

Zigbee Based Personal Area Network for Speech Impaired People

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Abstract - In India itself there are over 2.7 million people with speech impairment .The communication between speech impaired person and hearing person poses to be a serious problem compared to communication between blind and normal visual people. To communicate at list basic needs of speech impaired people in hotel, shops etc this system will work to help them. For the implementation of this system zigbee technology is used. Along with zigbee GLCD screen and Touch screen pad are used for easy communication between speech impaired person and normal person. For a suite of high level communication protocols Zigbee has some specification used to create a personal area network with small, low power , digital radios ,such as for home automation ,medical device data connection and other low power low bandwidth needs, designed for small scale projects which need wireless connection.

Key Words — Zigbee, GLCD, Personal Area Network, Microcontroller, Arduino Uno, Intel 8051, Speech Impaired.

I. INTRODUCTION

In this practical world everyone has to have an equal opportunity to success. But the disabled people like the speech impaired face obstacles in their way to success just because of their disability .So to avoid this obstacles this system is implemented to help speech impaired people. For the implementation of this system zigbee technology is selected because it is simpler and less expensive as compare to other wireless personal area networks such as bluetooth or wifi. Its low power consumption limits transmission distances to 10-100 meters. For the data transmission of Zigbee over long distances by passing data through mesh network of intermediate devices to reach more distance ones. Zigbee is best suited for intermittent data transmission from sensor or input device. So in this system zigbee is used as zigbee transmitter and zigbee receiver. Graphical LCD displays the information received by Zigbee receiver. As ZigBee is the reliable technology in wireless field, an attempt is made to demonstrate its way of functionality through ZigBee transmitter.

II. LITERATURE REVIEW

The language do not have a common origin and hence difficult to interpret. In 1990 Zigbee-style self-organizing ad-hoc digital radio networks were conceived .On june 13, 2005 the zigbee alliance announced availability of Specification 1.0 known as the zigbee 2004 Specification. In September 2006, the zigbee 2006 Specification was announced. Then Zigbee PRO, which is well known as zigbee 2007, the enhanced zigbee Pro Specification, was posted on 31 October 2007, and was finalized that same year. zigbee PRO is fully backward-compatible with zigbee 2006 devices. A zigbee 2007 device may join and operate on a zigbee 2006 network and vice versa. Due to differences in routing options, zigbee PRO devices must become non-routing zigbee End-Devices (ZEDs) on a zigbee 2006 network, and zigbee 2006 devices must become ZEDs on a zigbee PRO network. The applications running on those devices work the same, regardless of the stack profile beneath them. The first zigbee Application Profile, Home Automation, was announced November 2, 2007.

This paper works on zigbee based personal area network for Speech impaired people. Before this system implemented there were lots of problems faced by speech impaired people. In hotels or shops there were not any system which will help speech impaired people. But after implementation of this system, it becomes easier for speech impaired people to give their order in Hotels, also in shops. This system requires small space and also inexpensive .The hardware used in this system are small in size and less expensive.

III. SYSTEM IMPLEMENTATION

Microprocessor and Microcontroller are the devices used in embedded system. Microprocessor simply accept the inputs, process it and give the output. Microprocessors used in everything from the smallest embedded systems and handheld devices to the largest mainframes and supercomputers.. In contrast, a microcontroller not only accepts the data as inputs but also changes it, interfaces the data with various devices, controls the data and thus finally gives the result .For the implementation of system we can use zigbee technology as well as PIC18F452 and PIC16F73

microcontroller can be used. The system design consist of two sections; hardware and software implementations. The hardware implementation consists of the development of the Touch screen sensor, ZigBee and GLCD while the software implementation focuses on the programming of the microcontroller using Proteus 7 (Embedded C).

as large as 124 simultaneously. ZigBee is used for many applications which require a lower data rate, longer battery life, and secured networking. It has a defined data rate of 250kb/s.

IV. HARDWARE IMPLEMENTATION



Figure 3. zigbee Module

The zigbee network layer mainly supports both star and tree networks, and generic mesh networking. Within star networks, the coordinator must be the central node which is also known as central Hub. Both trees network and mesh network allow the use of zigbee routers to extend communication at the network level.

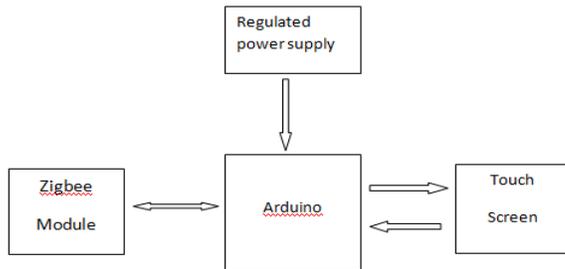


Figure1. Block diagram of Transmitting System

4.2 Arduino UNO

Arduino is an open source computer hardware and software company, and user community that not only designs but also manufactures single-board microcontrollers and microcontroller kits for building digital devices as shown in figure 4 below. Arduino boards are consist of sets of digital and analog input/output (I/O) pins that may be interfaced to various circuits. The serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs from personal computers these are some features of arduino board. The microcontrollers are typically programmed using a languages C and C++.

