International Journal of Information Technology & Computer Engineering

ISSN 2347–3657

Volume 13, Issue 2, 2025

CHILD SAFETY MANAGEMENT USING RFID TECHNOLOGY

M Baji Babu [1], Shaik Abu Sayeed [2], Kunde Pavan [3], Ishrath Humera [4] Javeed Ali [5]
[1]Assistant professor, [2,3,4,5]Students,
Department of Electronics and Communication Engineering, Lords Institute of Engineering and Technology, Hyderabad, Telangana.

Abstract
Ensuring the safety of children, especially in crowded areas like schools, parks, and shopping centers, is a significant concern for parents and guardians. Traditional methods of child safety management often rely on manual supervision, which can be prone to human error. This project proposes a child safety management system using RF technology to provide real-time monitoring and alerts. By integrating an RFID reader and cards, Node MCU, buzzer, IoT, LCD display, and GPS, this system tracks the presence of children within a specified area. The RFID reader detects the RFID cards worn by children, and the Node MCU processes this data to ensure their safety. If a child moves out of the designated area, the system triggers the buzzer. The LCD display shows real-time information about the children's location, enhancing safety and providing peace of mind to parents and guardians

I. Introduction

School buses transfers millions of children daily in various countries around the world. While there many issues that might disturb the parents regarding the travel safety of school going children, the paper Intends to look into introducing access safety in respect of school buses through bus tracking system that will help the school children's transportation in a secure and safer way The supervision of the regularity of students during their entry and exit from the bus is difficult to be controlled by drivers, which led to endangering child safety. The phenomenon of forgetting kids on the bus is one of the problems suffered by the children, which has increased significantly in recent years. This has often led to the death of many students on account of suffocation due to the lack of attention of derivers. This project, through entry and exit recordings, aims to create a suitable environment by following certain set of criteria of security and safety for school bus that will have a positive impact on the student and their family.

The paper proposed a bus safety system which was designed to control the entering/exiting of students from the bus. This system does several tasks, including identifying personal information (Eg. Name) of each student using RFID tag, which will exchange the data with the RFID reader via radio waves, and displaying each student name into LCD display. This will let the driver to know the number of students inside the bus and the students who departed from the bus. Moreover, the system has an emergency system that will alert in case if there is a child inside the bus after the

II. LITERATURE REVIEW:

Bus Safety System for School Children Using RFID and SIM900 GSM MODEM",

Maryam Said Al-Ismaili, Ali Al-Mahruqi and Jayavrinda Vrindavanam.

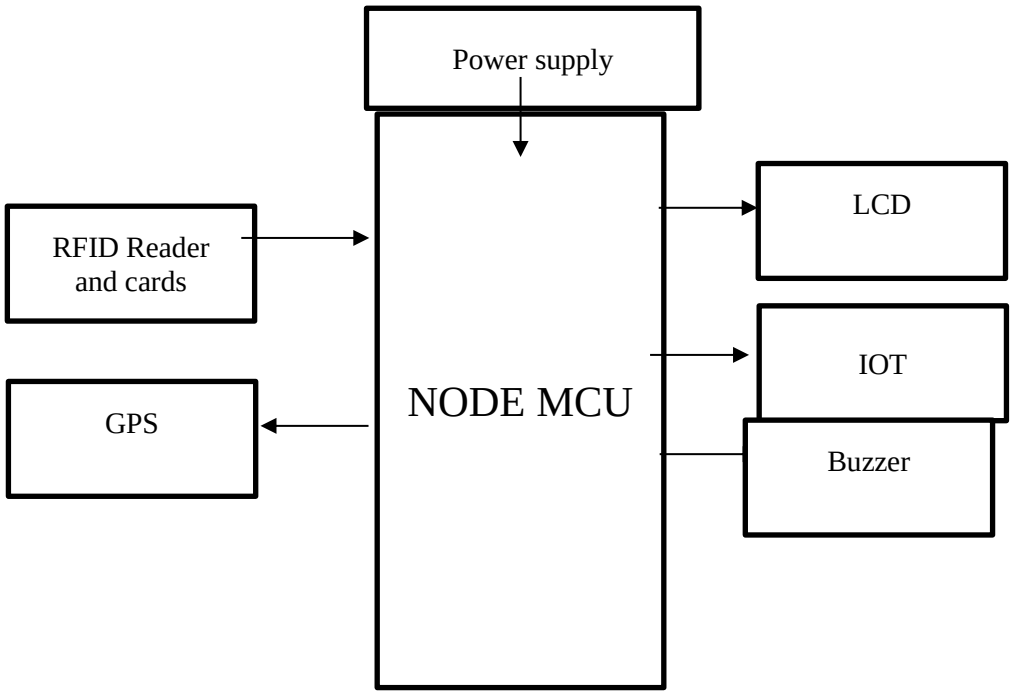
Millions of children need to commute between homes to school every day. Safer transportation of school children has been a critical issue as it is often observed that, kids find themselves locked in the school bus at the bus stop after going to school, they miss the bus, or ride the wrong bus with no way to track them. This project intends to find yet another solution to solve this problem by developing a bus safety system that will control the entry and exit of students from the buses through an energy efficient methodology. The proposed system will control the entry and exit of students to and from the bus using RFID (Radio Frequency Identification) and GSM technologies to ensure the entering and exiting of all students to and from the school bus in a safer manner. The process, does not require any additional action by the student and drivers. The system will do all the process and allow the student to be tracked while entering and leaving the bus. If the bus journey is successful from the source to destination, it will send an SMS to the management to inform its departure and arrival.

