

## ZIGBEE-BASED ASSISTANCE SYSTEM FOR ENHANCING AIR TRAVEL EXPERIENCE FOR THE DEAF AND HARD OF HEARING

<sup>1</sup>GANDHE PRASAD RAJENDRA,<sup>2</sup>SUDHEER RAJA VENISHETTY,<sup>3</sup>LINGAIAH JADA,  
<sup>4</sup>POTU ANKITHA,<sup>5</sup>BATHULA YAMINI

<sup>1</sup>Assistant Professor, <sup>2,3</sup>Associate Professor, <sup>4,5</sup>Students  
Department of ECE

Vaagdevi College of Engineering, Warangal, Telangana

### ABSTRACT

This paper's primary goal is to provide an easy-to-use multilingual communication system for illiterate or stupid individuals who travel by air. Since there are many different languages in the world, it is difficult for us to be fluent in them all. Therefore, in this study, we are developing a tool that enables users to communicate their requirements to airhostesses (those who speak a different language) by asking them whether they need anything during the trip, such as coffee, tea, beverages, etc. Because this material includes visuals that illustrate the demands, we employ touch screen technology to make it easier to understand, especially for those who are illiterate. This even makes it easier for air hosts to greet guests who speak diverse languages. Here, Zigbee technology is used for wireless communication.

**Keywords:** Zigbee, Airlines,

### I. INTRODUCTION

Because it is accompanied with visuals that highlight the demands, touch screen technology is employed in this article to make it simple, especially for those who are illiterate. This even makes it easier for nurses to interact with clients who speak different languages. Here, Zigbee technology is used for wireless communication. ZigBee is a wireless technology that was created as an open worldwide standard to meet the particular requirements of wireless sensor networks that are inexpensive and low-power. The IEEE 802.15.4 wireless protocol serves as the foundation for the Zigbee series of specifications. Since Zigbee is a new wireless technology, we tried to show how it works and its many features, including types, benefits, and drawbacks, by developing a tiny application to operate various machinery and electrical equipment. Many people use Zigbee technology to send large amounts of data quickly via a dedicated channel. This project uses a Zigbee-based system that uses an LCD and touch screen to display visuals and transfer wireless signals based on user input. The data will be shown in English on an LCD at the receiver's (nurses') end. Here, the micro controller uses a Zigbee transmitter to relay the information when the user gently touches the graphics on the touch screen LCD to indicate his needs. The LCD will show the data that the Zigbee receiver has received. Every time we visit a restaurant, we are given a menu that is pasted on the wall or on the table. A waiter or other staff member is either waiting at the table or approaching it to take our orders and determine the best way to serve us. Typically, the item name is written in the restaurant without a picture or the same picture is kept for the same item for many years. There are several reasons why a client can get unhappy, and one of them is that the waiter takes a long time to take their orders since there aren't many servers in the restaurant. Human mistake is also a possibility, such as when a waiter serves a customer the incorrect order. In light of all the issues that arise when doing things manually, we are putting forward a system that is entirely digital. It is based on an Arduino microcontroller and includes a touch screen that is positioned above a GLCD. The idea is that we can view the menu at our fingertips right on the table. The items on the menu are clearly defined and described, along with the ingredients, pictures, and other details. The customer uses the touch screen to place their order, choosing from a variety of categories. The serving staff will then serve their order, or they can self-serve.

The Zigbee Alliance created Zigbee, a wireless technology, as an open worldwide standard to meet the particular requirements of wireless sensor networks that are low-cost and low-power [5]. The standard runs in unlicensed bands globally at the following frequencies: 2.400–2.484 GHz, 902–928 MHz, and 868.0–868.6 MHz. It fully utilises the IEEE 802.15.4 physical radio specification. The

XbeeZigbee Module from Digi International is the Zigbee utilised in this study. It uses only 1 mW of power to transfer data, and it can communicate data up to 30 m. There are three modes of operation available for Xbee, which operates at 2.4 GHz: AT mode, Application Programming Interface (API) mode, and API with Escape (ESC) character mode. For this project, API operation was selected for a number of reasons. First of all, it doesn't require command mode to send data to several locations. Second, it may determine each packet's originating address, and third, it will be informed of the transmission's success or failure.

