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Campus Navigator

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ABSTRACT
A University Campus may be very large with many departments and blocks. Every year lots of students get admitted to the university. It creates a problem for the newcomer to locate a department, canteen, or a library building on time. The new faculty members, staff, and visitors also face the same problem inside the campus. This device allows them to navigate the campus. The receiver consists of an RF (Radio frequency) receiver module, an array of switches and a speaker which acts as a navigator to the user. By using the switch array placed in the device, one can enter the location where he/she wants to go. The microcontroller based circuit is used to handle the entire system functioning. RF transmitter is placed at different locations in a route. The RF receiver interprets the transmitted signal and gives voice directions through the speaker unit when it reaches those locations and guides them to the next location.
Keywords – *Navigation, PIC, RF Communication, RF Module*

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I. INTRODUCTION

A University Campus has many departments and different buildings. Every year lots of students join the university. It is a tedious task for a newcomer to locate buildings and departments inside the campus for the first time. Even experienced students often need directions to seldom visited buildings. Static maps are available on campus to provide the locations. But it cannot provide continuous help for the users [2]. So the idea of "campus navigator" arises. Here RF transmitters are placed at different locations. The RF receiver embedded in the device interprets the received signal to obtain the routes.

Navigation inside the campus is possible using GPS [1] or Android application [2][3]. But it requires internet and smartphones to identify the location. Campus navigator provides a simpler, user-friendly interface to find directions inside the campus. The output is taken from a voice module so anyone can easily access the location even for a visually impaired person.

The paper is organized as follows: section II presents the review of related works, section III involves overall system requirement, section IV represents the analysis of system, section V includes results and section VI include the conclusion and future scope.

II. LITERATURE SURVEY

GPS system embedded in smartphones is used to know the current location in Kasetsart University, Kamphaeng Sean Campus. In order to display a map, Google Map APIs are connected to an application. PHP, AJAX, JAVA, and JavaScript along with running Google Map APIs are used to create routes on the map, sending coordinates and creating a menu to access the database. MYSQL database through a connected webpage is used to get latitude/ longitude coordinates of a location. Smartphones GPS sensor is used to display the location of a place on a map [1]. The Campus can be represented as a Graph with locations such as buildings, parking lots are stored as vertices of the Graph and transitions between the locations such as roads, sidewalks are stored as edges between the vertices. This application directs the user from his current location to the exact location where he/she wants to go on the campus. It reduces the effort of walking inside the campus [2]. Another technique discussed in the literature is GPS based on map application which is used to locate desired place and shortest path from the current location and to get an update of the event on the map with its location. Thus it will reduce frustration and confusion of anybody inside the campus. This paper presents the architecture and design of a Google map based application on android platform. The application has been implemented using Android SDK and has been tested for KJ campuses [3].

III. SYSTEM REQUIREMENT

The proposed embedded system consists of hardware block as well as software part. The hardware components for implementation require a

microcontroller, RF Module, Voice playback module and speaker. MPLAB IDE v4.05 software tool is used to program the microcontroller.

1. Microcontroller: PIC microcontroller is used as the central part of the Campus Navigator. The microcontroller has 5 I/O ports, which are used to interface the RF module and playback module. MPLAB IDE v4.05 is used to program the microcontroller.
2. RF Module: The RF modules are very small in dimension and have a wide operating voltage range i.e. 3V to 12V. 433 MHz RF Transmitter and receiver operate at a specific frequency of 433MHz. The data is sent serially from the transmitter which is received by the paired receiver. A receiver is duly interfaced to PIC microcontrollers for data transfer.
3. Voice Playback module: The aPR33A3 is used as the voice playback module to record the message and play the message through the speaker based on the information provided by the microcontroller. The aPR33A series incorporates all the functionality required to perform demanding audio/voice applications.

IV. SYSTEM DESIGN

4.1 Block Diagram

Fig 1 shows the block diagram of campus navigator. The visitor can enter the desired location through the switch array. The microcontroller identifies the location and chooses the efficient path between the starting point and destination. RF transmitters placed at different location sends unique data corresponding to that location. RF transmitter and receiver pairs only when the addresses are matched. Hence the addresses of transmitter and receiver module are set to zero so that they always pair with each other. Based on the data received, this device sends location through the speaker.

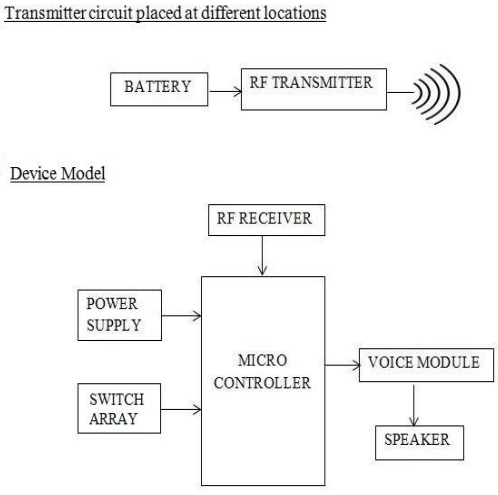

Fig 1: Block Diagram

4.2 Circuit Diagram

Fig 2 shows the circuit diagram of campus navigator which is kept by the user. PIC16F877A microcontroller is used to handle the entire functioning. In this circuit, an array of the switch is connected to PORT B of the microcontroller. RF receiver has 4 data pins (D0 toD3), which is connected to PORT C. The four message pins of aPR33A3 are connected to PORT A. RF transmitter