III . PROPOSED SYSTEM:

We propose an automated system using RFID technology. The system operates by equipping children with RFID cards that are detected by an RFID reader within the designated area. The Node MCU processes this data to monitor the children's presence. If a child moves out of the safe zone, the Node MCU triggers the buzzer to alert nearby adults. The LCD display provides real-time information about the location of each child. This system offers several advantages, including real-time monitoring, automated alerts, and reduced reliance on manual supervision, significantly enhancing child safety.

International Journal of Information Technology & Computer Engineering
ISSN 2347–3657
Volume 13, Issue 2, 2025

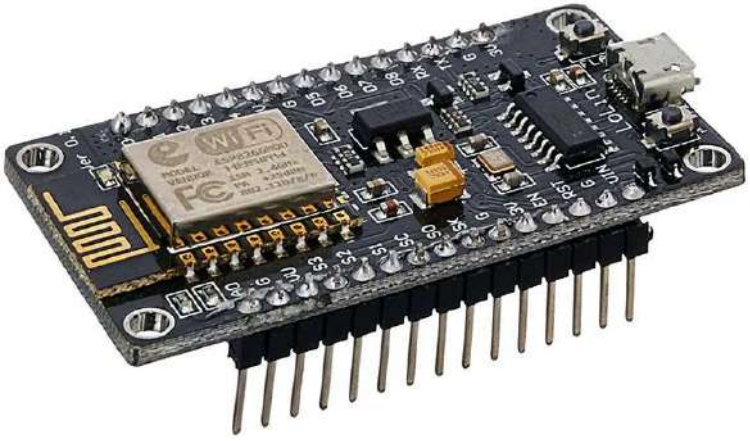
IV. BLOCK DAIGRAM:



V. Hardware Requirements;

Node MCU

Technically speaking Node MCU is a firmware for ESP8266 developed using C Programming Language, Espressif NON-OS SDK and Lua scripting language. Traditionally, we write code for our Microcontrollers like Arduino, STM32, 8051 etc., either in C or C++ and compile it with a set of tools and generate a binary file. This binary file is then uploaded into the flash memory of the microcontroller and it gets executed. Things are quite different with Node MCU. You can consider the Node MCU firmware as an interpreter for Lua Scripts. So, if your ESP8266 is loaded with Node MCU Firmware, you can simply write your application in Lua and send it to the ESP8266.Node MCU Firmware will interpret the byte code and executes the commands. There is no compilation, no binary file etc. Just write a script and run it the team which developed Node MCU Firmware also developed a breakout board for ESP-12E module called the Node MCU Devkit. So, many of us are actually using the board called Node MCU and programming it with Arduino IDE and not the Lua Scripts.



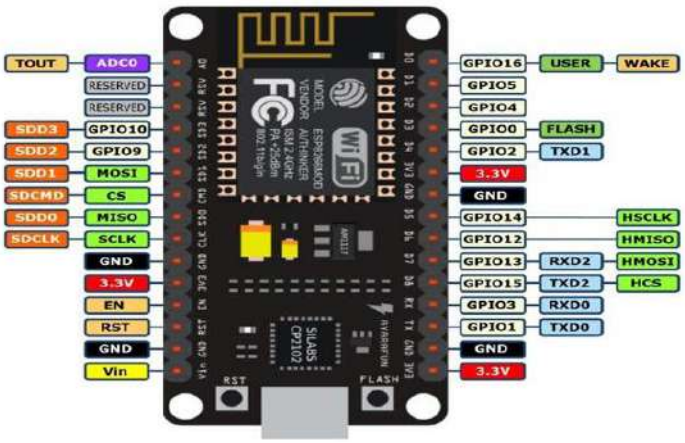
ESP8266 Wi-Fi module

International Journal of Information Technology & Computer Engineering

ISSN 2347–3657

Volume 13, Issue 2, 2025

ESP8266 comes up with powerful processing speed on board. Storage space of this module is also high allowing it to integrate with other devices like sensors. To make this module compatible with other development boards, we have to do level shifting of voltages externally because this board doesn't come up with on-board voltage regulator. This module is cost effective and thus used widely in many applications like the Internet of things and much more. So in this article, we are going to discuss key features of ESP8266, pins specifications, how to use this board for programming purposes and a sample program.