## II. LITERATURE SURVEY

A Touch Screen and Zigbee Based Wireless Communication Assistant: The principle point of this undertaking is to develop an easy to use multi-dialect correspondence framework for ignorant/imbecilic individuals going via Airlines. As we have distinctive dialects in our reality and it's inconceivable for us to know every one of the dialects. Along these lines, in this venture we are building a gadget that encourages them in communicating their necessities with other dialect individuals (Airhostess) i.e. ask for them in the event that we require anything in the flight like espresso, tea, drinks and so forth. In this task we utilize GLCD and Touch screen Technology to make it simple even to unskilled people as it is additionally included with pictures, which shows the necessities. This even decreases the trouble to airhostess in accepting the clients with various dialects. Here for remote correspondence reason we utilize Zigbeeinnovation[1].

In India itself there are over 2.7 million people with speech impairment. [2]. these speech disorders can occur at any age. Regardless of the severity, a person's ability to interact and communicate with others is affected. The speech impaired does not have any problem in processing their thoughts but only to express them. In the 21st century 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. The obstacles are mainly due to the fact that they do not have enough resources to communicate their thoughts. The main motive of this paper is to implement a system such that it aides the speech impaired to communicate at least the basic needs. This communication could be between two speech impaired personals or between a speech impaired and a person with no impairment. To implement this system ZigBee technology is selected because ZigBee is a wireless technology developed as an open global standard to address the unique needs of low cost, low power, wireless sensor networks. ZigBee is the set of specifications built around the IEEE 802.15.4 wireless protocol. [3]. as ZigBee is the reliable technology in wireless field, an attempt is made to demonstrate its way of functionality through ZigBee transmitter. The information received by the ZigBee receiver will be displayed on GLCD. ZigBee is an IEEE 802.15.4-based specification for a suite of high-level communication protocols used to create personal area networks with small, low-power digital radios. [4]. LANs and WLANs evolved and WPANs which were its part were used to cover small areas using less power required for transmission. The technology defined by the ZigBee specification is intended to be simpler and less expensive than other wireless personal area networks (WPANs), such as Bluetooth or Wi-Fi. Applications include wireless light switches, electrical meters with in-home displays, traffic management systems, and other consumer and industrial equipment that require short-range low-rate wireless data transfer., [5] An embedded system is a combination of software and hardware to perform a dedicated task. Some of the main devices used in embedded products are microprocessors and microcontrollers. Microprocessors are commonly referred to as general purpose processors as they simply accept the inputs, process it and give the output. In contrast, a microcontroller not only accepts the data as inputs but also manipulates it, interfaces the data with various devices, controls the data and thus finally gives the result. [6]. this system will be implemented by using not just ZigBee but also PIC18F452 and PIC16F73 microcontrollers. The system design can be divided into 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). : The new standards in the ISM radio band are frequencies 868 MHz, 915 MHz and 2.4 GHz. From these the frequency of 2.4GHz is used worldwide. There was a need for a standard communication and as a result the ZigBee Alliance created ZigBee. [7] ZigBee is a specification based on IEEE 802.15-4 standard used for high level communication protocols, creating a personal

