SMART DETECTION OF OVER SPEEDING VEHICLE USING IoT

A PROJECT REPORT
Submitted in partial fulfilment of the requirements for the award of the degree of

BACHELOR OF TECHNOLOGY

In

ELECTRONICS AND COMMUNICATION ENGINEERING

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We undersigned solemnly declare that the Main Project report **"SMART DETECTION OF OVER SPEEDING VEHICLE USING IOT"** is based on our own work carried out during the course of our study under the supervision of **Dr. S. V. R. K. Rao**, Professor.

We assert the statements made and conclusions drawn are an outcome of my research work. We further certify that

I. The work contained in the report is original and has been done by me under the general supervision of my supervisor.

II. The work has not been submitted to any other Institution for any other degree/diploma/certificate in this university or any other University of India or abroad.

III. We have followed the guidelines provided by the university in writing the report.

IV. Whenever we have used materials (data, theoretical analysis, and text) from other sources, we have given due credit to them in the text of the report and giving their details in the references.

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BONAFIDE CERTIFICATE

Certified that this project report “**SMART DETECTION OF OVER SPEEDING VEHICLE USING IOT”** is the Bonafide work of **“T DIVYA SAI (21555A0421), M VIVEK VARMA (20551A04G3), S BHANU VARDHAN (20551AO4D3), P PRATHYUSHA (20551A04G7)”**, who carried out that project work under my supervision during the year 2023 to 2024, towards partial fulfillment of the requirements of the Degree of Bachelor of Technology in Electronics & Communication Engineering as administered under the Regulations of Godavari Institute of Engineering & Technology, Rajamahendravaram, AP, India, and award of the Degree from Jawaharlal Nehru Technological University, Kakinada. The results embodied in this report have not been submitted to any other University for the award of any degree.

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ABSTRACT

To combat the increasing rates of accidents due to over-speeding, this project aims to design an advanced system to automatically detect and report over-speeding vehicles. Leveraging IoT, the system uses RFID cards for vehicle identification, cameras for capturing the image of the vehicle, and an integrated LCD display. If a vehicle is detected surpassing the speed limit, the system captures the vehicle's image and sends a notification email with the associated vehicle number. This not only enhances road safety by holding drivers accountable but also reduces the dependency on manual monitoring. The innovative aspect is the vehicle's capability to adapt its speed based on road conditions autonomously, ensuring a safer driving environment.

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CHAPTER 1

INTRODUCTION

Now-a-days the technology changes continuously, as of now the people were of using the equipment's instantly to reduce the time and efficiency .as we know that the electronic device was of changes the man life as well.one of the device is of Generator. It was used in day-to-day life to run the electronic devices for long extension of electronic devices and not to waste of human resources. As weall know that generators are electronic energy storing device and transmitting of energy.

The major concern of vehicle accident is the part of continual disaster lists, which might happen anywhere anytime. In accordance with Association for Safe International Road Travel Report, around 1.24 million people die and 50 million people are getting wounded on the roads each year in the World. Statistically, they are assumed as the second important reasons for death. In order to overcome these problems, many automobile device industries and vehicle manufacturers have tried to propose speed control techniques in order to keep up a vehicle safe distance. In this direction, the effort is going on devising a security driving application for vehicles by new rising IOT-oriented technology, which is employed for devising a more effective solution.

With population growth, the demand for vehicles has increased tremendously, which has created an alarming situation in terms of traffic hazards and road accidents. The road accidents percentage is growing exponentially and so are the fatalities caused due to accidents. However, the primary cause of the increased rate of fatalities is due to the delay in emergency services. Many lives could be saved with efficient rescue services. The delay happens due to traffic congestion or unstable communication to the medical units. The implementation of automatic road accident detection systems to provide timely aid is crucial.

Many solutions have been proposed in the literature for automatic accident detection. The techniques include crash prediction using smartphones, vehicular ad-hoc networks, GPS/GSM based systems, and various machine learning techniques. With such high rates of deaths associated with road accidents, road safety is the most critical sector that demands significant exploration. In this paper, we present a critical analysis of various existing methodologies used for predicting and preventing road accidents, highlighting their strengths, limitations, and challenges that need to be addressed to ensure road safety and save valuable lives.

Automatic vehicle monitoring has turned out to be a very crucial scenario in the current years. It may develop into possibility by executing the following technologies. This project targets to propose a system, which detects speeding vehicles over a specific speed limit and immediately report to concerned authorities. At present, road accidents rates have raised so, there is a necessity for developing a system that detects an over speeding vehicle. The implementation of present Smart Vehicle Over Speeding Detector using Internet of Things determines all the road traffic information automatically with intelligence. The smart vehicles are suitable with over speeding detector that has capability for recording, storing and information sharing about the vehicle's speed. The system contains GPS module, Radar, Google maps and IoT module. The safe regions are identified automatically using GPS and IoT technologies. Electronic tracking device runs in 12 V lithium batteries with network of GPS sensing andIoT implementation. The battery life of this device is range from 5-10 hours. A smart vehicle over speeding sensor is employed and is combined with IoT in order to decrease the vehicle's speed at particular places like accident prone zones. If this smart sensor technology is used the safety parameters, then avoidance of accidents may be attained. The system sends the data wirelessly. If the over speeding vehicle is detected, then the sensor alerts by sounding an alarm.

1.1 PROBLEM STATEMENT:

The project focuses on developing a Smart Over-speeding Vehicle Detection System designed to enhance road safety by promptly identifying and addressing instances of speeding. This system integrates cutting-edge technologies such as Internet of Things (IoT), real-time data analytics, and alert mechanisms to provide an intelligent solution for monitoring and controlling vehicle speed.

1.2 MOTIVATION:

In today's fast-paced world, road safety remains a paramount concern as over-speeding continues to contribute significantly to accidents and fatalities on our highways and streets. As technology advances, there arises a pressing need for innovative solutions to mitigate the risks associated with over- speeding and enhance overall road safety measures. This project introduces a comprehensive system leveraging the Internet of Things (IoT) to automatically detect and report instances of over-speeding vehicles.

1.3 OBJECTVES:

The primary objective of this project is to design and implement an advanced system that employs a combination of RFID technology, cameras, and integrated display units to monitor and enforce speed limits on roadways. By seamlessly integrating these technologies, the system aims to detect vehicles exceeding the prescribed speed limits and promptly notify relevant authorities, thereby fostering a proactive approach towards ensuring adherence to speed regulations.

Central to this system's functionality is its ability to accurately identify vehicles using RFID cards, capture real-time images of the vehicles in question, and promptly relay this information through email notifications. This real-time reporting mechanism not only facilitates swift intervention but also serves as a deterrent against reckless driving behavior. Moreover, by automating the detection process, the system significantly reduces reliance on manual monitoring, thus optimizing resource allocation and operational efficiency.