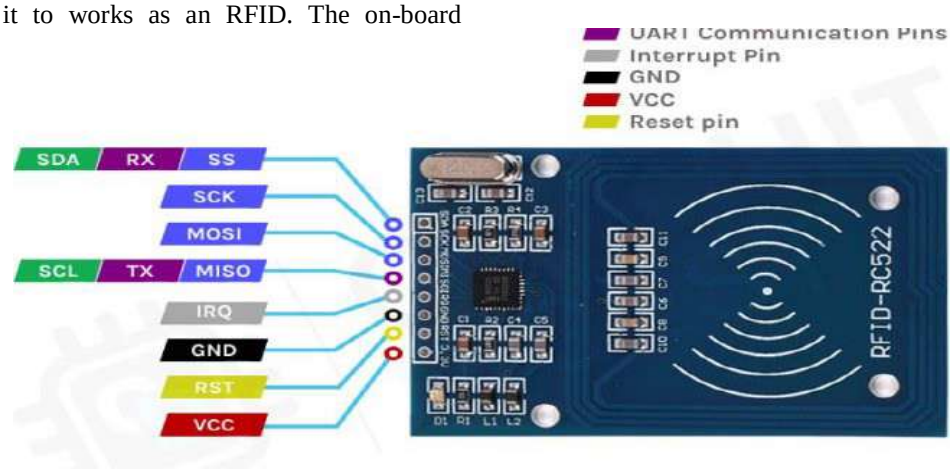


RC522 Pin Configuration Details

In this module, there are only two kinds of pins. So, the first one is power and the second one is the communication pins. Therefore, the device may have its microcontroller chip on itself but it only makes it to works as an RFID. The on-board microcontroller won't make the module a stand-alone device.

RC522 Pin out Diagram

All the pins of MFRC/RC522 RFID card Reader are:



RFID cards

An RFID card is a smart card that integrates **radio frequency identification** (RFID) technology. Each RFID card is embedded with an antenna connected to an RFID IC, so it can receive, store, and transmit data via radio waves. The core function of an RFID card is to automatically identify objects and transmit data in a contactlee.

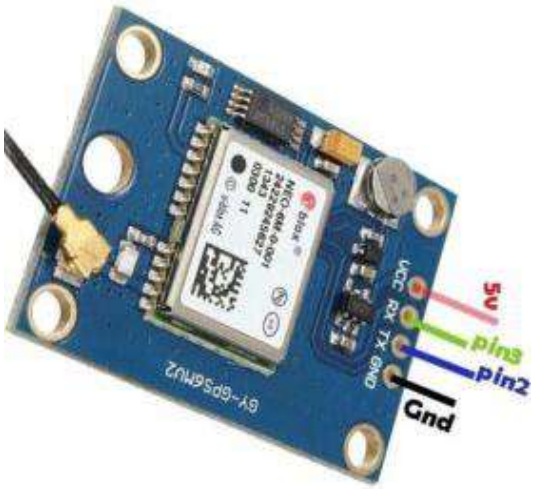
International Journal of Information Technology & Computer Engineering

ISSN 2347–3657

Volume 13, Issue 2, 2025

GPS (Global Positioning System
Introduction

The **NEO-6M** is a popular GPS (Global Positioning System) module manufactured by u-blox. It is commonly used in various applications that require accurate positioning and navigation capabilities. The module combines a GPS receiver with an integrated antenna, making it compact and easy to integrate into different electronic devices.



Working Principle

Satellite Signal Reception: The NEO-6M module receives signals from multiple GPS satellites, as well as other satellite constellations like GLONASS, Galileo, and BeiDou.

These satellites transmit signals containing precise timing information and their own orbital data.

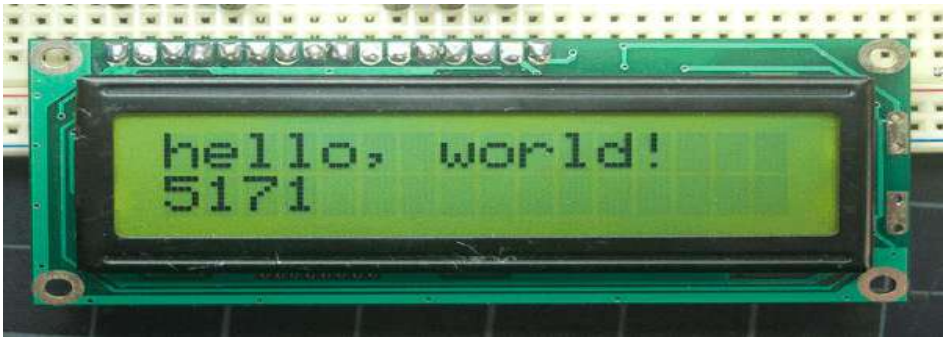
Signal Processing: The module processes the received satellite signals to extract essential information. It uses a combination of algorithms, including trilateration, to determine the distance between the module and each satellite. By analyzing the time it takes for the signals to travel from the satellites to the module, the module can calculate the module's position.

