IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 9, May 2023

IOT Based Intelligent Transportation System

Dr. Rahane S. B.[1], Mr. Pawase Pratik[2], Mr. Pokharkar Prasad[3], Miss. Tikande Pooja[4], Mr.Walunj Vikas[5]
Prof, Department of Electronics Engineering[1]
Students, Department of Electronics Engineering[2,3,4,5]
Amrutvahini College of Engineering, Sangamner, India

Abstract: *The IoT Based Intelligent Transportation System is a ground-breaking project that leverages the power of Internet of Things (IoT) technology to revolutionize the monitoring, tracking, and management of vehicles. This project incorporates various sensors, a microcontroller, and communication modules to collect real-time data from vehicles, enabling enhanced safety, efficiency, and communication within the transportation sector. The main objective of this project is to develop a comprehensive IoT-based solution that monitors critical vehicle parameters, tracks their location, detects accidents, and provides an alert messaging system for emergency situations. By integrating advanced technologies, such as the PIC18F4520 microcontroller, fuel level sensors, force sensors, MEMS sensors, temperature sensors, GSM module, and GPS module, the system creates an intelligent platform for effective vehicle management and safety. In addition, the system incorporates GPS technology for precise and real-time vehicle tracking. An alert message is sent to the vehicle owner, enabling quick action or assistance. The system utilizes a GSM module to enable seamless communication and data transfer. This module uploads vehicle data to the designated web platform, Thing speak, where it is stored, analyzed, and visualized. The GSM module also ensures timely transmission of alert messages to vehicle owners in emergency situations and risk mitigation. This project report provides comprehensive insights into the design, development, and implementation of the IoT Based Intelligent Transportation System. It covers component selection, integration, microcontroller programming, sensor calibration. The report presents the results and findings obtained from the collected data, showcasing the system's efficacy in improving vehicle monitoring, tracking, and safety. The successful completion of this project demonstrates the practical application of IoT technology in the transportation domain. The IoT Based Intelligent Transportation System has the potential to transform vehicle management and safety, leading to smarter and more efficient transportation networks.*

Keywords: Internet of Things, Transportation Management, GPS Location Tracking, GSM, Accident Alert

I. INTRODUCTION

The rapid advancement of Internet of Things (IoT) technology has opened up new possibilities for enhancing various industries, including transportation. The "IoT Based Intelligent Transportation System" is an engineering project that aims to revolutionize the way vehicles are monitored, tracked, and managed. This system utilizes a range of sensors, microcontrollers, and communication modules to collect and analyze real-time data from vehicles, enabling improved safety, efficiency, and communication in the transportation sector. The primary objective of this project is to develop a comprehensive IoT-based solution that monitors vital parameters of vehicles, tracks their location, detects accidents, and provides an alert messaging system for emergency situations. By integrating cutting-edge technologies, such as the PIC18F4520 microcontroller, fuel level sensors, force sensors, MEMS sensors, temperature sensors, GSM module, and GPS module, this system creates a powerful and intelligent platform for vehicle management and safety. The monitoring aspect of the system involves the collection of essential vehicle data, including fuel level, speed, engine temperature, and load information. This data is crucial for evaluating the performance of vehicles, optimizing fuel consumption, and identifying maintenance requirements. By continuously monitoring these parameters, the system provides valuable insights for efficient fleet management and proactive maintenance planning. Furthermore, the system