Furthermore, the innovative aspect of this project lies in its vision for enhancing road safety beyond mere enforcement. In addition to detecting over-speeding violations, the system proposes an autonomous adaptation feature wherein vehicles can dynamically adjust their speed based on prevailing road conditions. By incorporating this adaptive technology, the system aspires to create a safer driving environment by promoting responsible and context-aware driving practices.

1.4 SCOPE OF THE PROJECT:

The project aims to develop an intelligent vehicle control system using IoT, RFID cards, and a camera-based speed detection mechanism. Its scope includes the creation of a self-adaptive system that autonomously adjusts vehicle speed based on road conditions, with a focus on over-speeding detection through RFID cards. The system will employ an LCD display and motor control to alert and upload vehicle numbers when speeding is identified, contributing to enhanced road safety.

CHAPTER 2

LITERATURE SURVEY

Over speeding and Rash Driving Vehicle Detection System:

The present world is advancing at the speed of light in the field of trade and business, and the development in technology has been significantly influencing this growth. However, transportation by road is one of the major factors that have been affecting the commercial development of our country. With the increasing vehicular population and their movement on the roads, accidents are also steadily increasing. It has become a nightmare for the authorities to prevent or reduce such fatal accidents on the road and all their efforts are in vain. According to the Indian road accidents survey, every year there are more than 135,000 incidents of road accidents. Out of these, most of them are due to rash driving. According to Indian Constitution, IPC section 279, rash driving is an offence. So, our idea is to design a module which can detect the vehicle whenever it is rashly driven or driven above permissible speed limit, and transmit the data to the concerned authority [1].

Design and Construction of Speed Detection System for Vehicles:

The objective of this paper is to detect the over speed for vehicles on the highway road. Although the maximum speed limit on the highway, many accidents keep on because of over speed driving. It is necessary to solve these problems through electronics circuit. This paper describes speed detection system for vehicles. The highway traffic police are easy to check over speed by using this system. Thissystem mainly consists of Arduino UNO, two IR sensors (MD-0138 Infrared Obstacle Avoidance Sensor), 1602A LCD display and buzzer. The detected speed is displayed on LCD. Moreover, if the vehicle crosses the limited speed, this system displays the condition of over speed on LCD and the buzzer is alarmed [2].

Automated Over Speeding Detection and Reporting System:

Researchers have designed Automated Speed Detection System that may detect the vehicle’s speed and if over speeding happens, then remove the particular vehicle’s license number and send it through mail to Toll Plaza in order to indict fine. Here, Doppler Effect observable fact is employed for measuring the speed. If over speeding is identified, then a camera captures the image of a vehicle automatically; and DIP (Digital Image Processing) methods are used to remove the license number. The findings have revealed that the developed system detects over speeding vehicle successfully, mines the license number, has great performance and may be used on roads to test out for over speeding vehicles [3].

Vehicle Speed Detection System in Highway:

This research planned to build the vehicle speed detection system using video-based approach. Video based vehicle speed detection system is effective application for intelligent traffic monitoring due to low cost and great capabilities. This system uses camera output for video processing and to draw out required information for speed detection. This research paper shows a new way to detect speed of vehicle through video-based technique rather than radar. The vehicle speed observation from a video frame system contains six components: First we have to deal with capturing the real-time video of the vehicles. Each moving object is detected using here cascade when it enters in the frame. Then detected vehicle is provided with a unique ID After that, movement among consecutive frame are calculated forfinal speed measurement. The output of the system is displayed in the streaming web application and store the speed and detection time of the vehicle in the csv file. The project aims to reduce the chance of accident. Vehicle speed computation is one of the major key components of traffic inspection system. The presented data can also be used for traffic controlling and law enforcement. It provides the speed of passing vehicle with high accuracy [4].

IOT Based Smart Vehicle Monitoring and Tracking System

Car accidents are taken into consideration certainly one of the most detrimental phenomena. Though there are numerous different reasons behind car accidents, most injuries occur due to driver's unawareness and uncontrolled speed. Also, there appears to be a trouble accomplishing the spot of accident on time due to loss of awareness. So smart vehicle using an Internet of Things (IoT) technology is the solution to reduce the number of accidents and also to prevent theft. This paper presents a smart system design to detect the accident immediately. This system always monitors the gap between the vehicles using ultrasonic sensor. The proposed design is cognizant with GPS/GPRS and GSM that automatically send an alert message to family members and nearest rescue team. The GPS/GPRS systemcontinuously keeps the track of vehicle location and can be used during an accident and theft [5].

The authors have presented EBM (Eye Blink Monitoring) technique, which alerts the focus during drowsiness state. An embedded system depends on the psychological state of focus through monitoring head movements and eye movements are helpful in alerting drivers at the sleep cycle stage of drowsiness. An ordinary eye blink moment has no effect on the system results. The researchers have designed Automated Speed Detection System that may detect the vehicle's speed and if over speeding happens, then remove the particular vehicle's license number and send it through mail to Toll Plaza in order to indict fine. Here, Doppler Effect observable fact is employed for measuring the speed. If over speeding is identified, then a camera captures the image of a vehicle automatically; and DIP (Digital Image Processing) methods are used to remove the license number. The findings have revealed that the developed system detects over speeding vehicle successfully, mines the license number, has great performance and may be used on roads to test out for over speeding vehicles.

The authors have proposed a new Vibration Sensor Device that was set on the vehicle. If any accident happens, vibration is activated and then vehicle’s location has been detected with the help of GPS locator. Immediately, the incident has been intimated to Patrol and Life support in order to recuperate the accident as well as suspect is to be tracked by means of GPS locator. The researchers haveestimated the speed of vehicles by incorporating the accelerometer readings throughout the time and determine the acceleration faults.

In this, proposed work focused on the LTR (Lateral load transfer ratio) evaluation system to prevent vehicle rollover incidents. In their system they use two different models: a nonlinear suspension model and a rolling plane vehicle. By combining they were able to make a cost-effective system for vehicles and an easy to install system and provide effectiveness and feasibility in the detecting and preventing a vehicle rollover and reduce the risk of accidents.

In their proposed work they used an EEG (Electroencephalogram) system to detect drowsiness of the driver, in their system they have used 3 different main building blocks to detect drowsiness using EEG signals. In first block they collected raw EEG signals and EEG spectrogram, in second they performed pre-trained VGGNet and Alex net directly on EEG spectrogram images and in the third block they used TQWT (TunableQ-factor Wavelet transform) to decompose EEG signals and they calculated the required data from it. They also used different algorithms and compared them and were able to achieve or increase the accuracy at 94.31%.