LCD

LCD is a flat display technology, stands for "Liquid Crystal Display," which is generally used in computer monitors, instrument panels, cell phones, digital cameras, TVs, laptops, tablets, and calculators. It is a thin display device that offers support for large resolutions and better picture quality. The older CRT display technology has replaced by LCDs, and new display technologies like OLEDs have started to replace LCDs. An LCD display is most commonly found with Dell laptop computers and is available as an active-matrix, passive-matrix, or dual-scan display. The picture is an example of an LCD computer monitor.

The Liquid Crystal library allows you to control LCD displays that are compatible with the Hitachi HD44780 driver. There are many of them out there, and you can usually tell them by the 16-pin interface.

International Journal of Information Technology & Computer Engineering
ISSN 2347–3657
Volume 13, Issue 2, 2025



Buzzer

An audio signalling device like a beeper or buzzer may be electromechanical or piezoelectric or mechanical type. The main function of this is to convert the signal from audio to sound.

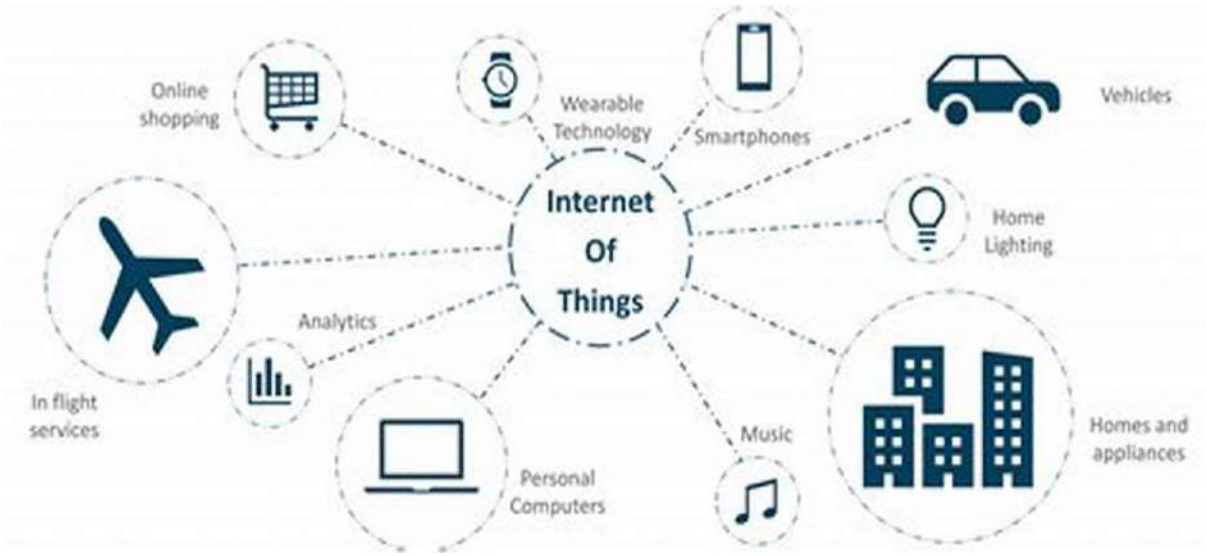
Generally, it is powered through DC voltage and used in timers, alarm devices, printers, alarms, computers, etc. Based on the various designs, it can generate different sounds like alarm, music, bell & siren.

Buzzer Pin Configuration

IOT (Internet of Things)

The Internet of Things (IoT) refers to a network of physical devices, vehicles, appliances, and other physical objects that are embedded with sensors, software, and network connectivity, allowing them to collect and share data.

IoT devices—also known as "smart objects"—can range from simple "smart home" devices like smart thermostats, to wearables like smart watches and RFID-enabled clothing, to complex industrial machinery and transportation systems. Technologists are even envisioning entire "smart cities" predicated on IoT technologies



International Journal of Information Technology & Computer Engineering
ISSN 2347–3657
Volume 13, Issue 2, 2025

POWER SUPPLY:

REGULATED POWER SUPPLY

Virtually every component of an electronic system converts DC electricity. Therefore, the DC power source will be necessary for each of these stages. A battery can power any system that uses little electricity. However, batteries may not be the most straightforward or affordable option for gadgets that need constant power. An unregulated power supply, which includes a filter, rectifier, and transformer, is the most effective option. Down below, you can see the diagram.

The electrical circuits inside any given device must be capable of supplying a consistent DC voltage within the device's specified power supply limit. Both the voltage and the current may only go as high as this DC supply allows. The problem is that the electrical devices are vulnerable to breakdowns caused by fluctuations in the mains supply.

