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Student Monitoring System for Boarding and Leaving Bus

Ms.Pradnya Maturkar[1],Nehal Nandanwar[2],Mayuri Rahangdale[2],Sayali Lute[2],Sayali Zile[2].

[1]*Assitant Professor,Department of Electronics & Telecommunication Engineering,*
Rajiv Gandhi College of Engineering & Research,Nagpur,India

[2]*Student, Department of Electronics & Telecommunication Engineering,*
Rajiv Gandhi College of Engineering & Research,Nagpur,India

***Abstract*:** In today's situation, avoiding any mishap with the children has become an important issue for both parents and school management. This project proposes a SMS based solution to aid parents to track their children location in real time. The proposed system takes the advantage of location services provided by the kit after the child shows its RFID card. It allows the parent to get their child's location on a real time map by the geographical coordinates which is send by the module kit. Information such as GPS coordinates and time are gathered and sent to the parent's phone that's preregistered on the module kit. The communication between the parent and the child module kit is done by using Short Message Service (SMS). SMS offers the system unique features and also provide other safety measurements.

Keywords: RFID, GPS, GSM.

I. Introduction

The project mainly focuses on child's safety in the following ways:

The device will read the information of each student by the RFID card provided to each student. As soon as the student will board the bus from the pickup point and shows the card to the device immediately the device will send the SMS with the location and time to the respective parents. The parents can also keep the track of their ward continuously.

The device will also monitor each student's entry and exit count while boarding and leaving bus. This will help if any of the student mistakenly left into the bus then we can easily come to know.

The temperature sensor into the device will monitor the internal/ surrounding temperature and alarm the driver.

The project also proposes speed limit of the bus. So that bus driver cannot drive harshly. If the bus driver tries to do that then driver will get warning message till the time he doesn't slow down to speed limit of the road. The device will also register the count of speed limits reached by the driver and send it to the school authority.

If the bus gets late due to some circumstances or changes its route than the registered student's parents of that bus will receive message.

The alcohol sensor mount into the module kit will sense the prescribed % of alcohol of the driver and if the driver is drunk more than the prescribed % than the alarm will buzz and the bus will not get start and driver have to be changed.

II. System Design

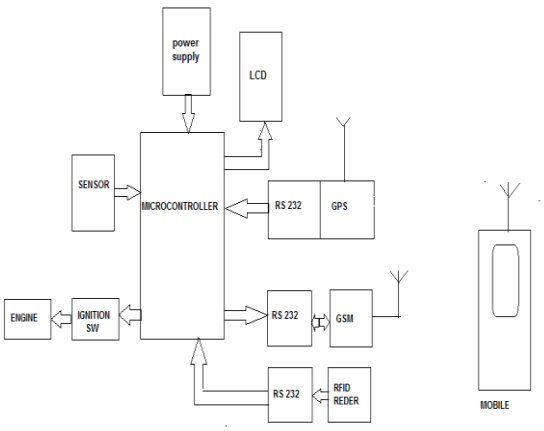

Fig.1.1 Block diagram of student monitoring system for boarding and leaving bus

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The main objective of this project is to inform the parents of the children that the time to go to school is the time to board the school bus.

Each student received a unique RFID card, which contained a unique number. The RFID tag was read by the RFID reader provided on the bus.

Each time the reader read an RFID reader, the alarm message was sent to their personal phone number over time.

The all communication units, such as the RFID reader and the GSM modem connected to the microcontroller. The coding for this project was written in Embedded C and compiled using ASSEMBLY LANGUAGE.

III. Proposed Methodology

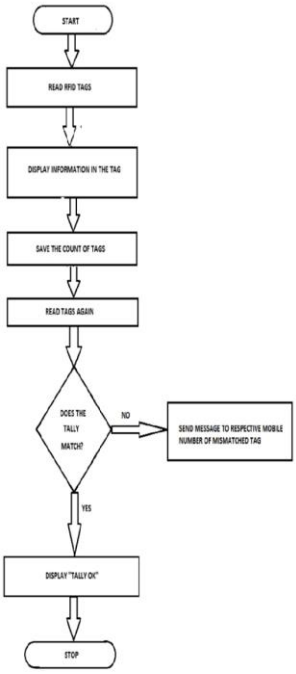

Fig.1.2 Flow Chart

IV. Hardware

1. PIC Microcontroller

PIC (usually pronounced as "pick") is a family of microcontrollers made by Microchip Technology, derived from the PIC1650[1][2][3] originally developed by General Instrument's Microelectronics Division. The name PIC initially referred to Peripheral Interface Controller [4] and is currently expanded as Programmable Intelligent Computer [5]. The first parts of the family were available in 1976; by 2013 the company had shipped more than twelve billion individual parts, used in a wide variety of embedded systems.

