

# IEEE 802.15.4 Standard Based Tracking and Guiding System for Visitors

Sankirna Joge<sup>1</sup>, Neha Deshpande<sup>2</sup>

<sup>1</sup>Department of E&TC, Shrimati Kashibai Nawale College of Engineering, Savitribai Phule Pune University, India

<sup>2</sup>Department of E&TC, Sinhgad College of Engineering, Savitribai Phule Pune University, India

**Abstract**—In our day to day life, all work that we have to do should happen in an accurate and consistent manner which should give us the assured of security and accuracy. Based on this the system has been developed where guiding and tracking should happen through the two main units in which the handed unit will consist of microcontroller, LCD to see the guidelines. The keypad will be used to enter the destination where he wants to go or the person to whom he wants to meet. Zigbee module is used to send the location to the security unit. RFID reader is used to read the location code at various checkpoints. If a visitor enters into some restricted area by mistake the handheld unit will warn him as well as it will convey about it to security. The security unit will consist of Zigbee module and PC interface. On PC there will be plotted map of premise using VB. Data coming from handed unit via Zigbee will be used to plot the location of the visitor on map.

**Index Terms**- Tracking, RFID, Zigbee, Security unit, micro-controller

## I. INTRODUCTION

This is the world of wireless technology. Number of systems and applications using wired data transfer are now replaced by wireless communication media. We are developing this system for big premises such as colleges, hospitals, industries etc. Our aim is to use this wireless technology for visitor guide and visitor tracking application. The system will consist of one handheld unit given to a visitor at the entrance of premises by security persons. Figure 1 shows the prototype model with security unit and portable unit. The visitor will enter the destination where he wants to go or the person to whom he wants to meet. This handheld unit will guide him to reach the destination. He doesn't need to ask anyone. Another feature of this system is that it is wirelessly connected to security unit located in security cabin, where the security person will be able to track the visitor on premise map on PC. There will

be wireless link between handheld unit and security unit. For this we will use Zigbee modules which use IEEE 802.15.4 standard and RF media for data transfer.

## II. CHALLENGES

A lot of trained human power is required in order to secure the huge restricted campus and to guide the visitors. The same work can be done with the help of portable unit that will guide to the visitor. Only one trained human will require in a security unit to keep an eye on multiple visitors through a single display unit.

## III. METHODOLOGY

### 1. Block Diagram

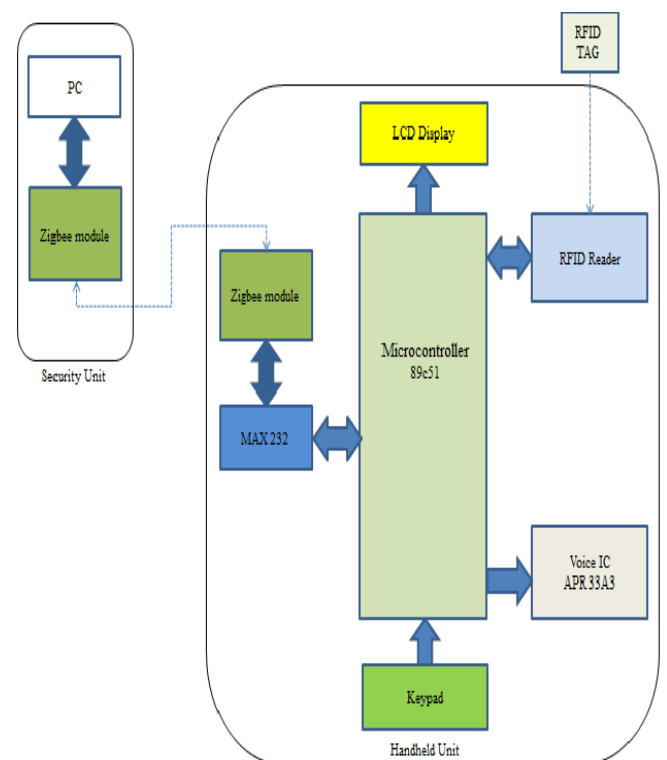


Fig.1: System model

## II. Description

The block diagram consists of two main unit mainly portable unit and a security unit. The portable unit consists of microcontroller, LCD display, 4X1 keypad, zigbee module and RFID reader. The security unit consists of Personal computer to whom the zigbee module is connected. The zigbee module of portable unit and the security unit are in continuous communication whenever the RFID reader reads a tag at cross point in a map, the same will be displayed on a screen of personal computer in security unit. Hence from this one can track the position of a visitor. When a visitor enters a destination through a keypad the directions will get shown on a screen of LCD display. At a point where a reader reads a tag, the accurate direction get displayed on a screen according to the destination entered. In this manner guiding takes place.