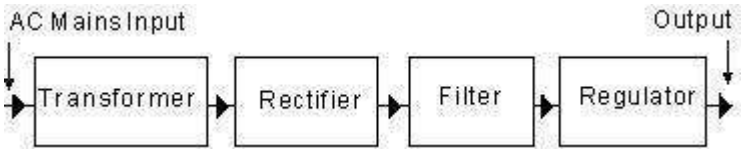


Fig 3.5 Block diagram of Regulated power supply

TRANSFORMER

Simply said, a transformer is a static device that aids in the conversion of electrical power from one circuit to another, while maintaining the same frequency. In a circuit, changing the voltage requires changing the current ratings in a direct proportional fashion.

TRANSFORMER WORKING PRINCIPLE

A transformer operates on the principle of mutual inductance, which occurs when two circuits linked by a common magnetic flux experience a change in current. Two electrically separate coils that are inductively linked are magnetically coupled via a reluctance channel to make a basic transformer. To better grasp the operation of the transformer, refer to the diagram provided below.

Below, you can see the primary and secondary windings of a power transformer. In the core's cross-section, you can make see the little spaces that exist between the lamination strips. Imbricated is the word that best defines these staggered joints. The two coils have a rather large mutual inductance. A mutual electromotive force is induced in the transformer by the coil, which is connected to an alternating voltage source, via the alternating flux that builds up in the laminated core.

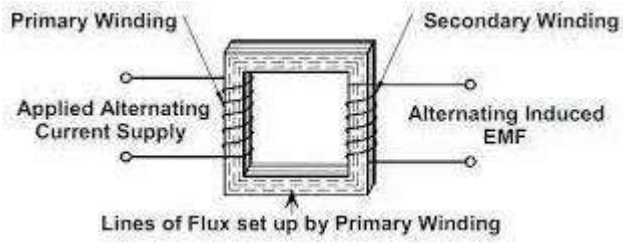


Fig 3.7 Working principle of Transformer

VOLTAGE REGULATOR

A voltage regulator is a kind of electrical regulator that is specifically designed to automatically keep the voltage level constant. A combination of active and passive electrical components, as well as an electromechanical mechanism, might be used. A number of AC or DC voltages may be controlled by it, depending on its architecture.

The purpose of a voltage regulator is to "regulate" the voltage level automatically. It takes the input voltage and reduces it to the required level, then maintains that level throughout the supply. As a result, the voltage remains constant regardless of the supplied load.

All three of these pins are regulators.

International Journal of Information Technology & Computer Engineering
ISSN 2347–3657
Volume 13, Issue 2, 2025

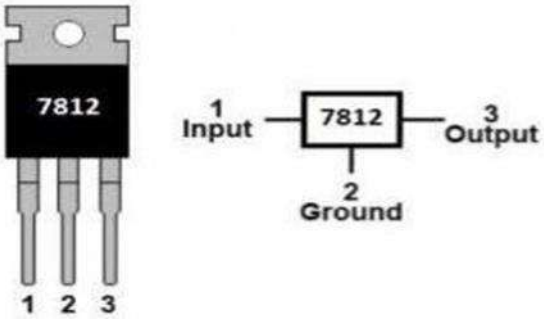


Fig 3.15 12

V Voltage Regulator There are two types of regulator are they.

- Positive Voltage Series (78xx) and
- Negative Voltage Series (79xx)

VI.SCHEMATIC DAIGRAM::