area networks from small and low-powered digital radio system. ZigBee is capable of transmitting data by passing data through intermediate devices, reaching more distant ones, thus creating a network. The key components of a ZigBee network are- PAN coordinator, routers and end devices. All of them can be configured to deal with multiple applications as large as 124 simultaneously. [8] ZigBee is employed in applications which require a lower data rate, longer battery life, and secured networking. It has a defined data rate of 250kb/s. [9]. 4.2 Data Security in ZigBee: The encryption algorithm used is AES (Advanced Encryption Standard) with a 128bit key length (16 Bytes). [10]. It is really important to count with an unique kind of encryption method due to the fact that most of the 802.15.4/ZigBee transceivers have a specific hardware design to cope with this work at the electronic level (embedded low resources devices). The AES algorithm is not only used to encrypt the information but to validate the data which is sent. This concept is called Data Integrity and it is achieved using a Message Integrity Code (MIC) also named as Message Authentication Code (MAC) which is appended to the message. [11] This code ensures integrity of the MAC header and payload data attached. It is created encrypting parts of the IEEE MAC frame using the Key of the network, so if we receive a message from a non-trusted node we will see that the MAC generated for the sent message does not correspond to the one what would be generated using the message with the current secret Key, so we can discard this message. The MAC can have different sizes: 32, 64, 128 bits, however it is always created using the 128bit AES algorithm. Its size is just the bits length which is attached to each frame.

JiasongMuLiangHan et.al.said that The ZigBee network is widely studied and deployed recently because of its low cost and simplicity features. However, the power consumption issue needs a further improvement since the application requirements are not fully satisfied.

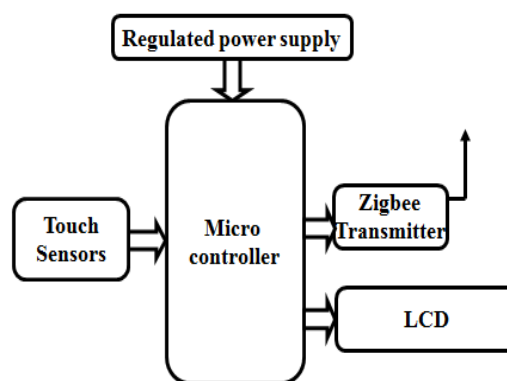
### III. EXISTING METHODS

In the existing model of assistance system for dump people in airplanes using manual mode of operations. When the passenger feels emergency condition for everything we need to call airhostess for help. It's very difficult and time taking process. Airhostess will assist passenger in limited time so this system is poor to assist passenger. We are integrating wireless touch screen based assist system for easy way of approaching passengers in any emergency conditions using wireless zigbee system.

### PROPOSED METHOD

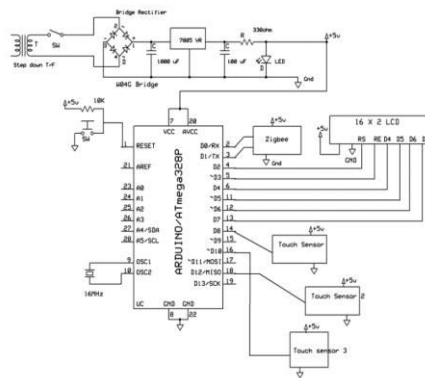
The methodology of this project design can be divided into two sections; hardware and software implementations. The hardware implementation consists of the development of the Touch screen sensor, Zigbee, Buzer, Arduino micro controller ,LCD and ARDUINO IDE integrated software This having transmitting section and receiving section using zigbee

#### 1. Transmitter Section



**Fig.1: Block Diagram of Transmitter**

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.



**Fig .2: Schematic diagram of transmitter**

**IV. SOFTWARE ARCHITECTURE:**

There are several different types of software architecture in common use.

- Simple Control Loop:

In this design, the software simply has a loop. The loop calls subroutines, each of which manages a part of the hardware or software.

- Interrupt Controlled System:

Some embedded systems are predominantly interrupting controlled. This means that tasks performed by the system are triggered by different kinds of events. An interrupt could be generated for example by a timer in a predefined frequency, or by a serial port controller receiving a byte. These kinds of systems are used if event handlers need low latency and the event handlers are short and simple.