### A. Microcontroller Unit- AT89C51:

This popular 8051 chip has on-chip ROM in the form of flash memory. This is ideal for development since flash memory can be erased in seconds compared to the twenty minutes or more needed for the 8751 for this reason the AT89C51 is used in place of the 8751 to eliminate the waiting time needed to erase the chip & thereby speed up the development time. To use the AT 89C51 to develop a micro controller based system requires a ROM burner that supports flash memory; however, a ROM eraser is not needed. Notice that in flash memory you must erase the entire contents of ROM in order to program it again. PROM burner itself does this erasing of flash & this is why a separate eraser is not needed. TO eliminate the need of prom burner Atmel is working on a version of the AT 89C51 that can be programmed via the serial COM port of an IBM PC.

#### Features:

- 4 Kbytes of In-System Reprogrammable Flash Memory
- 128 x 8-Bit Internal RAM
- 32 Programmable I/O Lines
- Two 16-Bit Timer/Counters
- Low Power Idle and Power Down Modes

### B. RFID Tag & RFID Reader

Radio-frequency identification (RFID) is the wireless non-contact use of radio-frequency electromagnetic fields to transfer data, for the purposes of automatically identifying and tracking tags attached to objects. The tags contain electronically stored informa-

tion. Some tags are powered by and read at short ranges (a few meters) via magnetic fields (electromagnetic induction), and then act as a passive transponder to emit microwaves or UHF radio waves (i.e., electromagnetic radiation at high frequencies). Others use a local power source such as a battery, and may operate at hundreds of meters. Unlike a barcode, the tag does not necessarily need to be within line of sight of the reader, and may be embedded in the tracked object.

#### Features:

- High sensitivity, reliable transmission range.
- Error checking (CRC) of data in built.
- Stable, small size, easier mounting.
- No tuning required, PLL based self-tuned.
- 2.4 GHz band, no need to apply frequency usage license.
- Automatic switching between TX and RX mode.

### C. APR33A3 (Voice Recording IC)

The APR33A series are powerful audio processor along with high performance audio analog-to-digital converters (ADCs) and digital-to-analog converters (DACs). The aPR33A series are a fully integrated solution offering high performance and unparalleled integration with analog input, digital processing and analog output functionality. The aPR33A series incorporates all the functionality required to perform demanding audio/voice applications. High quality audio/voice systems with lower bill-of-material costs can be implemented with the aPR33A series because of its integrated analog data converters and full suite of quality-enhancing features such as sample-rate convertor.

#### Features:

- Single Chip, High Quality Audio/Voice Recording & Playback Solution
- Powerful 16-Bits Digital Audio Processor.
- No Battery Backup Required
- Easy to PCB layout
- High Quality Line Receiver
- Averagely 1,2,4 or 8 voice messages record & playback

## IV. IMPLEMENTATION

### I. Software

#### A. EmbeddedC language

C is a general-purpose, imperative computer programming language, supporting structured programming, lexical variable scope and recursion, while a static type system prevents many unintended operations. By design, C provides constructs that map efficiently to typical machine instructions, and therefore it has found lasting use in applications that had formerly been coded in assembly language, including operating systems, as well as various application software for computers ranging from supercomputers to embedded systems. It is used for programming the microcontroller unit.

The basic features of C language are:

- C Programs are portable i.e. they can be run on any Compiler with Little or no Modification
- It is easier to write assembly language codes in C programming.
- It provides Wide verity of 'Data Types, Wide verity of 'Functions' and Provides useful Control & Loop Control

Embedded C is set of language extension for the C Programming language by the C standards committee to address commonality issues that exist between C extensions for different embedded system. Embedded C uses most of the syntax and semantic of standard C. Assembly language program is used but mainly to implement those portion of the code where very high timing accuracy, code size efficiency etc. are prime requirement. An assembly programs are specific to a processor, to overcome this disadvantage high level language is used including C.