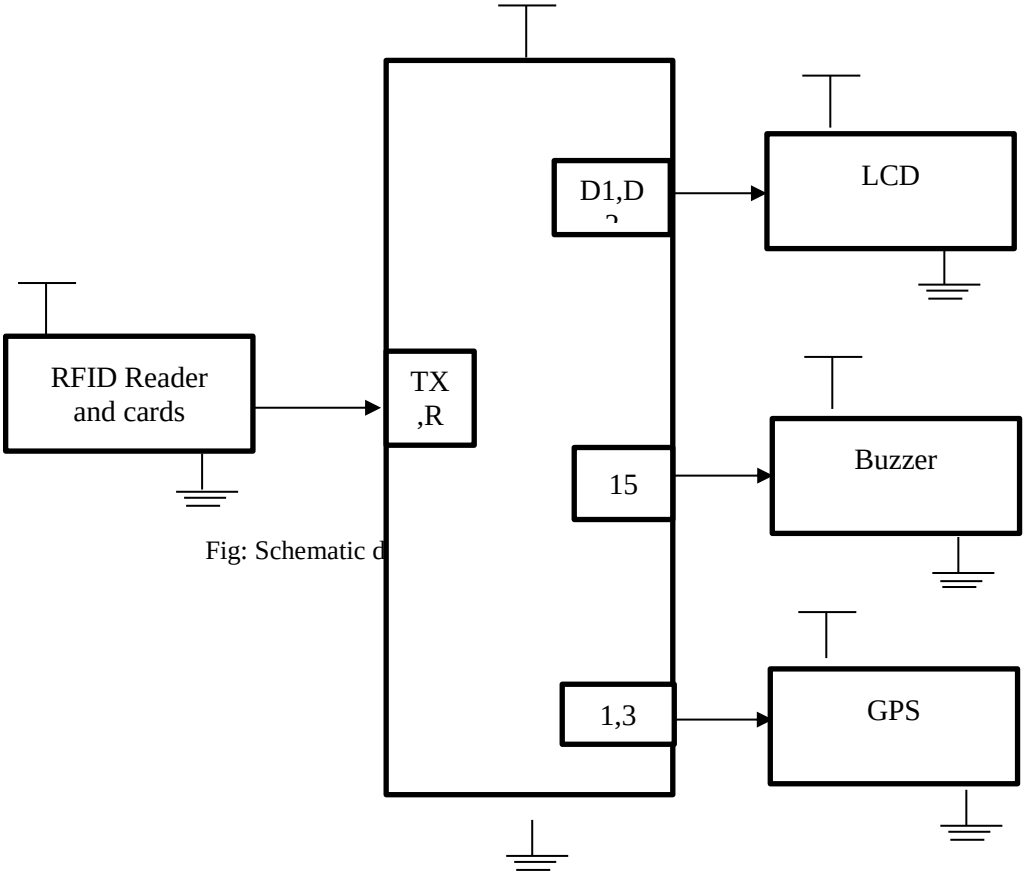


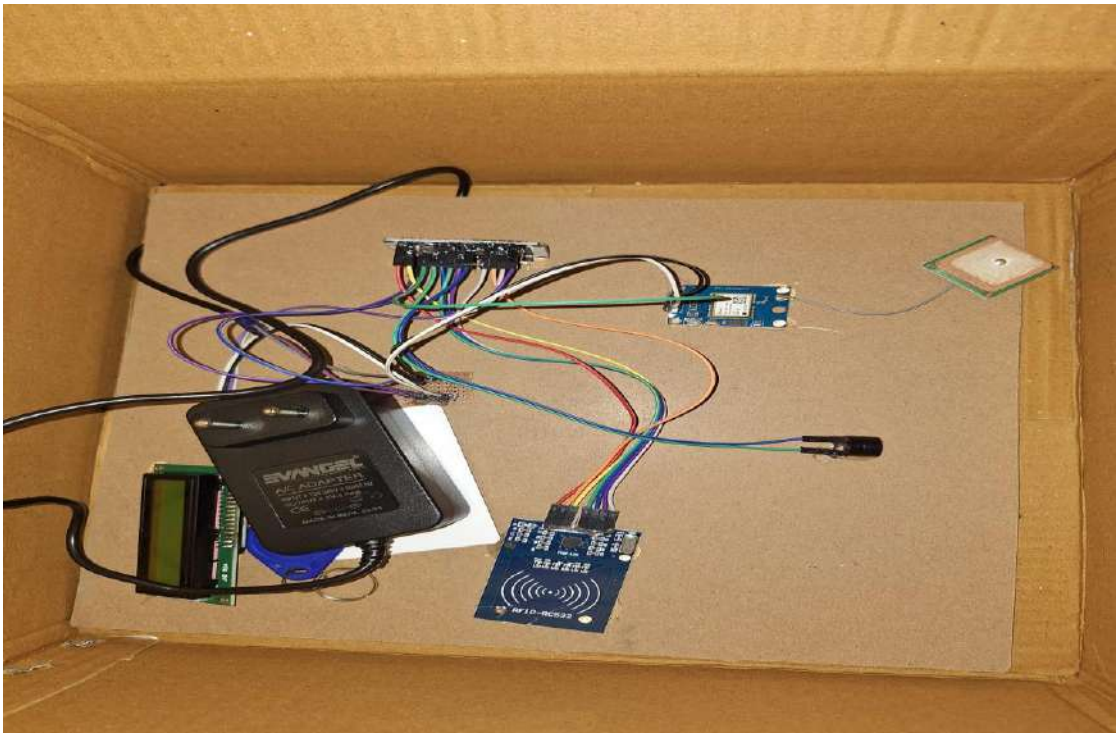
Fig: Schematic d

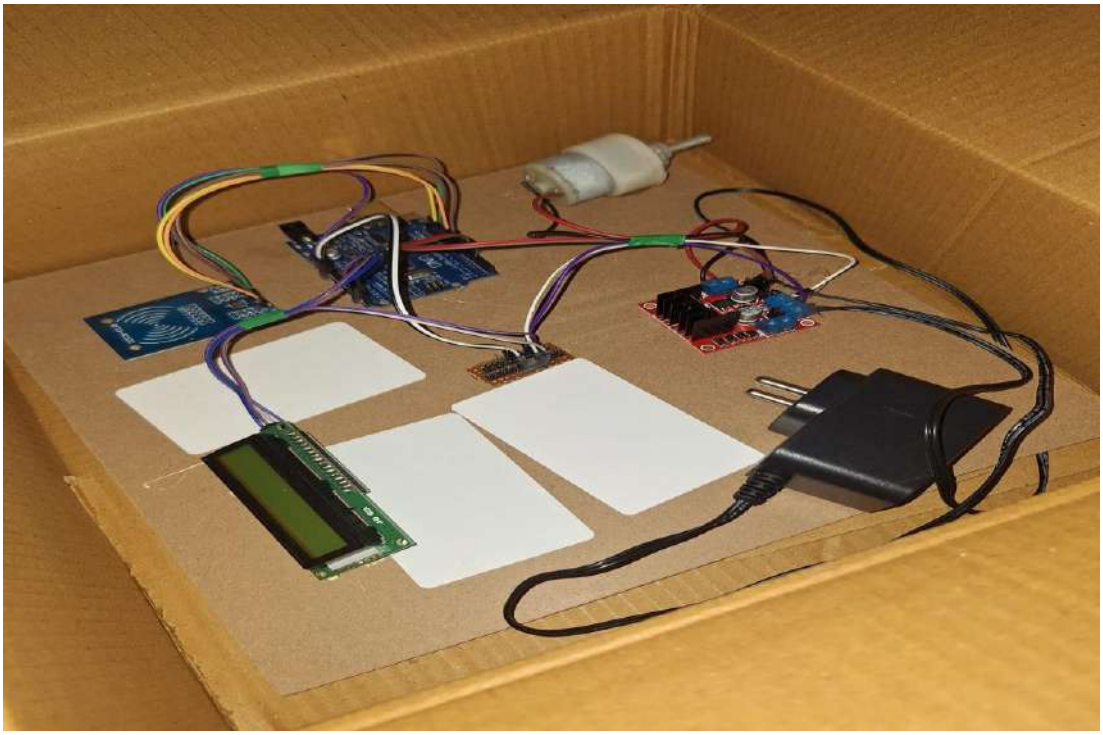
International Journal of Information Technology & Computer Engineering

ISSN 2347–3657

Volume 13, Issue 2, 2025

VII.RESULT AND ANALYSIS:





VIII .RESULT:

The proposed Child Safety Management System using RFID technology offers a reliable and efficient solution to ensure the safety of children in crowded or public spaces. By integrating real-time monitoring and automated alerts, the system significantly reduces the possibility of human error and enhances the effectiveness of child supervision. Its innovative use of hardware like RFID cards, Node MCU, and GPS ensures precise tracking, while features like the buzzer and LCD display provide immediate feedback and real-time information to adults. This project not only addresses a critical safety concern but also provides peace of mind to parents and guardians by leveraging advanced technology. Moving forward, this system can be further optimized for broader applications and improved scalability to ensure child safety in diverse environments.

IX.. FUTURE SCOPE:

The scope of a project focused on target tracking in the logistics management system. target tracking system based on RFID sensor network has been proposed, which achieves position and property tracking of the mobile targets by RFID and sensor technologies. It enables legal users to completely and visually