**zigbee Receiver:**

The ST-RX02-ASK is an ASK Hybrid receiver module. A effective low cost solution for using at 315/433.92 MHZ. The circuit shape of ST-RX02-ASK is L/C. Receiver Frequency: 315 / 433.92 MHZ, Typical sensitivity: -105dBm, Supply Current: 3.5mA



**Fig .3: 315/434 MHz zigbee RECEIVER**

**CODING**

**TRANSMITTER:**

```
#include <LiquidCrystal.h>
#include <stdio.h>
#include <SoftwareSerial.h>
LiquidCrystal lcd(6, 7, 5, 4, 3, 2);
int sw1 = 8;
int sw2 = 10;
int sw3 = 12;
```

```
pinMode(sw1, INPUT);pinMode(sw2, INPUT);pinMode(sw3, INPUT);
lcd.begin(16, 2);
  // Print a message to the LCD.
lcd.print(" Welcome ");
delay(1000);
delay(500);
lcd.clear();
lcd.setCursor(0, 0);
  //serialEvent();
}
void loop()
{
if(digitalRead(sw1) == HIGH)
  {delay(400);
while(digitalRead(sw1) == HIGH);
lcd.clear();lcd.setCursor(0,0);lcd.print("Chairman Sir ");
lcd.setCursor(0,1);lcd.print(" Meeting ");
Serial.write("*1#");
  }
if(digitalRead(sw2) == HIGH)
  {delay(400);
while(digitalRead(sw2) == HIGH);
lcd.clear();lcd.setCursor(0,0);lcd.print("Secretary Madam");
lcd.setCursor(0,1);lcd.print(" Meeting ");
Serial.write("*2#");
  }
if(digitalRead(sw3) == HIGH)
  {delay(400);
while(digitalRead(sw3) == HIGH);
lcd.clear();lcd.setCursor(0,0);lcd.print("HOD Sir Meeting");
Serial.write("*3#");
  }
void RecieveData()
{
if(Serial.available() > 0)
  {
data_temp = Serial.read();
RFID_data[read_count] = data_temp;
read_count++;
  }
}
```

#### RECIEVER CODE :

```
#include <LiquidCrystal.h>
#include <stdio.h>
#include <SoftwareSerial.h>
SoftwareSerialmySerial(A4, A5);
LiquidCrystalled(6, 7, 5, 4, 3, 2);
int buzzer = 8;
void beep()
{
digitalWrite(buzzer, LOW);delay(2000);digitalWrite(buzzer, HIGH);
```

```
}  
void setup()  
{  
  Serial.begin(9600);  
  mySerial.begin(9600);  
  pinMode(buzzer, OUTPUT);  
  
  digitalWrite(buzzer, LOW);  
  lcd.begin(16, 2);  
  // Print a message to the LCD.  
  lcd.print(" Welcome ");  
  delay(1000);  
  delay(500);  
  lcd.clear();  
  lcd.setCursor(0, 0);  
}  
void loop()  
{  
  if(stringComplete)  
  {  
    if(gchr == '1')  
    {  
      lcd.clear();lcd.setCursor(0,0);lcd.print("Chairman Sir ");  
      lcd.setCursor(0,1);lcd.print(" Meeting ");beep();  
    }  
    if(gchr == '2')  
    {  
      lcd.clear();lcd.setCursor(0,0);lcd.print("NEED FOOD");  
      lcd.setCursor(0,1);lcd.print(" Meeting ");beep();  
    }  
    if(gchr == '3')  
    {  
      lcd.clear();lcd.setCursor(0,0);lcd.print("NEED MEDICINE");beep();  
    }  
    if(gchr == '4')  
    {  
      lcd.clear();lcd.setCursor(0,0);lcd.print("EMERGENCY");beep();  
    }  
    sti=0;  
    inputString = "";  
    stringComplete = false;  
  }  
}  
void RecieveData()  
{  
  if(Serial.available() > 0)  
  {  
    data_temp = Serial.read();  
    RFID_data[read_count] = data_temp;  
    read_count++;  
  }  
}
```