CHAPTER 3

HARDWARE IMPLEMENTATION

3.1 RASPBERRY PI

Raspberry Pi is a credit-card sized computer manufactured and designed in the United Kingdom by the Raspberry Pi foundation with the intention of teaching basic computer science to school students and every other person interested in computer hardware, programming and DIY-Do-it Yourself projects.

The Raspberry Pi is manufactured in three board configurations through licensed manufacturing deals with Newark element 14(Premier Farnell), RS Components and Egoman. These companies sell the Raspberry Pi online. Egoman produces a version for distribution solely in China and Taiwan, which can be distinguished from other Pi's by their red colouring and lack of FCC/CE marks. The hardware is the same across all manufacturers.

The Raspberry Pi has a Broadcom BCM2835 system on a chip (SoC), which includes an ARM1176JZF-S 700 MHz processor, Video Core IV GPU and was originally shipped with 256 megabytes of RAM, later upgraded (Model B & Model B+) to 512 MB. It does not include a built-in hard disk or solid-state drive, but it uses an SD card for booting and persistent storage, with the Model B+ using a MicroSD.

The Foundation provides Debian and Arch Linux ARM distributions for download. Tools are available for Python as the main programming language, with support for BBC BASIC (via the RISC OS image or the Brandy Basic clone for Linux), C, Java and Perl.

Fig 3.1.1: Raspberry pi Board

DESCRIPTION OF THE COMPONENTS ON THE RASPBERRY PI:

1) Processor/SoC (System on Chip)

The Raspberry Pi has a Broadcom BCM2835 System on Chip module. It has a ARM1176JZF-S processor. The Broadcom SoC used in the Raspberry Pi is equivalent to a chip used in an old smartphone. While operating at 700 MHz by default, the Raspberry Pi provides a real world performance roughly equivalent to the 0.041GFLOPS. The Raspberry Pi chip operating at 700 MHz by default, will not become hot enough to need a heatsink or special cooling.

2) Power source

The Pi is a device which consumes 700mA or 3W or power. It is powered by a Micro USB charger orthe GPIO header. Any good smartphone charger will do the work of powering the Pi.

3) SD Card

The Raspberry Pi does not have any onboard storage available. The operating system is loaded on a SD card which is inserted on the SD card slot on the Raspberry Pi. The operating system can be loaded on the card using a card reader on any computer.

4) GPIO

General-purpose input/output (GPIO) is a generic pin on an integrated circuit whose behavior, including whether it is an input or output pin, can be controlled by the user at run time. GPIO pins have no special purpose defined, and go unused by default. The idea is that sometimes the system designer building afull system that uses the chip might find it useful to have a handful of additional digital control lines, and having these available from the chip can save the hassle of having to arrange additional circuitry.

The production Raspberry Pi board has a 26-pin 2.54 mm expansion header, marked as P1, arranged in a 2x13 strip. They provide 8 GPIO pins plus access to I²C, SPI, UART), as well as +3.3 V, +5 V and GND supply lines. Pin one is the pin in the first column and on the bottom row.

5) Audio Jack

A standard 3.5 mm TRS connector is available on the RPi for stereo audio output. Any headphone or 3.5mm audio cable can be connected directly. Although this jack cannot be used for taking audio input, USB mics or USB sound cards can be used.

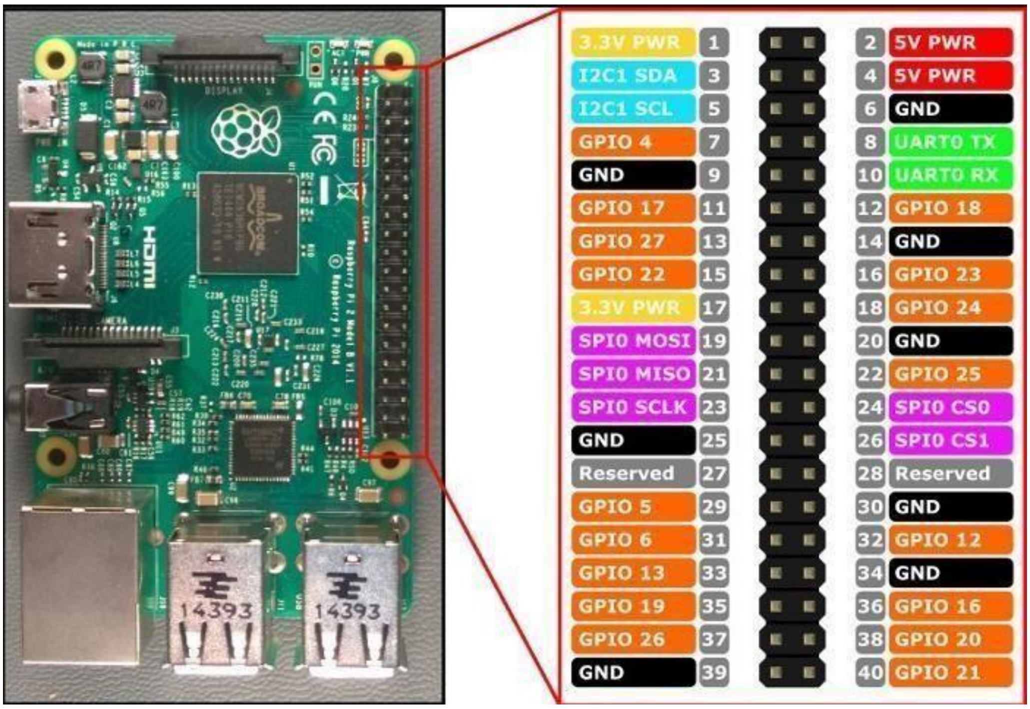


Fig 3.1.2: GPIO Pin configuration

6) DSI connector

The Display Serial Interface (DSI) is a specification by the Mobile Industry Processor Interface (MIPI) Alliance aimed at reducing the cost of display controllers in a mobile device. It is commonly targetedat LCD and similar display technologies. It defines a serial bus and a communication protocol between the host and the device. A DSI compatible LCD screen can be connected through the DSI connector, although it may require additional drivers to drive the display.

7) RCA Video

RCA Video outputs (PAL and NTSC) are available on all models of Raspberry Pi. Any television orscreen with a RCA jack can be connected with the RPi.

Fig 3.1.3: RCA Video Connector

8) Status LEDs

There are 5 status LEDs on the RPi that show the status of various activities. They are “OK” ,"ACT”, “POWER” (PWR), Full Duplex ("FDX"), “LNK” (Link/Activity), “10M/100” which are shown infigure below.