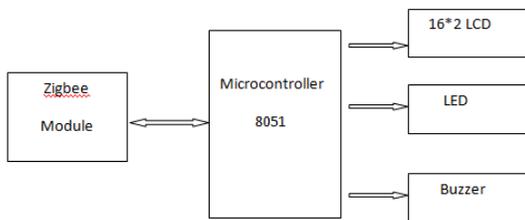


Figure 2. Block diagram of Receiving System

4.1 Zigbee

Small scale projects which need wireless connection zigbee is best suited .It is also suited for high-level communication protocols used to create personal area networks with small , low-power digital radios, such as for home automation, medical device data collection, and other low-power low-bandwidth needs. There was a need for a standard communication and hence as a result the ZigBee Alliance created ZigBee as shown in figure in 3. ZigBee is capable of transmitting data by passing data through intermediate devices, reaching more distant ones, thus creating a network. Zigbee has key components like PAN coordinator, routers and end devices. To deal with multiple applications all of them can be configured. It can configured



Figure 4. Arduino Uno

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins, 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. The board

consist of everything needed to support the microcontroller; simply we have to connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

4.3 Intel MCS-51

8051 is the originally named by Intel with 4 KiB ROM and 128 byte RAM. Others are 8031 and 8032 are ROM-less versions, with 128 and 256 bytes RAM. The last digit of it can indicate memory size, e.g. 8052. The Intel MCS-51 commonly known as 8051 microcontroller. It has internally Harvard architecture, complex set of instruction, single chip microcontroller (μC) series developed by Intel in 1980 for use in embedded systems. The 8051 architecture provides many functions such as CPU (Central processing unit), random access memory (RAM), read only memory (ROM), input/output (I/O), interrupt logic, timer, etc.) in one package: 8-bit arithmetic logic unit (ALU) and accumulator, 8-bit registers (one 16-bit register with special move instructions), Also it has 8-bit data bus and 2×16 -bit address bus/ program counter/data pointer and related 8/11/16-bit operations; hence it is mainly an 8 bit microcontroller.

4.4 GRAPHICAL LCD

The normal LCD with 16x2 Character have their own limitations; it can only display characters of certain dimensions. To display customized characters and image the graphical LCD are thus used. In upcoming section of LCD we are going to discuss about normal 16*2 LCD which is alphanumeric display used to display character and numbers. We need Graphic display for complex graphic or may be image, animations, graphs, wave-forms then we need Graphic display. There are different model of Graphic display. Here we will Learn about KS0108 controllers based 128x64 Graphic LCD.



Figure 5 . Graphical LCD

The KS0108 controller divides the 128x64 LCD into two equal halves with each half being controlled. Such LCDs that is using KS0108 controller involves paging scheme, i.e., whole LCD is divided equally into pages. Each page has 64×64 pixel. Each page in turn is divided into 8 line. When we write a byte to the LCD from the microcontroller it is displayed on that column. These GLCD have common display drivers like KS0108 and T6963C and 4 wire resistive

touch screen. There is no need for touch screen digitizer/controller for microcontrollers having on chip ADC with four analog channels. The graphical LCDs has many applications; they are used in video games, mobile phones, lifts etc. as display units.

4.5 ALPHA NUMERIC LCD

A 16x2 LCD (Liquid Crystal Display) is very basic module and is very commonly used in many devices and circuits. These modules are convenient as compare to seven segments and other multi segment LEDs. The reasons are LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5×7 pixel matrix. This LCD consist of two registers, namely, Command and Data. The command register stores the command instructions given to the LCD. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD.

4.6 TOUCH SCREEN SENSOR

A touch screen is an input and output device which is normally layered on the top of an electronic visual display of an information processing system. A user can give input or control the information processing simple or multi-touch gestures by touching the screen. The user can use the touch screen to react to what is displayed and to control how it is displayed; for example, zooming to increase the text size.

Touch screen is an electronic visual device that helps the user to operate by touching the icons displayed on the screen. Touch screen based system allows an easy navigation. Whereas a touch screen sensor is a clear transparent glass or polymer panel having touch response surface. This sensor is placed over the screen so that the responsive area of the panel covers the area of the display. In most the sensors, the electrical signal flows over the panel and on touching the signal or voltage changes. This change is used for detecting the exact location of touch.

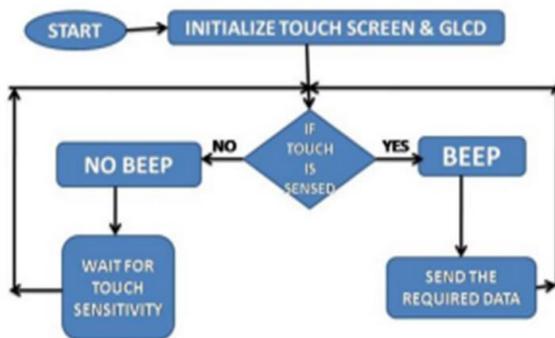
V. WORKING

Working of this system is divided into two sections which are Transmitting section and Receiving Section