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 9, May 2023

incorporates GPS technology to enable precise and real-time vehicle tracking. This feature assists in managing transportation logistics, optimizing routes, and ensuring the safety and security of vehicles. In the event of an accident, the MEMS sensor detects sudden impacts or abnormal vehicle movements, triggering an immediate response. An alert message is sent to the owner of the vehicle, enabling them to take prompt action or seek appropriate assistance. To ensure seamless communication and data transfer, the system utilizes a GSM module. This module enables the uploading of collected vehicle data to a designated web platform called Thing speak, where the information can be stored, analyzed, and visualized. Additionally, the GSM module facilitates the transmission of alert messages to vehicle owners in emergency situations, thereby enabling timely response and mitigating potential risks. This project report provides a detailed account of the design, development, and implementation of the IoT Based Intelligent Transportation System. It covers the selection and integration of components, the programming of the microcontroller, the calibration of sensors, and the testing of the system's functionalities. Furthermore, it presents the results and insights derived from the collected data, showcasing the system's effectiveness in enhancing vehicle monitoring, tracking, and safety. By successfully completing this project, we have demonstrated the practical application of IoT technology in the transportation domain. This IoT-based Intelligent Transportation System has the potential to revolutionize vehicle management and safety, paving the way for smarter and more efficient transportation networks.

II. LITERATURE SURVEY

Many researchers This section first discusses the recent research developments in intelligent traffic management including system models for traffic updates, traffic congestion measures, emergency vehicle handling, and applications of roadside units to deliver messages. Current advances in cost-effective and power-efficient wireless sensor nodes for traffic monitoring follow this. This section also includes specific printed circuit boards based on sensor nodes to detect vehicles, estimate speed, and classify them. The discussion includes the features of these nodes, their pros, and cons.

Real-time traffic monitoring systems play a key role in the transition toward smart cities. A considerable amount of literature has been published on intelligent traffic management systems based on the IoT paradigm [25,56,60,61]; Z [38]. Autonomous traffic sensing is at the heart of smart city infrastructures, wherein smart wireless sensors are used to measure traffic flow, predict congestion, and adaptively control traffic routes. Doing so effectively provides an awareness that enables more efficient use of resources and infrastructure.

Identifying and measuring congestion is the very first step in the traffic management process [40]. The flow, occupancy, density is the widely used traffic congestion measures, which are mostly obtained from images or videos captured by vision systems initially [53]. Based on these measures, the traffic warning messages are broadcasted through smartphones, radio, televisions, light signals, dynamic variable message signs, or display units. Among them, the mobile-based web applications received much attention among researchers [18,56].

Most of the recent developments in delivering real-time traffic updates used the congestion estimates to dynamically control the traffic signal [3,27,32,43,59,63]. An IoT based real-time traffic monitoring system is proposed [43] for dynamic handling of traffic signals based on traffic density. The proposed system uses a set of ultrasonic sensors and has two modules: one for vehicle monitoring and other for priority management. The ultrasonic sensors are used to detect vehicles, and the density levels of a given road are sent to an LCD, and the data sent to the server for later usage. In similar research [63], the authors proposed an ultrasonic sensor-based system model specifically for road intersections. In addition to traffic signal lightings, the system alarms on any false vehicle activities such as crossing the red signals. In another research, an IoT based smart traffic management system is proposed [29] to manage real-time traffic through both central and local servers. The data collection layer uses sensors, cameras, and RFIDs. The application layer automatically controls the traffic signal based on traffic density and provides a daily report through a web application. Besides sensors, video monitoring is also used to estimate traffic congestion density [32] and update traffic signals in real-time.

The internet of connected vehicles is another research development in this area [26] to collect real-time traffic data. The connected vehicles support individual vehicle monitoring which enables efficient emergency vehicle management. Integrating roadside units (eg: traffic lights) with the vehicular network to ensure the trustworthiness of traffic events [66]. The emergency vehicle (e.g. Police cars, Fire engines, Ambulances) handling is very critical, the delay of every second matter because of the urgency of the services they are providing. Automatic scheduling of emergency vehicles

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 9, May 2023

can be performed by controlling the traffic signals [45,64] to improve the response time [57]. However, these systems are specifically designed for highways.