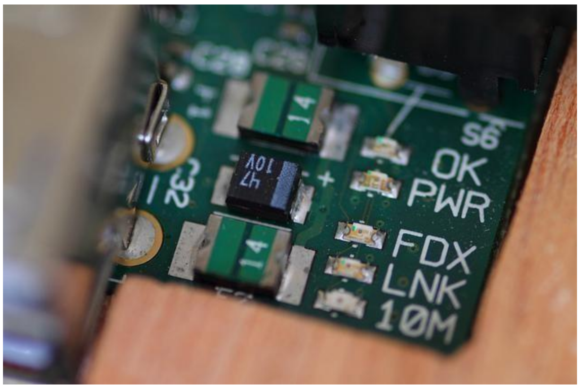


Fig 3.1.4: Status LEDs

9) USB 2.0 Port

USB 2.0 ports are the means to connect accessories such as mouse or keyboard to the Raspberry Pi. There is 1 port on Model A, 2 on Model B and 4 on Model B+. The number of ports can be increased by using an external powered USB hub which is available as a standard Pi accessory.

10) Ethernet

Ethernet port is available on Model B and B+. It can be connected to a network or internet using a standard LAN cable on the Ethernet port. The Ethernet ports are controlled by Microchip LAN9512 LAN controller chip.

11) CSI connector

CSI – Camera Serial Interface is a serial interface designed by MIPI (Mobile Industry Processor Interface) alliance aimed at interfacing digital cameras with a mobile processor. The RPi foundation provides a camera specially made for the Pi which can be connected with the Pi using the CSI connector.

12) HDMI

HDMI –High-Definition Multimedia Interface

HDMI 1.3 a type A port is provided on the RPi to connect with HDMI screens.

13) JTAG headers

JTAG is an acronym for 'Joint Test Action Group', an organization that started back in themid 1980's to address test point access issues on PCB with surface mount devices. The organization devised a method of access to device pins via a serial port that became known as the TAP (Test Access Port). In 1990 the method became a recognized international standard (IEEE Std 1149.1). Many thousands of devicesnow include this standardized port as a feature to allow test and design engineers to access pins.

SPECIFICATIONS:

	Model A	**Model B**	**Model B+**
Target price:	US$25	US$35	
SoC:	Broadcom BCM2835 (CPU, GPU, DSP, SDRAM, and single USB port)		
CPU:	700 MHz ARM1176JZF-S core (ARM11 family, ARMv6 instruction		
GPU:	Broadcom Video Core IV @ 250 MHz		
Memory	256 MB	512 MB (shared with GPU)	
USB 2.0 ports:	1(direct from BCM2835 chip)	2 (via the on-board3-port USB hub)	4 (via the on-board 5-port USB hub)
Video input:	15-pin MIPI camera interface (CSI) connector, used with the Raspberry Pi		
Video outputs:	Composite RCA (PAL and NTSC) –in model B+ via 4-pole 3.5 mmjack, HDMI (rev 1.3 & 1.4), raw LCD Panels via DS		
Audio outputs:	3.5 mm jack, HDMI, and, as of revision 2 boards, I²S audio (also potentially)		
Onboard storage:	SD / MMC / SDIO card slot (3.3 V card power support only)		MicroSD
Onboard network:	None	10/100 Mbit/s Ethernet (8P8C) USB adapter onthe third/fifth port of the UShub	
Low-level peripherals	8× GPIO, UART, I²C bus, SPI bus with two chip selects, I²S audio +3.3 V, +5 V,		17× GPIO

Power ratings:	300 mA (1.5 W)	700 mA (3.5 W)	600 mA (3.0 W)
Power source:	5 V via Micro USB or GPIO header		
Size:	85.60 mm × 56 mm (3.370 in × 2.205 in) –not including protruding		
Weight:	45 g (1.6 oz)		

Table 1: Components Specifications

3.2 BRIEF DESCRIPTION OF SYSTEM ON CHIP (SoC)

Since smartphones and tablets are basically smaller computers, they require pretty much the same components we see in desktops and laptops in order to offer us all the amazing things they can do (apps, music and video playing, 3D gaming support, advanced wireless features, etc). But smart phones and tablets do not offer the same amount of internal space as desktops and laptops for the various components needed such as the logic board, the processor, the RAM, the graphics card, and others. That means these internal parts need to be as small as possible, so that device manufacturers can use the remaining space to fit the device with a long-lasting battery life. A systemon a chip or system on chip is an integrated circuit (IC) that integrates all components of a computer or other electronic system into a single chip. It may contain digital, analog, mixed-signal, and often radio-frequency functions—all on a single chip substrate. SoCs are very common in the mobile electronics market because of their low power consumption. A typical application is in the area of embedded systems.

The contrast with a microcontroller is one of degree. Microcontrollers typically have under 100 kB of RAM (often just a few kilobytes) and often really are single-chip- systems, whereas the term SoC is typically used for more powerful processors, capable of running software such as the desktop versions of Windows and Linux, which need external memory chips (flash, RAM) to be useful, and which are used with various external peripherals. In short, for larger systems, the term system on a chip is a hyperbole, indicating technical direction more than reality: increasing chip integration to reduce manufacturing costs and to enable smaller systems. Many interesting systems are too complex to fit on just one chip built with a process optimized for just one of the system's tasks.

3.3 ACCESSORIES

Raspberry Pi being a very cheap computer has attracted millions of users around the world. Thus, it has a large user base. Many enthusiasts have created accessories and peripherals for the Raspberry Pi. This ranges from USB hubs, motor controllers to temperature sensors. There are some official accessories for the RPi as follows:

3.3.1 USB HUB

Although not an official accessory, it is a highly recommended accessory for the Pi. A powered USB Hub with 7 extra ports is available at almost all online stores. It is compulsory to use a USB Hub to connect external hard disks or other accessories that draw power from the USB ports, as the Pi cannot give power to them.

3.3.2 POWER SUPPLY

A power supply is a component that provides at least one electrical charge with power. It typically converts one type of electrical power to another, but it can also convert a different Energy form in electricalenergy, such as solar, mechanical, or chemical.

A power supply provides electrical power to components. Usually, the term refers to devices built intothe powered component. Computer power supplies, for example, convert AC current to DC current and aregenerally located along with at least one fan at the back of the computer case.

Most computer power supplies also have an input voltage switch that, depending on the geographiclocation, can be set to 110v/115v or 220v/240v. Due to the different power voltages supplied by power outlets in different countries, this switch position is crucial.