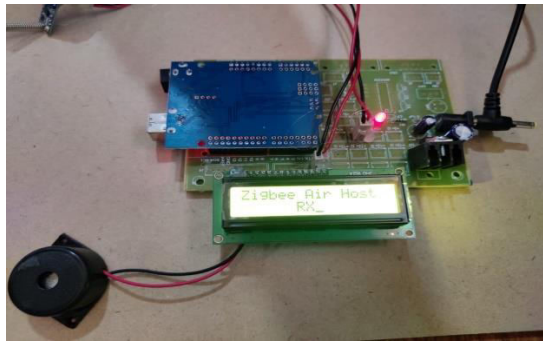


Fig 4: Receiver Section output

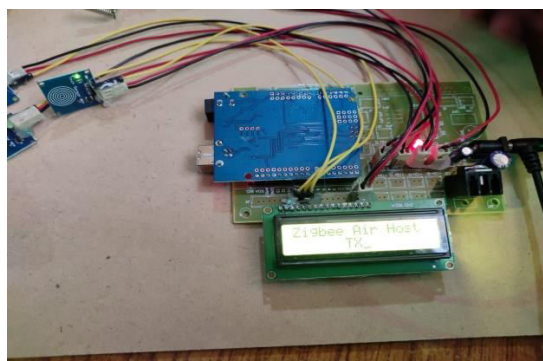


Fig 5: Transmitter output

## V. CONCLUSION

The main aim of this paper is to construct a user friendly multi-language communication system for illiterate/dumb people traveling by Airlines. As we have different languages in our world and its impossible for us to know all the languages. Thus the project has been successfully designed and tested. This project consists of Zigbee based system that transmits the wireless signals according to the input given by the user using touch screen. At the receiver (nurses) end the information will be displayed on LCD in English language. Here when user sends his need through touch screen, then micro controller transmits that information through Zigbee transmitter. The information received by the Zigbee receiver will be displayed on LCD. This project provides an efficient device that helps dumb/illiterate to communicate with nurses in airlines..

## REFERENCES

1. Guangming Song, Fei Ding, Weijuan Zhang and Aiguo Song, "A Wireless Power Outlet System for Smart Homes," *IEEE Transactions on Consumer Electronics*, Vol. 54, No. 4, NOVEMBER 2008
2. R. Gadalla, "Voice Recognition System for Massey University Smart house," M. Eng thesis, Massey University, Auckland, New Zealand, 2006.
3. L. R. Rabiner and R. W. Schafer, *Digital Processing of Speech Signals*, New Jersey, US: Prentice Hall Inc, 2001
4. B. Yukesekkaya, A. A. Kayalar, M. B. Tosun, M. K. Ozcan, and A. Z. Alkar, "A GSM, Internet and Speech Controlled WirelessInteractive Home Automation System," *IEEE Transactions on Consumer Electronics*, vol. 52, pp. 837-843, August 2006.
5. Jinn-KweiGuo, Chun-Lin Lu, Ju-Yun Chang, Yi-Jing Li, Ya-Chi Huang, Fu-Jiun Lu and Ching-Wen Hsu, "Interactive Voice-Controller Applied to Home Automation," 2009 Fifth International Conference on Intelligent Information Hiding and Multimedia Signal Processing.

6. Guangming Song, Fei Ding, Weijuan Zhang and Aiguo Song, "A Wireless Power Outlet System for Smart Homes," *IEEE Transactions on Consumer Electronics*, Vol. 54, No. 4, NOVEMBER 2008
7. Il-Kyu Hwang Dae-Sung Lee Jin-WookBaek "Home Network Configuring Scheme for All Electric Appliances Using ZigBee-based Integrated Remote Controller," *IEEE Transactions on Consumer Electronics*, Vol.55, No.3, AUGUST2009.
8. Rozeha A. Rashid, Hong Ling Zhen. "Wireless Monitoring System Using ZigBee IEEE 802.15.4 Standard", *Int'l Wireless Telecommunication Symposium (IWTS06)*, Grand BluewaveHotel,ShahAlam, 15-17th May 2006.
9. *Product Manual v1.xAx - 802.15.4 Protocol For OEMRF Module Part Numbers: XB24-...-001, XBP24-...-001.*
10. Tunheim, Svein Anders. "Implementing an IEEE 802.15.4 and ZigBee Compliant RF Solution", *Chipcon Paper IIC-China ESC-China 2005.*