As this research does not anticipate any smart devices with the drivers, the traffic updates through roadside message units are analysed in detail. A patented device for displaying traffic conditions [17] is designed to install on the roadside. The graphical message unit displays the upcoming traffic conditions and incidents through messages, signs, or colors. The studies on the impact of dynamic message signs through roadside message units show that it has received acceptance among drivers [23,35,65]. The dynamic message signs can be delivered in permanent mode through roadside message units (installed on bridges, toll plazas, tunnels, etc.) or portable units. The portable units are mainly used to warn about unusual traffic incidents. The roadside units mostly display the messages about over spilled roads, planned activities, environmental updates, traffic flow conditions, etc. The impact analysis of such message units reported that they mainly assist elderly drivers in their decision making [23].

The transportation project for the Beijing Olympics (F [69]. is a great example of providing traffic updates through public message units. The project used changeable message boards, radios, television, internet, and in-vehicle displays to monitor and dispatch traffic updates. However, system development was quite expensive due to advanced programs and devices [5]. After that, several research efforts have been made in this area to provide real-time traffic updates. A system is proposed to display traffic intensity through three different light colors on installed electronic boards at decision points [60]. In this system, the real-time traffic density is calculated from the average vehicle speed determined by vehicle detection systems. The authors apply image processing algorithms to process real-time traffic videos, and the traffic congestion estimation is based on optical flow. Similarly, electronic signboards are used to avoid congestions by setting up different speed limits [21].

III. PROPOSED SYSTEM

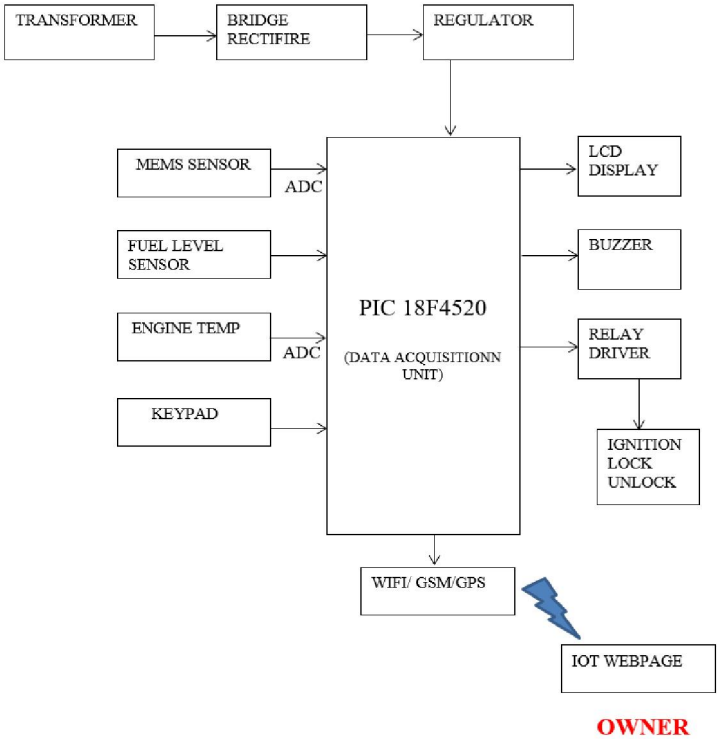

Fig.1. Block Diagram

Tracking of vehicle is a process in which we track the vehicle location in form of Latitude and Longitude (GPS coordinates). GPS Coordinates are the value of a location. This system is very efficient for outdoor application purpose. This kind of Vehicle Tracking System Project is widely in tracking Cabs/Taxis, stolen vehicles, school/colleges buses etc.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 9, May 2023

This circuit is designed for tracking the location of vehicles. Most of tracking systems are made by using GPS. This is very simple and cheap. Tracking systems are mostly used by fleet operators for tracking a vehicle location, routing and others. This is a very good method for preventing our vehicles from stolen. This tracking system sends us the geographical
Coordinates and by using these coordinates we can track our vehicle position on electronic maps using internet. By using these tacking systems, we can share real time information about transportations. And also, can be share real time information or position bus/taxi/cab with passengers. Means passengers can see the real time of arriving bus/taxi/cab on Mobile.
Signal Identification and Signal Processing: The Vibration sensor sense the activity of accident and the vehicle information stored in the registered user is immediately transferred to the microcontroller.
Locating the position of vehicle: The position of vehicle is located using the GPS system. Longitude and Latitude axis of the geographical location is tracked and forwarded to the nearest emergency service.