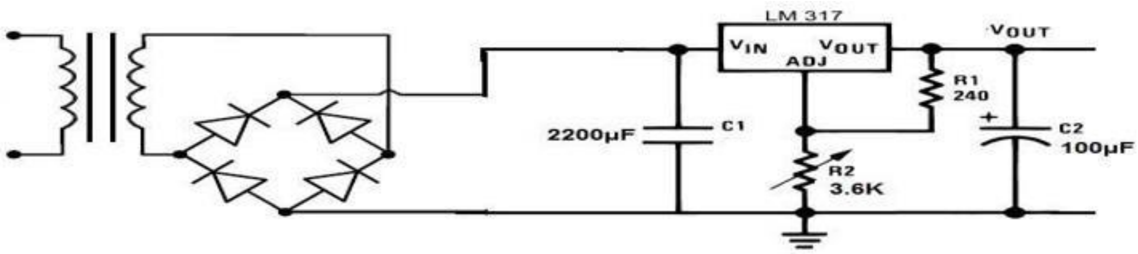


Fig 3.3.1: Power Supply

Some basic components used in the supply of power are:

Rectifier

A rectifier is an electrical device that converts alternating current (AC), which periodically reverses direction, to direct current (DC), which flows in only one direction. The process is known as rectification, since it "straightens" the direction of current.

Rectifiers have many uses, but are often found to serve as components of DC power supplies and direct power transmission systems with high voltage. Rectification can be used in roles other than direct current generation for use as a power source.

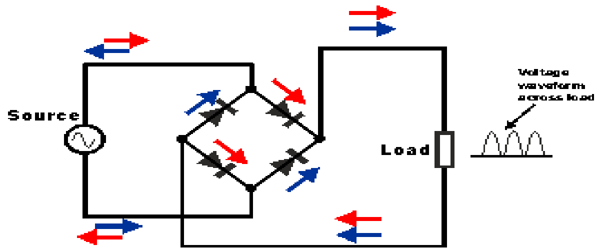


Fig 3.3.2: Circuit of rectifier

Fig 3.3.3: Rectifier

Capacitors

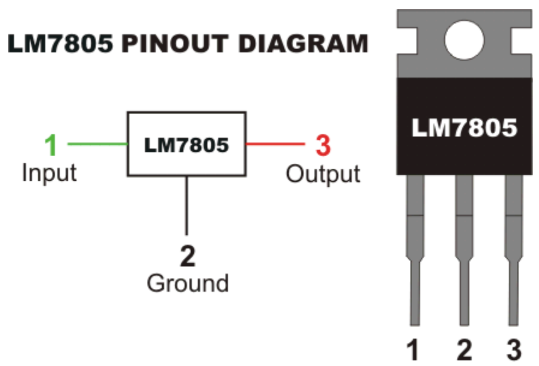
Capacitors are used to attain from the connector the immaculate and smoothest DC voltage in which the rectifier is used to obtain throbbing DC voltage which is used as part of the light of the present identity. Capacitors are used to acquire square DC from the current AC experience of the current channels so that they can be used as a touch of parallel yield.

Fig 3.3.4: Capacitor

Voltage regulators

The 78XX voltage controller is mainly used for voltage controllers as a whole. The XX speaks to the voltage delivered to the specific gadget by the voltage controller as the yield. 7805 will supply and control 5vyield voltage and 12v yield voltage will be created by 7812.

The voltage controllers are that their yield voltage as information requires no less than 2 volts. For example, 7805 as sources of information will require no less than 7V, and 7812, no less than 14 volts. This voltage is called Dropout Voltage, which should be given to voltage controllers.



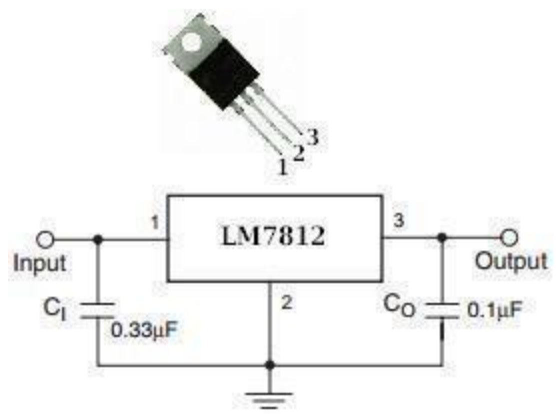


Fig 3.3.5: 7805 voltage regulator

Fig 3.3.6: 7812 voltage regulator

3.4 RC522 RFID MODULE

The RC522 is a 13.56MHz RFID module that is based on the MFRC522 controller from NXP semiconductors. The module can support I2C, SPI and UART and normally is shipped with a RFID card and key fob. It is commonly used in attendance systems and other person/object identification applications.

Fig 3.4.1: RFID module

RC522 Pin Configuration

Pin Number	Pin Name	Description
1	Vcc	Used to Power the module, typically 3.3V is used
2	RST	Reset pin – used to reset or power down the module
3	Ground	Connected to Ground of system
4	IRQ	Interrupt pin – used to wake up the module when a device comes into range
5	MISO/SCL/Tx	MISO pin when used for SPI communication, acts as SCL for I2c and Tx for UART.
6	MOSI	Master out slave in pin for SPI communication
7	SCK	Serial Clock pin – used to provide clock source
8	SS/SDA/Rx	Acts as Serial input (SS) for SPI communication, SDA for IIC and Rx duringUART

Table 2: RC522 pin configuration

RFID Technology

RFID or Radio Frequency Identification system consists of two main components, a transponder/tag attached to an object to be identified, and a Transceiver also known as interrogator/Reader.

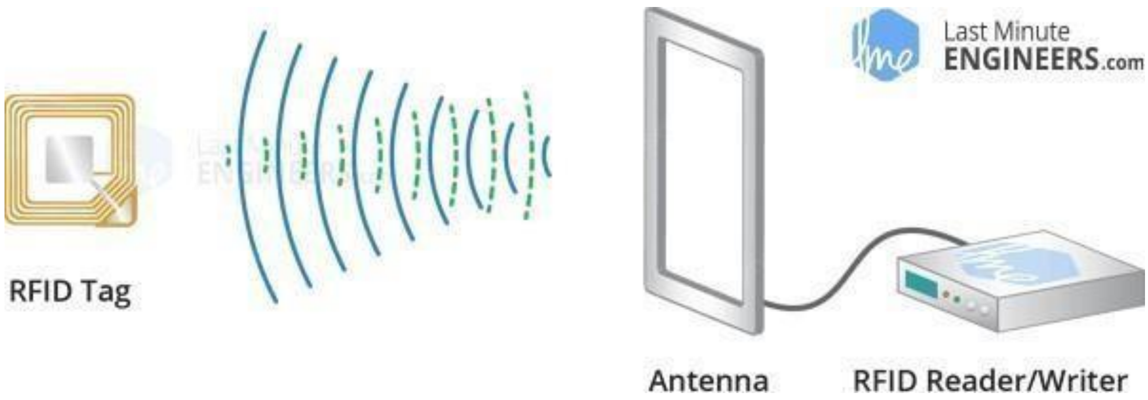


Fig 3.4.2: RFID Technology

A Reader consists of a Radio Frequency module and an antenna which generates high frequency electromagnetic field. On the other hand, the tag is usually a passive device, meaning it doesn't contain a battery. Instead, it contains a microchip that stores and processes information, and an antenna to receive and transmit a signal.

