and most flexible approach to speech recognition.

Mobile phones have become an integral part of our Everyday life, causing higher demands for content that can be used on them. Smart phones offer customer enhanced methods to interact with their phones but the most natural way of interaction remains speech. Market for smart mobile phones provides a number of applications with speech recognition implementation.

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Google's Voice Actions and recently iphone's Siri are applications that enable control of a mobile phone using voice, such as calling businesses and contacts, sending texts and email, listening to music, browsing the web, and completing common tasks. Both Siri and Voice Actions require an active connection to a network in order to process requests and most of Android phones can run on a 4G network which is faster than the 3G network that the iPhone runs on.

ANDROID

Android is a software environment for mobile devices that includes an operating system, middleware and key applications [1]. In 2005 Google took over company Android Inc., and two years later, in collaboration with the group the Open Handset Alliance, presented Android operating system (OS). Main features of Android operating system are:

- Enables free download of development environment for application development.
- Free use and adaptation of operating system to manufacturers of mobile devices.
- Equality of basic core applications and additional applications in access to resources.
- Optimized use of memory and automatic control of applications which are being executed.
- Quick and easy development of applications using development tools and rich database of software libraries.
- High quality of audiovisual content, it is possible to use vector graphics, and most audio and video formats.
- Ability to test applications on most computing platforms, including Windows,Linux…

The Android operating system (OS) architecture is divided into 5 layers (fig. 1.). The application layer of Android OS is visible to end user, and consists of user applications. The application layer includes basic applications which come with the operating system and applications which user subsequently takes. All applications are written in the Java programming language. Framework is extensible set of software components used by all applications in the operating system. The next layer represents the libraries, written in the C and C + + programming languages, and OS accesses them via framework.

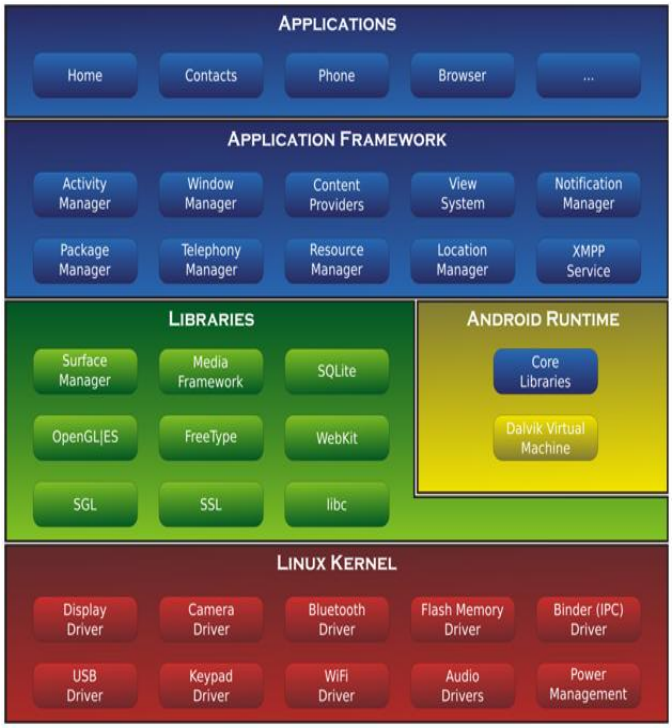

Fig5.1: Android Architecture

SPEECH RECOGNITION

Speech recognition for application Voice SMS is done on Google server, using the HMM algorithm. HMM algorithm is briefly described in this part. Process involves the conversion of acoustic speech into a set of words and is performed by software component. Accuracy of speech recognition systems differ in vocabulary size and confusability, speaker dependence vs. independence, modality of speech (isolated, discontinuous, or continuous speech, read or spontaneous speech), task and language constraints . Speech recognition system can be divided into several blocks: feature extraction, acoustic models database which is built based on the training data, dictionary, language model and the speech recognition algorithm. Analog speech signal must first be sampled on time and amplitude axes, or digitized. Samples of speech signal are analyzed in even intervals. This period is usually

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20ms because signal in this interval is considered stationary.

Speech feature extraction involves the formation of equally spaced discrete vectors of speech characteristics. Feature vectors from training database are used to estimate the parameters of acoustic models. Acoustic model describes properties of the basic elements that can be recognized. The basic element can be a phoneme for continuous speech or word for isolated words recognition. Dictionary is used to connect acoustic models with vocabulary words. Language model reduces the number of acceptable word combinations based on the rules of language and statistical information from different texts. Speech recognition systems, based on hidden Markov models are today most widely applied in modern technologies. They use the word or phoneme as a unit for modeling.

The model output is hidden probabilistic functions of state and can't be deterministically specified. State sequence through model is not exactly known. Speech recognition systems generally assume that the speech signal is a realization of some message encoded as a sequence of one or more symbols . To effect the reverse operation of recognizing the underlying symbol sequence given a spoken utterance, the continuous speech waveform is first converted to a sequence of equally spaced discrete parameter vectors. Vectors of speech characteristics consist mostly of MFC (Mel Frequency Cepstral) coefficients , standardized by the European Telecommunications Standards Institute for speech recognition. The European Telecommunications Standards Institute in the early 2000s defined a standardized MFCC algorithm to be used in mobile phones . Standard MFC coefficients are constructed in a few simple steps. A short-time Fourier analysis of the speech signal using a finite-duration window (typically 20ms) is performed and the power spectrum is computed. Then, variable bandwidth triangular filters are placed along the perceptually motivated mel frequency scale and filter bank energies are calculated from the power spectrum.