PIC 18f4520 Microcontroller

It is an 8-bit enhanced flash PIC microcontroller that comes with nanowatt technology and is based on RISC architecture. Many electronic applications house this controller and cover wide areas ranging from home appliances, industrial automation, security system and end-user products. This microcontroller has made a renowned place in the market and becomes a major concern for university students for designing their projects, setting them free from the use of a plethora of components for a specific purpose, as this controller comes with inbuilt peripheral with the ability to perform multiple functions on a single chip.

- Data Memory up to 4k bytesn Data register map - with 12-bit address bus 000-FFF
- Divided into 256-byte banks
- There are total of F banks
- Half of bank 0 and half ofbank 15 form a virtual (oraccess) bank that is accessibleno matter which bank isselected – this selection isdone via 8-bit
- Program memory is 16-bits wide accessed through a separate program data bus and address bus inside the PIC18.
- Program memory stores the program and also static data in the system.
- On-chip External
- On-chip program memory is either PROM or EEPROM.
- The PROM version is called OTP (one-time programmable) (PIC18C) The EEPROM version is called Flash memory (PIC18F).
- Maximum size for program memory is 2M n Program memory addresses are 21-bit address starting at location 0x000000

Fig. 2. PIC18f4520

GPS Module

This is New Version (V2) of our famous GPS Receiver with Antenna (5VTTL Serial), with 4pin 2.54mm pitch Berg strip connector option. It is made with third generation POT (Patch Antenna on Top) GPS module. The on board 3V3 to 5V level convertor enables us to directly interface with normal 5V Microcontrollers. Its low pin count (4Pin) will

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 9, May 2023

make it easy to interface and it is bread board friendly with 2.54 mm (0.1″) Pitch connector pads. The 4 Pins are 5V, TXD, RXD and GND. Yes, there is no setting required, just plug in to the power (5v), your raw data (NMEA0183) is ready at TX pin! This is a standalone 5V GPS Module and requires no external components. It is built with internal RTC Back up battery. It can be directly connected to Microcontroller's USART.

With the use high gain GPS engine providing a solution that high position and speed accuracy performances as well as high sensitivity and tracking capabilities in urban conditions & provides standard NMEA0183 strings in "raw" mode for any microcontroller. The module provides current time, date, latitude, longitude, speed, altitude and travel direction / heading among other data, and can be used in a host of applications, including navigation, tracking systems, fleet management, mapping and robotics.

Fig. 3. GPS Module

GSM Module

This GSM modem has a SIM800A chip and RS232 interface while enables easy connection with the computer or laptop using the USB to Serial connector or to the microcontroller using the RS232 to TTL converter. Once you connect the SIM800 modem using the USB to RS232 connector, you need to find the correct COM port from the Device Manger of the USB to Serial Adapter. Then you can open Putty or any other terminal software and open a connection to that COM port at 9600 baud rates, which is the default baud rate of this modem. Once a serial connection is open through the computer or your microcontroller you can start sending the AT commands. When you send AT commands for example: "AT\r" you should receive back a reply from the SIM800 modem saying "OK" or other response depending on the command send.

Fig. 4.GSM Module

MEMS Sensor

ADXL335 from Analog Devices, is a triple-axis accelerometer with digital I2C and SPI interface. We added an on-board 3.3V regulator and logic-level shifting circuitry, making it a perfect choice for interfacing with any 3V or 5V microcontroller such as the pic.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 9, May 2023

The sensor has three axes of measurements, X Y Z, and pins that can be used either as I2C or SPI digital interfacing. You can set the sensitivity level to either +-2g, +-4g, +-8g or +-16g. The lower range gives more resolution for slow movements, the higher range is good for high-speed tracking. The ADXL335 is the latest and greatest from Analog Devices, known for their exceptional quality MEMS devices. The VCC takes up to 5V in and regulates it to 3.3V with an output pin