To read the information encoded on a tag, it is placed in close proximity to the Reader (does not needto be within direct line-of-sight of the reader). A Reader generates an electromagnetic field which causes electrons to move through the tag's antenna and subsequently power the chip.

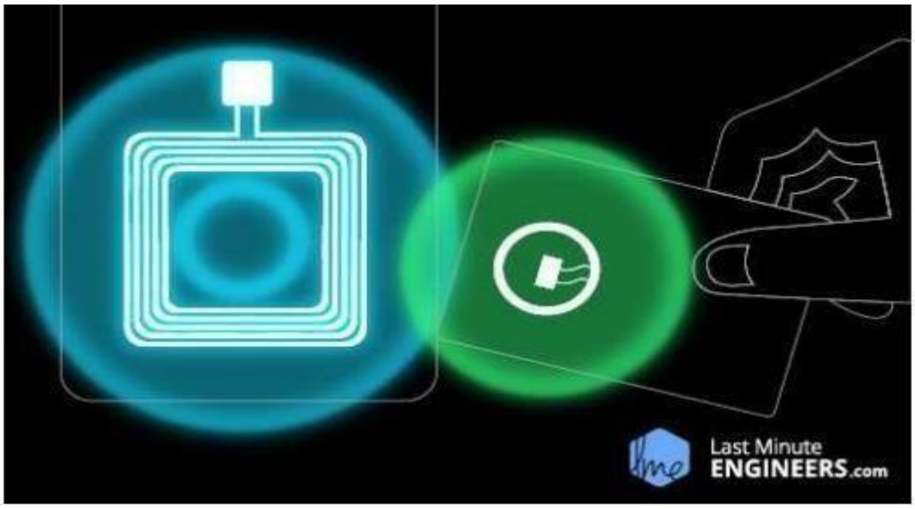


Fig 3.4.3: RFID reader

The powered chip inside the tag then responds by sending its stored information back to the reader in the form of another radio signal. This is called backscatter. The backscatter, or change in the electromagnetic/RF wave, is detected and interpreted by the reader which then sends the data out to a computeror microcontroller.

RFID Tag

The picture given is that of a RFID tag (brilliant card molded tag). RFID labels are accessible in varioussorts of size and shapes. The Tag contains an IC for putting away the information, a reception apparatus for transmitting and accepting, and furthermore a modulator. Tags are very small in size and they can hold only few bits of data.

Fig 3.4.4: RFID Tags

Working of RFID

RFID has a place with the Automatic Identification and Data Capture (AIDC) innovation gathering. AIDC strategies consequently distinguish objects, gather information on them, and straightforwardly enter thisinformation into PC frameworks with next to zero human mediation. To accomplish this, RFID techniques utilize radio waves.

RFID frameworks are comprised of three segments at a straightforward dimension: a RFID tag or brilliant mark, a RFID reader, and a radio wire. RFID labels contain a coordinated circuit and receiving wire for transmitting information to the RFID reader (otherwise called the examiner). The reader then changes theradio waves into an information structure that is progressively usable. Data assembled from the labels is then exchanged to a host PC framework by means of a correspondence interface, where information can be put away in a database and broke down at a later date.

3.5 BUZZER

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers and confirmation of user input such as a mouse click or keystroke. Buzzer is an integrated structure of electronic transducers, DC power supply, widely used in computers, printers, copiers, alarms, electronic toys, automotive electronic equipment, telephones, timers and other electronic products for sound devices. Active buzzer 5V Rated power can be directly connected to a continuous sound, this section dedicated sensor expansion module and the board in combination, can complete a simple circuit design, to "plug and play.

Fig 3.5.1: Buzzer

Buzzer Pin Configuration

Pin Number	**Pin Name**	**Description**
1	Positive	Identified by (+) symbol or longer terminal lead. Can be powered by 5V DC
2	Negative	Identified by short terminal lead. Typically connected to the ground of the circuit

Table 3: Buzzer pin configuration

Features and Specifications

- Rated Voltage: 6V DC
- Operating Voltage: 4-8V DC

- Rated current: <30mA
- Sound Type: Continuous Beep
- Resonant Frequency: ~2300 Hz
- Small and neat sealed package
- Breadboard and Perf board friendly

Buzzer Usage

A buzzer is a small yet efficient component to add sound features to our project/system. It is very small and compact 2-pin structure hence can be easily used on breadboard, Perf Board and even on PCBs which makes this a widely used component in most electronic applications.

There are two types are buzzers that are commonly available. The one shown here is a simple buzzer which when powered will make a Continuous Beeeeeeppp. sound, the other type is called a readymade buzzer which will look bulkier than this and will produce a Beep. Beep. Beep. Sound due to the internal oscillating circuit present inside it. But, the one shown here is most widely used because it can be customized with help of other circuits to fit easily in our application.

This buzzer can be used by simply powering it using a DC power supply ranging from 4V to 9V. A simple 9V battery can also be used, but it is recommended to use a regulated +5V or +6V DC supply. The buzzer is normally associated with a switching circuit to turn ON or turn OFF the buzzer at required time and require interval.

Applications of Buzzer

- Alarming Circuits, where the user has to be alarmed about something.
- Communication equipment’s.
- Automobile electronics.
- Portable equipment’s, due to its compact size.

3.6 LCD

LCD (Liquid Crystal Display) is the innovation utilized in scratch pad shows and other littler PCs.Like innovation for light-producing diode (LED) and gas-plasma, LCDs permit presentations to be a lot slenderer than innovation for cathode beam tube (CRT). LCDs expend considerably less power than LED shows and gas shows since they work as opposed to emanating it on the guideline of blocking light.

An LCD is either made with a uninvolved lattice or a showcase network for dynamic framework show. Likewise alluded to as a merger film transistor (TFT) show is the dynamic framework LCD. The uninvolved LCD lattice has a matrix of conductors at every crossing point of the network with pixels. Two conductors onthe lattice send a current to control the light for any pixel. A functioning framework has a transistor situated atevery pixel crossing point, requiring less current to control the luminance of a pixel.

Some aloof network LCD's have double filtering, which implies theyexamine the matrix twice with currentin the meantime as the first innovation took one sweep. Dynamic lattice, be that as it may, is as yet a higher innovation. A 16x2 LCD show is an essential module that is generally utilized in various gadgets and circuits.These modules more than seven sections and other multi fragment LEDs are liked. The reasons being: LCDsare affordable; effectively programmable; have no restriction of showing exceptional and even custom characters (not at all like in seven fragments), movements, etc.