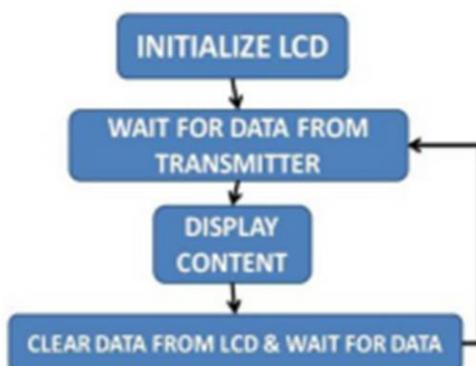
The transmitting section of the system will work such that when the speech impaired user will start the system, the person will observe a welcome screen with multiple options that will be programmed into the system. The options such as coffee, cold drink etc. The user will have to select the option he wishes to use and further the display will showcase icons on the touch screen display under that option. The user will have to recognize the required icon and touch it to select it. The data of the selected icon will be processed by the microcontroller and transmitted via ZigBee transmitter.

At the receiving section of the proposed system, the unit must be first switched on. The ZigBee Receiver will receive the data transmitted by the ZigBee transmitter. The microcontroller will process the data and it will be displayed in verbal form on the screen at the receiver system. LED indicators and buzzers are used for prompting the user that new data is available.

How the Transmitter will Work



How the Receiver will work



VI. SOFTWARE IMPLEMENTATION

A. PROTEUS 8

Proteus 8 is a professional software which can be used to draw schematics, PCB layout. Drawing the schematics is very easy using Proteus. The Proteus Design Suite is an Electronic Design Automation (EDA) tool including schematic capture, simulation and PCB Layout modules. The software runs on the Windows operating system. Proteus combines ease of use with powerful features to help you design, test and layout professional PCBs. We can click the 'pick devices' button and select the desired component also wire can be drawn.

B. FLASH MAGIC

Flash Magic is an application developed by Embedded Systems Academy to allow you to easily access the features of a microcontroller device. With this program one can erase individual blocks or the entire Flash memory of the microcontroller. This application is very useful for those who work in the electronics field. The main window of the program is composed of five sections where you can find the most common functions in order to program a microcontroller device.

C. Arduino 1.5.4

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them.

VII. SIMULATION OUTPUT

The actual touch input at the transmitter GLCD and the respective output generated on the receiver LCD is pictorially represented as follows:

In the below figure we see the some icons of particular options are their on Graphical LCD. The user have to select this option by touching on it

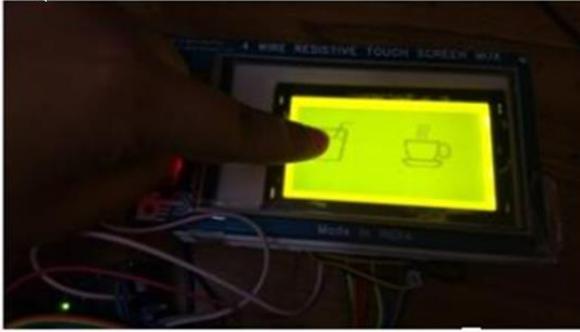


FIGURE 6 . TRANSMITTER OUTPUT

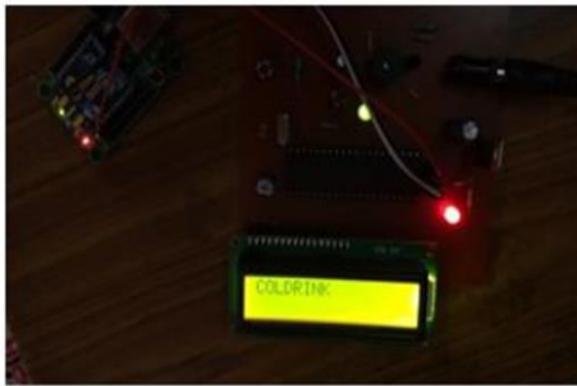


FIGURE 7. RECEIVER OUTPUT

VIII. ADVANTAGES

Easy to implement, Reliable, Fast communication Useful for speech impaired and paralyzed person ,person at the receiver side will be always in contact with handicapped person.

IX. APPLICATION

Easy to communicate for speech impaired people while it will use in hotels, shop, etc.

FUTURE ENHANCEMENT

This system can be implemented by more than one transmitter connected in the same network to establish a communication between the head receiver and the speech impaired people/customers. Thus in particular hotel we can implement more than one transmitter. With the help of this system multiple languages can be incorporated thus enhancing communication between people who don't speak the same language. Also, we can use TFT LCD screen in case of graphical LCD for more convenience.

CONCLUSION

This paper is a useful tool for speech impaired which will fill the communication gap. The main goal of this paper is to implement successfully a PAN that will facilitate the basic communication for speech impaired in Hotel, shops etc. Hence this paper is an attempt to make it easy to understand the actions of speech impaired people by getting the output in the form of text on alpha numeric LCD. This system will provide an efficient device that helps the speech impaired to communicate. ZigBee used in this project will provide a typical range of 50m. By using power zigBee module , the range. ZigBee is most preferable where data security is important.

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