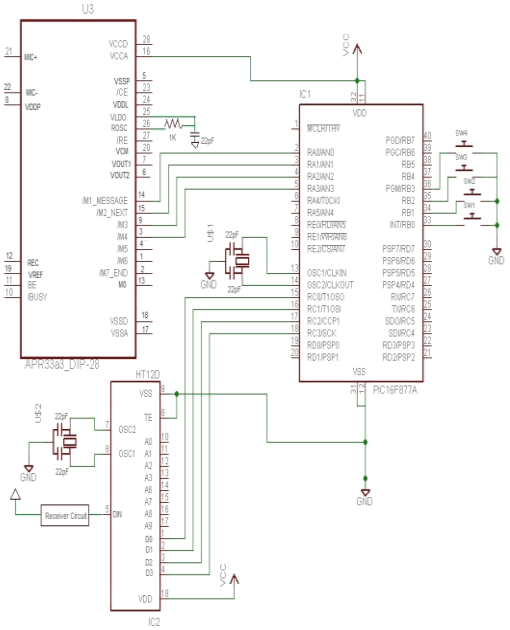

Fig 2: Circuit diagram of campus navigator

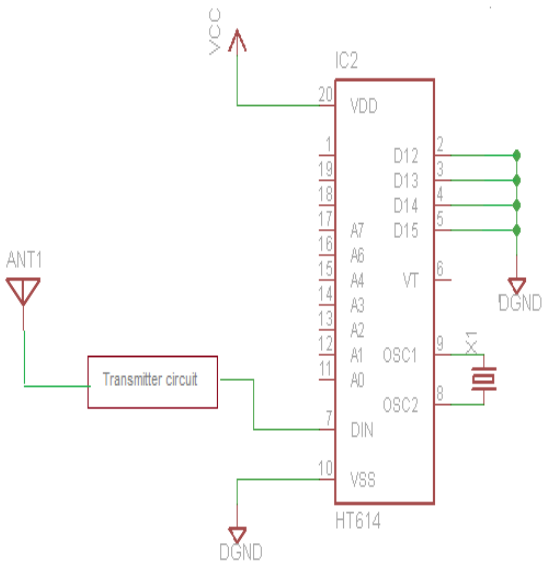

Fig 3: RF Transmitter sending data 0000

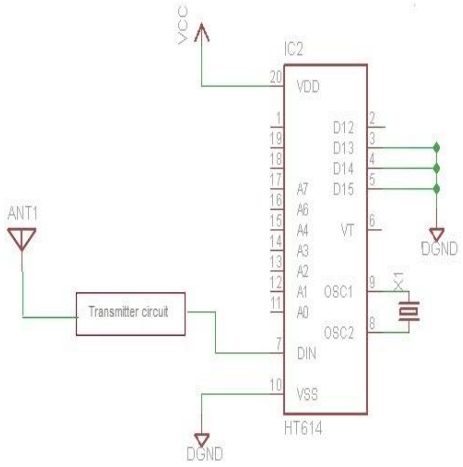

Fig 4: RF Transmitter sending data 0001

and receiver pairs when the addresses are same. In this circuit, the address of RF transmitter and receiver set to 0, so that the RF modules always pairs with each other. Otherwise, the user must set the address corresponding to the transmitter which is a tedious task. Fig 3 and fig 4 shows the figures of RF transmitters which is located at different locations sends data 0000 and 0001. The RF receiver decodes these data and is processed by the microcontroller. The data from the microcontroller is given to the voice playback module and based on that the voice module gives voice messages to the user through the speaker.

V. RESULT

By using the developed navigator, one can easily access the location of buildings/departments inside the campus. Figures shown above represent the implemented model of campus navigator. Fig 5 and 6 show the top and side view of campus navigator. Fig 7 shows the internal structure of the implemented

model indicates how the various modules are connected to the microcontroller. Fig 8 shows the structure of RF transmitter located at different places sending unique data.

Fig 5: Top view of campus navigator

Fig 6: Side view of campus navigator

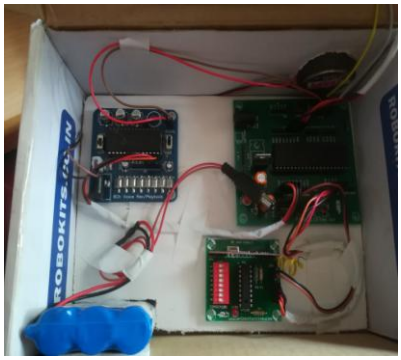

Fig 7: Internal structure of campus navigator

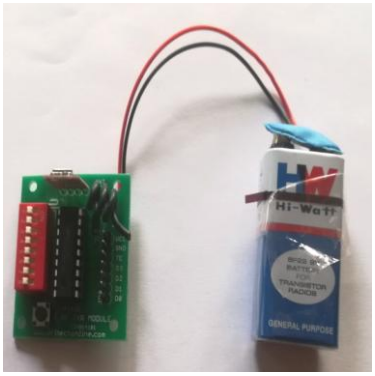

Fig 8: Transmitter placed at different locations

VI. CONCLUSION

Campus navigator is a low-cost device that aids the easy navigation of a newcomer. This device can be used for blind people to find location inside campus/ hospitals. This device can be used in hospitals, used as a tour guide etc. An LCD display can be added so that it can display the details of a particular location when used as a tour guide or display the availability of doctors when used in hospitals. For the better user interface, push buttons can be replaced by a keypad. A long-range RF module with more data pins can be used in these places to cover the entire location.

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