A 16x2 LCD implies 16 characters can be shown per line and 2 such lines exist. Each character is shown in a lattice of 5x7 pixels in this LCD. There are two registers in this LCD, in particular Command and Data. The directions given to the LCD are put away by the order register. An order is a direction given to LCD to play out a predefined assignment, for example, introducing it, clearing its screen, setting the situation of the cursor, controlling presentation, and so forth. The information register will store the information that will be shown on the LCD. The information is the character's ASCII incentive to show on the LCD.

Data/Signals/Execution of LCD

Two types of signals are accepted by LCD, one is data and one is control. The LCD module recognizes these signals from the RS pin status. By pulling the R / W pin high, data can now also be read from the LCD display. Once the E pin has been pulsed, the LCD display reads and executes data at the falling edge of the pulse, the same for the transmission case.

It takes 39-43µS for the LCD display to place a character or execute a command. It takes 1.53ms to 1.64ms except for clearing display and searching for cursor to the home position.

Any attempt to send data before this interval may result in failure in some devices to read data or execute the current data. Some devices compensate for the speed by storing some temporary registers with incoming data.

There are two RAMs for LCD displays, namely DDRAM and CGRAM. DDRAM registers the position in which the character would be displayed in the ASCII chart. Each DDRAM byte represents every single position on the display of the LCD.

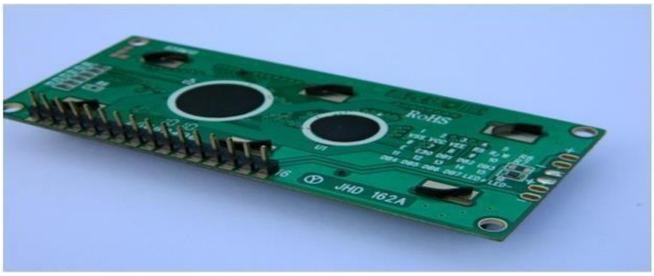


Fig 3.6.1: LCD Front View **Fig 3.6.2: LCD Back View**

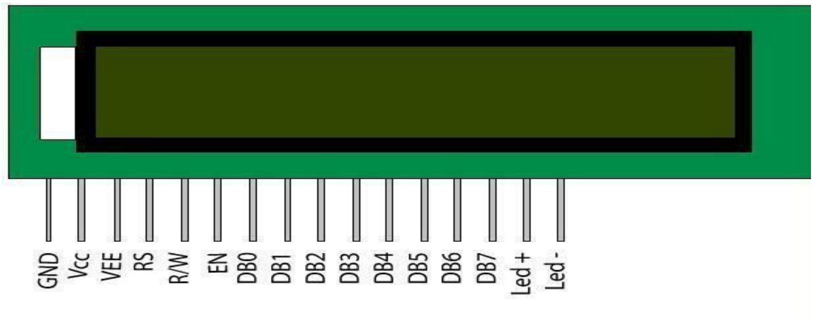


Fig 3.6.3: LCD Pin Diagram

LCD Pin Description

Pin No	Function	Name
1	Ground (0V)	Ground
2	Supply voltage; 5V (4.7V – 5.3V)	Vcc
3	Contrast adjustment; through a variable resistor	V_{EE}
4	Selects command register when low; and data register when high	Register Select
5	Low to write to the register; High to read from the register	Read/write
6	Sends data to data pins when a high to low pulse is given	Enable
7	8-bit data pins	DB0
8		DB1
9		DB2
10		DB3
11		DB4
12		DB5
13		DB6
14		DB7
15	Backlight V_{CC} (5V)	Led+
16	Backlight Ground (0V)	Led-

Table 4: LCD pin description

RS (Register select)

A 16X2 LCD has two order and information registers. The determination of the register is utilized to change starting with one register then onto the next. RS=0 for the register of directions, while RS=1 for the register of information.

Command Register

The guidelines given to the LCD are put away by the direction register. An order is a direction given to LCD to play out a predefined assignment, for example, instating it, clearing its screen, setting the situationof the cursor, controlling showcase, and so on. Order preparing happens in the direction register.

Data Register

The information register will store the information that will be shown on the LCD. The information isthe character's ASCII incentive to show on the LCD. It goes to the information register and is prepared there when we send information to the LCD. While choosing RS=1, the information register.

Read and Write Mode of LCD

As stated, the LCD itself comprises of an interface IC. This interface IC can be perused or composed by the MCU. A large portion of the occasions we're simply going to keep in touch with the IC since perusing will make it increasingly perplexing and situations like that are exceptionally uncommon. Information such as cursor position, status completion interrupts, etc. can be read if necessary.

LCD Commands

There are some preset commands in the LCD that we need to send to the LCD via some microcontroller.

The following are some important command instructions:

Sr. No.	Hex Code	Command to LCD instruction Register
1	01	Clear display screen
2	02	Return home
3	04	Decrement cursor (shift cursor to left)
4	05	Increment cursor (shift cursor to right)
5	06	Shift display right
6	07	Shift display left
7	08	Display off, cursor off

8	0A	Display off, cursor on
9	0C	Display on, cursor off
10	0E	Display on, cursor blinking
11	0F	Display on, cursor blinking
12	10	Shift cursor position to left
13	14	Shift cursor position to right
14		Shift the entire display to the left
15	1C	Shift the entire display to the right
16	80	Force cursor to beginning (1st line)
17	C0	Force cursor to beginning (2nd line)
18	38	2 lines and 5×7 matrix