Fig 2.1 PIC Microcontroller

2. RFID (Radio Frequency Identification)

RFID stands for Radio Frequency Identification [8]. To identify tags that are attached to objects and to trace them EM fields are utilized by RFID. For identification there are numerous methods but the most generic method is: serial number, in this a person or an item or any other data that is provided on a microchip is recognized. The chip attached to an antenna also known as RFID transponder or tag. RFID technology permits the identification of each item through radio waves automatically. The RFID reader identifies the item without direct line-of-sight, whereas the barcodes are line-of-sight technologies.

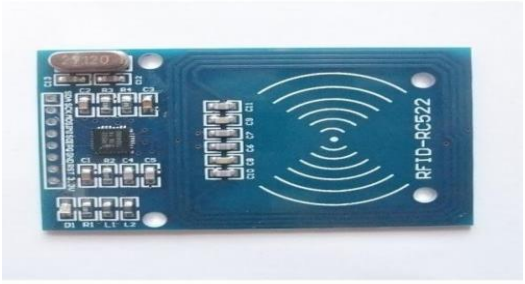

Fig 2.2 Radio frequency modulation

3. GPS (Global Positioning System)

The Global Positioning System (GPS), originally NAVSTAR GPS [1], is a satellite-based radio navigation system owned by the United States government and operated by the United States Space Force [2]. It is one of the global navigation satellite systems (GNSS) that provides geolocation and time information to a GPS receiver anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites [3]. Obstacles such as mountains and buildings block the relatively weak GPS signals.

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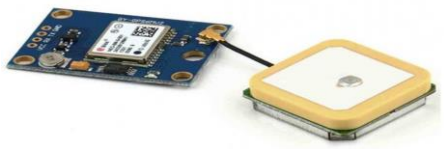

Fig 2.3 Global Positioning System

4. GSM (Global System for Mobile Communication)

The Global System for Mobile Communications (GSM) is a standard developed by the European Telecommunications Standards Institute (ETSI) to describe the protocols for second-generation (2G) digital cellular networks used by mobile devices such as mobile phones and tablets. It was first deployed in Finland in December 1991[2]. By the mid-2010s, it became a global standard for mobile communications achieving over 90% market share, and operating in over 193 countries and territories [3].

Fig 2.4 Global System for Mobile Communication

5. LCD (Liquid Crystal Display)

A liquid-crystal display (LCD) is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals combined with polarizers. Liquid crystals do not emit light directly [1], instead using a backlight or reflector to produce images in color or monochrome [2]. LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images with low information content, which can be displayed or hidden, such as preset words, digits, and seven-segment displays, as in a digital clock. They use the same basic technology, except that arbitrary images are made from a matrix of small pixels, while other displays have larger elements. LCDs can either be normally on (positive) or off (negative), depending on the polarizer arrangement.

Fig. 2.5 Liquid Crystal Display

V. Software

1. MPLAB:

MPLAB is a proprietary freeware integrated development environment for the development of embedded applications on PIC and dsPIC microcontrollers, and is developed by Microchip Technology.

MPLAB X is the latest edition of MPLAB, and is developed on the NetBeans platform.

MPLAB and MPLAB X support project management, code editing, debugging and programming of Microchip 8-bit PIC and AVR (including ATMEGA) microcontrollers, 16-bit PIC24 and dsPIC microcontrollers, as well as 32-bit SAM (ARM) and PIC32 (MIPS) microcontrollers.

MPLAB is designed to work with MPLAB-certified devices such as the MPLAB ICD 3 and MPLAB REAL ICE, for programming and debugging PIC microcontrollers using a personal computer. PIC Kit programmers are also supported by MPLAB.

MPLAB X supports automatic code generation with the MPLAB Code Configurator and the MPLAB Harmony Configurator plugins.

Features:

MPLAB X is the latest version of the MPLAB IDE built by Microchip Technology, and is based on the open-source NetBeans platform. MPLAB X supports editing, debugging and programming of Microchip 8-bit, 16-bit and 32-bit PIC microcontrollers.

MPLAB X is the first version of the IDE to include cross-platform support for macOS and Linux operating systems, in addition to Microsoft Windows.