### B. Visual basic for Map

Visual Basic is a third-generation event-driven programming language and integrated development environment (IDE) from Microsoft for its COM programming model first released in 1991 and declared legacy in 2008. Microsoft intended Visual Basic to be relatively easy to learn and use. Visual Basic was derived from BASIC and enables the rapid application development (RAD) of graphical user interface (GUI) applications, access to databases using Data Access Objects, Remote Data Objects, or ActiveX Data Objects, and creation of ActiveX controls and objects. A programmer can create an application using the components provided by the Visual Basic program itself. Over time the community of programmers developed third party components. Programs written in Visual Basic can also use the Windows API, which requires external function declarations.

### II. Hardware

- The system consists of microcontroller unit with LCD, Apr33A3 voice IC, keypad, Zigbee module and the RFID reader.
- The RFID tags are placed at every point where visitor may get confuse about which way to go as show in the map.
- At the security unit before the start, the visitor enters the destination and according to that the security unit will upload the path for the visitor in hand held device.
- The respective directions will be shown to the visitor through the LCD display.
- When a visitor reaches near the RFID tag, hand held device sends the information about the current position of a visitor to security unit.

Hence, the tracking of a visitor takes place for a security purpose.

If a visitor enters into the restricted area then the security unit sends corresponding message to a visitor.

### VI. ALGORITHM

1. Start
2. Initialize LCD
3. Display → "Choose the Destination"
4. Enter the destination through the keypad
5. Send entered destination to the security unit
6. Upload the directions in the microcontroller
7. Display the directions on the LCD according to the position of a visitor
8. RFID reader reads the TAG and sends the corresponding information to the security unit.
9. Security unit again uploads the correct information about which way to go and again updates the current position of the visitor on a map of PC placed at security unit.
10. If a visitor enters into a restricted zone then a warning message will get display on a pc placed at security unit
11. Upload a message into the microcontroller "You have been entered into the restricted zone"
12. Display the message on a LCD screen.
13. If a visitor reaches his entered destination then Display → "Reached at the destination"

14. Update the current position of a visitor on a map of a PC placed at security unit
15. While working the displayed messages will also get reflect as a sound through the voice recording IC.

## VII. RESULT

### A. Flow Demonstration

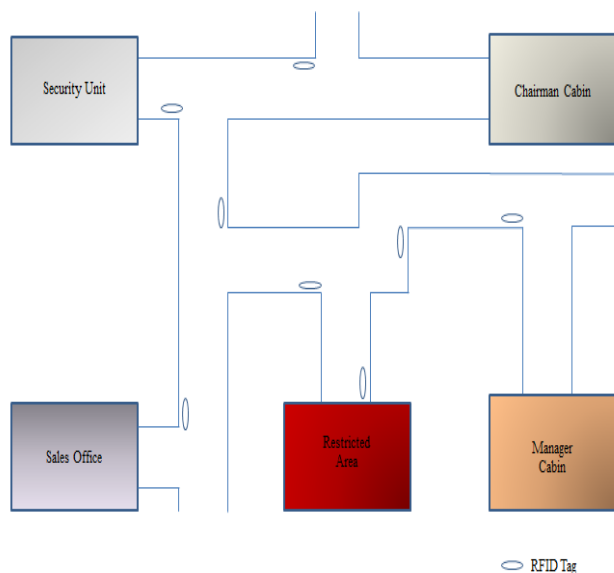


Figure 2: Demonstration Map

The final result of the project is, that the visitor reaches at its destination successfully without any kind of confusion. Figure 2 shows the map on a personal computer of security unit which is demonstration map for prototype designed. Another result is for the security purpose, the security person can track the location of the visitor on PC.

## VIII. CONCLUSION

The system is a reliable circuit that takes over the task of helping the visitor in big premises to find the way and reach its destination. It can be used by industries or institution to keep record of no. of visitors, instead of writing the data or record of an individual in a book hence it reduces the "Labour Work". The network of the project is limited up to some area. Hence; the network can be extended by using high range communicating module viz. WI-FI or by using repeaters. By using multiple portable units so that each unit can communicate to each other, the load of work from the security unit can be reduced.

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