master the cargo status, thereby delivering cargo in accurate amount and appropriate conditions at specific site. In the target tracking system based on RFID sensor network, sensors are responsible for searching information around the target and write into RFID tag. Then the RFID reader inside the smart phone of the driver sends the private data collected by the.

X. REFERENCES:

[1] Maryam Said Al-Ismaili, Ali Al-Mahruqi and Jayavrinda Vrindavanam, "Bus Safety System for School Children Using RFID and SIM900 GSM MODEM", *International Journal of Latest Trends in Engineering and Technology (IJLTET)*.

[2] Khaled Shaaban, Abdelmoula Bekkali, Elyes Ben Hamida and Abdullah Kadri, "Smart Tracking System for School Buses Using Passive RFID Technology to Enhance Child Safety", *Journal of Traffic and Logistics Engineering*, vol. 1, no. 2, pp. 191-196, December 2013.

[3] Zhiyuan Fang, Li Wei, Wei Chen and Yangjun He, A RFID-Based Kindergarten Intelligence Security System, 2012.

[4] Atsushi Ito, Tomoyuki Ohta and Shinji Inoue, Security system for children on school route, 2009.

[5] K. Finkenzeller, RFID Handbook: Radio-Frequency Identification Fundamentals and Applications, New York, NY, USA:Wiley, 2004.

[6] M. Cremer, A Pervez, U. Dettmar, T. Knie and R. Kronberger, "Using a circularly polarized patch antenna to optimize the passive UHF RFID indoor channel", *IEEE Antennas and Propagation Society International Symposium (APSURSI) 2013*, pp. 1730-1731, 2013.