Fig. 5. MEMS Sensor

LCD Display

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD

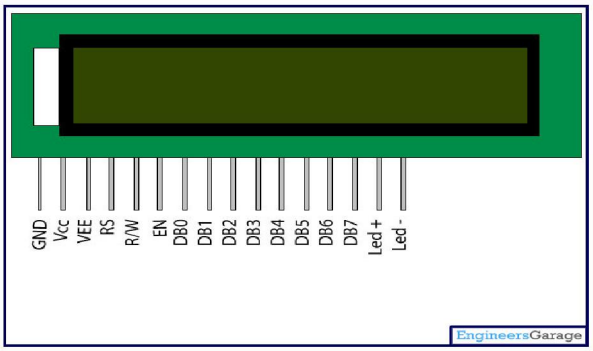

Fig. 6. LCD Display

IV. CONCLUSION

The proposed system uses the IoT for vehicle accident detection and alarming the authorities regarding accidents, vehicle tracking using GPS Modem. In this project we have designed IoT based vehicle accident detection and tracking system using GPS Modem. Hence IoT can revolutionize the way the system interacts and respond for the variety of applications especially in case of traffic control.

This design is the system which can detect the accidents in less time and sends the information to the first aid center. This project is user-friendly and reliable. The proposed method is highly beneficial to the automotive industry. In future, data logging and analysis can be implemented to monitor the traffic situations in various regions future.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 9, May 2023

ACKNOWLEDGMENT

It gives us great pleasure in presenting the paper on "IOT Based Intelligent Transportation System". We would like to take this opportunity to thank our guide, Dr. Rahane S.B. Professor, Department of Electronics Engineering, Amrutvahini College of Engg. Sangamner for giving us all the help and guidance we needed. We are grateful to him for his kind support, and valuable suggestions were very helpful.

REFERENCES

[1] Aishwarya S.R, AshishRai, Charitha, Prasanth M.A, and Savitha S.C "An IoT based vehicle accident prevention and tracking system for night drivers" proc. IEEE, vol.3, no.4, pp.2320-9798 2015.

[2] Sadhana B Shabrin, BhagyashreeJagadishNikharge, Maithri M Poojary and T Pooja, "Smart helmet-intelligent safety for motorcyclist using raspberry pi and open CV", proc. IEEE, vol.03, no.03 pp.2395-0056 2016

[3]Jagdish A. Patel, AringaleShubhangi, Shweta Joshi, AartiPawar and Namrata Bari discussed on "Raspberry Pi based smart home", Proc. IEEE, vol.6, no.3, pp.2321-3361 2016

[4]Dr.pankajTomar and preeti Mehta focused on "An Efficient Management System based on Face Recognition using Matlab and Raspberry Pi 2", Proc-IEEE, vol.3, no.5, pp.239 2016

[5] T. Anitha and T. Uppalaigh focused on "Android based home automation using Raspberry pi", Proc-IEEE, vol.04, no.01, pp-2351-8665 2016

[6] M. Patil, A. Rawat, P. Singh, S. Dixit, "Accident Detection and Ambulance Control using Intelligent Traffic Control System", International Journal of Engineering Trends and Technology (IJETT) ,34(8), pp.400-404,2016.

[7] N. Chaturvedi, P. Srivastava, "Automatic Vehicle Accident Detection and Messaging System Using GPS and GSM Modems", International Journal of Scientific & Engineering Research, 4(8), pp. 252-254,2013.

[8] V. Govindaraj, K. Venkatesan, K. Seethapathy, S. Suthanthiram, S. Alagarsamy, A. Thiyagarajan, "An Imitating Wearable Kidney: A Dialectical Replacement for The Cumbersome Dialysis Procedure for Renal Failures," Journal of Advanced Science and Technology, 29(7s), pp. 2932-2940,2020.