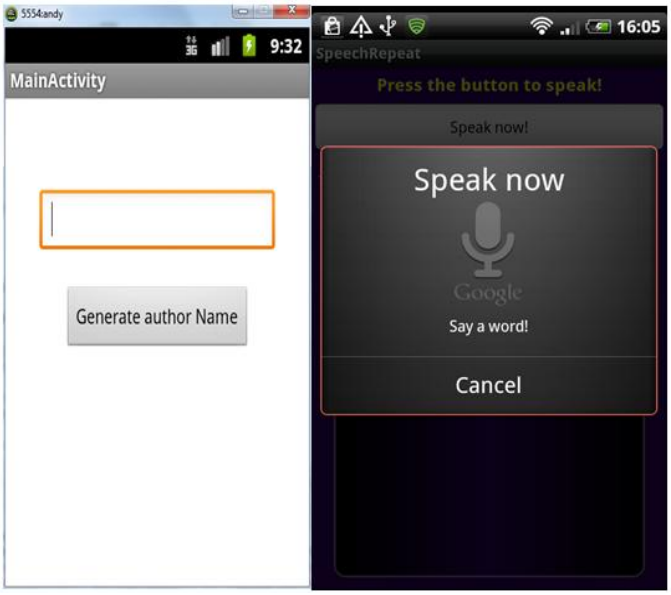

Fig5.2:Enables search after clicking image button

Fig5.3:Process and gives text output

Fig5.4:Interfacing for sending SMS

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PROPOSED MODEL

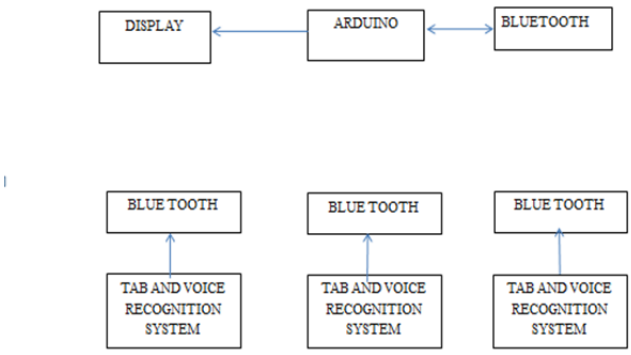

Fig6.1 block diagram

Here we are using mobile phones to display the items which are used for passengers in the airplane. Voice recognition system is used mainly for dumb and illiterates as they can easily communicate. Here bluetooth is used as a interface. Arduino is used as a controller in this system. We use Buzzer asa indication to the airhostess that hospitality should be needed.

RESULTS

This project was designed to provide a user friendly communication system fordeaf,dumb and blind people travelling by airplanes using Bluetooth technology. In our project we are using HC-05 bluetooth module.

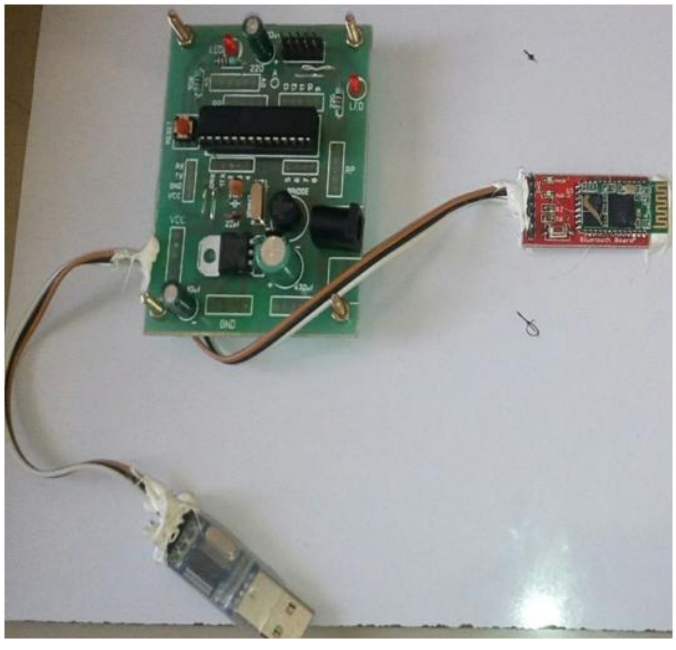

Fig7.1: HC-05 bluetooth interface

INPUTS:

Fig7.2: Transmitter Section

As shown the fig1 android apps are installed in mobile phones. Here we are using mobilephone touch screen to display the items which are required for passengers in the airplane.The touchscreen in mobile phones was designed for deaf and dumb people.The voice recognition system was designed for blind people. Deaf and dump can get their needs by clicking the icon in touchscreen and blind people get their needs by voice recongition. The information from the transmitter reaches the receiver using Bluetooth technology.

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Outputs:

Fig7.3: Receiver Section

The information which is received from Bluetooth will be converted in to hex code by arduino. If the hex code matches with the decoded database then respective output will be displayed as shown in fig7.3.

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