[7] G. Santucci, "From internet to data to internet of things", *Proceedings of the international conference on future trends of the internet*, 2009.

[8] Miao Yu, Ting Deng and Jie Fu, Application of RFID and GPS Technology in Transportation Vehicles Monitoring System for Dangerous Goods.

[9] Zhang Ling-yong, Gao Song, Zhong Lei and Wang Hong-pei, "The design of monitor and early warning system based on 3G for intransit dangerous goods vehicles", *Journal of Shandong University of Technology (Natural Science Edition)*, vol. 24, no. 1, pp. 70-74, Jan 2011.

[10] Wang Wen-yang, Liu Quan-zhou, Wang Chun-hua and Gong Jin-feng, "The Vehicle-loaded Goods Tracing System Based on RFID/GIS/GPS/ GPRS", *Logistics Technology*, vol. 28, no. 12, pp. 238-239, 2009.

[11] IEEE Standard for Information technology, 802.11, "Telecommunications and information exchange between systems Local and metropolitan area networks".

[12] H Wang, G. Bauer, F Kirsch and Martin Vossiek, Hybrid RFID system-based pedestrian localization: A case study.

VI. REFERENCES:

[1] Ankita Mishra, Jyoti Solanki “Design of RF based speed control system for vehicles,” International Journal of Advanced Research in Computer and Communication Engineering, Vol. 1, No 8, 2012.

[2] Vinod Rao, Saketh Kuma, “Smart Zone Based Vehicle Speed Control Using RF and Obstacle Detection and Accident Prevention,” International Journal of Emerging Technology and Advanced Engineering, Vol.4, No.3, 2014.

[3] Gummarekula Sattibabu, Satyanarayan , “Automatic Vehicle Speed Control With Wireless In-Vehicle Road Sign Delivery

System Using ARM 7," International Journal Of Technology Enhancements And Emerging Engineering Research, Vol 2, No. 8, 2014.

[4] Deepa B Chavan, Abdul Rahim Makandar , "Automatic Vehicle Speed Reduction System Using Rf Technology," International Journal of Engineering Research and Applications, Vol.4, No.4, 2014.

[5] Jyothi Kameswari, Satwik, "A Design Model for Automatic Vehicle Speed Controller," International Journal of Computer Applications, Vol.35, No.9, 2011.

[6] Ari Jules, "RFID Security and Privacy: A Research Survey Review", IEEE Trans. Selected area in Communication, pp. 381-394, February 2006.

[7] Ari Jules, S. Garfunkel and R. Pappu, "RFID Privacy: An Overview of Problems and Proposed Solution", IEEE Trans. Security and Privacy, pp. 34-43, May2005.

[8] K. Takaraj, M. Usami, R. Imra& R. Itsuki, "Recognition Security an Ultra Small Individual Chip", IEEE Trans. Micro, vol.21, no.6, pp.42-49, 2001.

[9] Raza, V. Hugue, "Application of RFID technology", IEEE Trans. RFID Technology, February 1999.

[10] M. A. Mazidi&Mazidi, "The 8051, Microcontroller & Embedded Systems".

[11] Kenneth J. Ayala, "The 8051, Microcontroller Architecture, Programming and Applications", 2nd Edition, Penram International.

[12] Jacob Millman& Christos C. Halkais, "ElectronicDevices & Circuit", Tata McGraw Hill Edition, 1991.Vishal Pande, Navnath Nehe & Nandini Bhandari, "RFID in Access Control System", Lambert Academic Publishing.

[13] Road accidents in India 2010, Ministry of road transport and highways transport research wing, Govt. of India

[14] "RFID design fundamentals and applications", Albert Lozano-Niento, CRC press, Pages 1-11, ISBN 978-1- 4200-9125-0

[15] The RF in RFID by Daniel Mark Dobkin, Newnes, 2007, ISBN 9780750682091 National Conference on Emerging Technologies for Sustainable Engineering & Management(NCETSEM'18)-2018ISSN: 2395-1303 http://www.ijetjournal.org Page 5

[16] Perez J; Seco F; Milenez A; Diaz J ;De pedro, "An RFID-Based Intelligent Vehicle Speed Controller Using Active Traffic Signals", Sensors 2010, 10, 5872- 5887

[17] "Intelligent Vehicle Control Based on Identification of Road and Traffic Signal Operated RFID transponders" by Ateeth Kumar Thirukkovulur, Harikrishna N, Vigneesh Parivallal, Proceedings of International Conference On Advances in Electrical and Electronics Engineering, Penang, Feb 2012, pg 339-343.

[18] Ari Jules, "RFID Security and Privacy: A Research Survey Review", IEEE Trans. Selected area in Communication, pp. 381-394, February 2006.