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MPLAB X supports the following compilers:

1. MPLAB XC8 — C compiler for 8-bit PIC and AVR devices

2. MPLAB XC16 — C compiler for 16-bit PIC devices

3. MPLAB XC32 — C/C++ compiler for 32-bit MIPS-based PIC32 and ARM-based SAM devices

4. HI-TECH C — C compiler for 8-bit PIC devices (discontinued)

5. SDCC — open-source C compiler.

2. DIPTRACE

Dip Trace is an EDA/CAD software for creating schematic diagrams and printed circuit boards. The developers provide a multi-lingual interface and tutorials (currently available in English and 21 other languages). Dip Trace has 4 modules: schematic capture editor, PCB layout editor with built-in shape-based auto router and 3D-preview & export, component editor, and pattern editor.

Features:

1. Simple user interface

2. Multi-sheet and hierarchical schematics

3. High-speed and differential signal routing

4. Smart manual routing modes

5.Wide import/export capabilities

6.High-speed shape-based autorouter

VI. Scope of the Project and Applications

An automatic route guider display can be installed in buses to better update the alternative route in case of serious road congestions. We can connect RFID reader wirelessly to the host application. There are many wireless technologies that can be used such as Bluetooth (802.15.3) and Zig Bee (802.15.4) to extend the range of an RFID reader. Fare collecting system can also be automated by providing another mobile service to which all the passengers using public transport are subscribed.

1. This project can be used for school bus

2. This project can also be used for tracking senior citizen elderly person in our home

VII. Results

LCD (Liquid Crystal Display) is a type of flat panel display which uses liquid crystals in its primary form of operation. LEDs have a large and varying set of use cases for consumers and businesses, as they can be commonly found in smartphones, televisions, computer monitors and instrument panels.

When RFID is put into the scanner then the scanner will display the message of “scanner ready”.

Therefore, LCD will display the message of arrival:

Fig 3.1 LCD “displaying scanner ready” indication

When a RFID holder will enter the bus the scanner will scan the RFID and then the microprocessor will process the scanning and information in the ID and then it will be display on LCD.

The message will be send to the registered no. in the RFID that the RFID holder has entered in the bus.

The SMS also contain the Sr. no. which will also be display on the LCD. The SMS meanwhile also given with link which will directly connect the user with Google map so that they can easily track the position of the bus with X and Y co-ordinates.

Therefore, the LCD will display the message with “Sr. no. XYZ” and with the notification display of “message sent”.

Fig 3.2 LCD displaying Sr. no. and message sent on display.

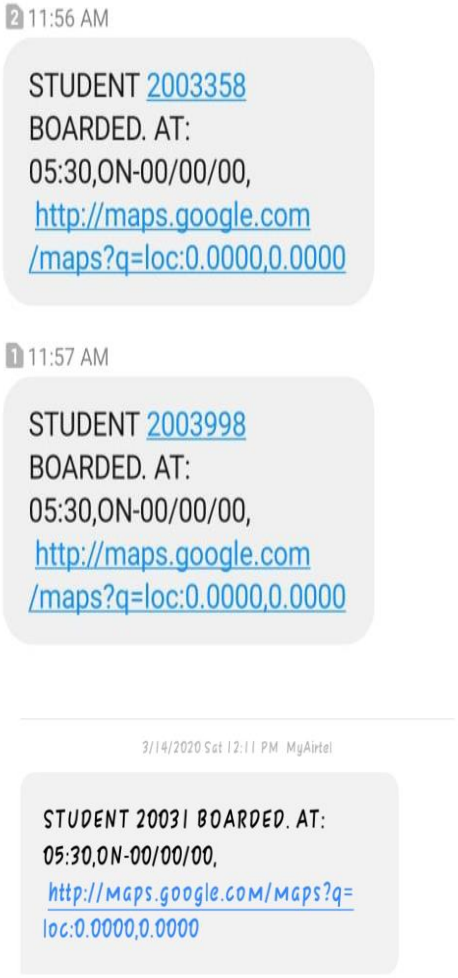

Fig 3.3 Screenshot of the text message received on the user's mobile.

VIII. Conclusion

In this research work, design and development of a low cost transportationon system based on integration of RFID and GSM data is described. The system makes use of various modules which are wirelessly linked with GSM modems. SMS service of GSM network very cost effective so it is used for the transfer of data between the modules. This service provides the user with the information about location of desired buses so that the user can adjust his schedule accordingly. This technology outdates the need of waiting at the Bus-Stop thus saving a lot of time. Displays are used at Bus-Stop to let passengers know the expected time to arrive and bus locations coming towards that stop. The system made such that it can also handle the emergency situations e.g., tire of bus is punctured, in case some kind of technical or non-technical fault.

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