Table 5: LCD commands

Block Diagram of LCD Display

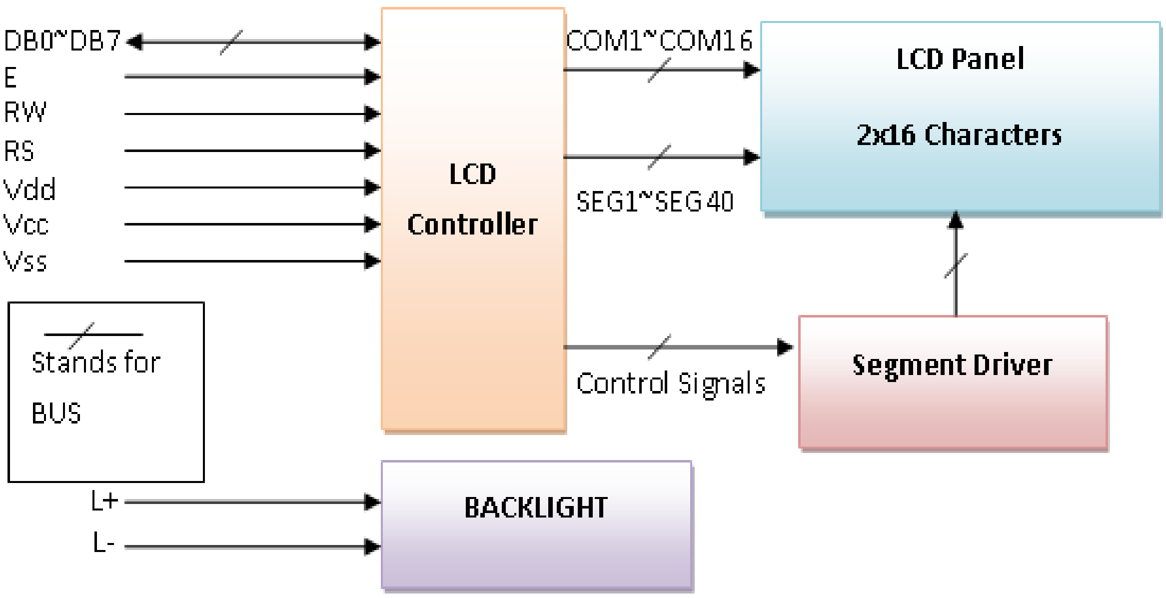


Fig 3.6.4: Block Diagram of LCD Display

3.6 GSM

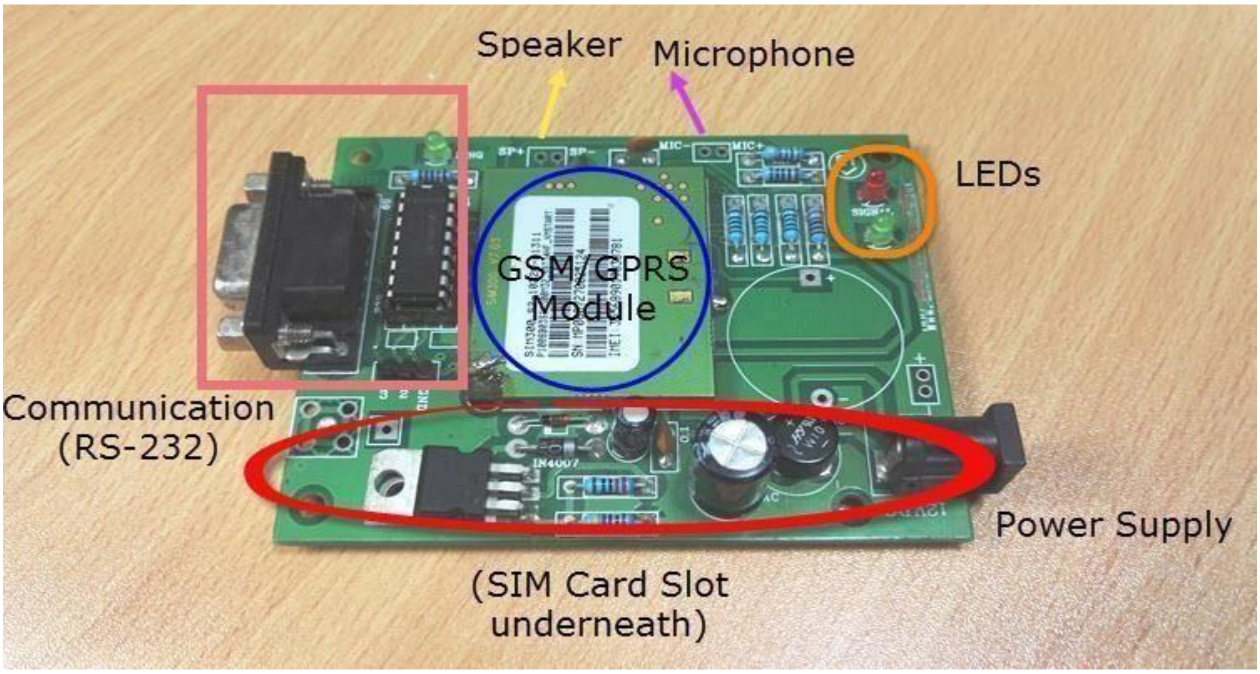


Fig 3.7.1: GSM

GPRS Modules are one of the commonly used communication modules in embedded systems. A GPRS Module is used to enable communication between a microcontroller (or a microprocessor) and the GPRS Network. Here, GSM stands for Global System for Mobile Communication and GPRS stands for General Packet Radio Service.

A GPRS MODEM comprises of a GPRS Module along with some other components like communication interface (like Serial Communication – RS-232), power supply and some indicators. With the help of this communication interface, we can connect the GSM GPRS Module on the GPRS MODEM with an external computer (or a microcontroller).

GPRS Modules allow microcontrollers to have a wireless communication with other devices and instruments. Such wireless connectivity of microcontroller opens up to wide range of applications like Home Automation, Home Security Systems, Disaster Management, Medical Assistance, Vehicle Tracking, Online Banking, E – Commerce etc. to name some. Difference between a Module, MODEM and Mobile (System).

A GSM/GPRS Module is a device or chip that is actually responsible for the wireless communication with the GSM Network. A GSM/GPRS MODEM is device that modulates and demodulates the signals from the Wireless Network and allows internet connectivity. A GSM MODEM generally consists of a GSM Module along with some other components like a SIM Card, a device to modulate and demodulate the signals and power supply.

A System, like a mobile phone for example, is a complete device that has a GSM Module (might be integrated in the processor), a GSM MODEM (even this might be integrated) and other components like processor, screen, keypad, speakers, microphone etc. peaking of GSM/GPRS MODEMS, they are a class of Wireless MODEMS, which use the GSM/GPRS Network for transmitting and receiving data. Wireless MODEMS are also available for different cellular networks like CDMA, GSM, UMTS and LTE and different data services like GPRS, EDGE, HSDPA and LTE.

GPRS Module

A GPRS Module is an IC or chip that connects to the GSM Network using a SIM (Subscriber Identity Module) and Radio Waves. The common radio frequencies in which a typical GSM Module operates are 850MHz, 900MHz, 1800MHz and 1900MHz.Since it is not possible to interface a GPRS Module directly to an external device like a microcontroller, we need a setup like shown in the following image.

It consists of the GPRS Module, slot for inserting a SIM Card, RS-232 Interface for connecting with computer or a microcontroller, signal status LED, power supply and a provision for connecting microphone and speaker. Each GPRS Module is unique and it can be differentiated by its IMEI Number. IMEI or International Mobile Equipment Identity Number is a 15 – digit unique number associated with mobile phone, satellite phones and other GSM Network devices.

With the help of this GPRS Module, we can do the following tasks.

- Make, receive or reject voice calls
- Send, receive or delete SMS messages in the SIM Card
- Add, read and search the contacts in the SIM Card
- Send and receive data to / from the GPRS Network through GPRS

All the above-mentioned tasks can be accomplished with the help of Attention Commands or AT Commands. AT Commands are parts of Hayes Command Set, which are defined originally for a modem. GSM Network also implements a similar AT like commands for its GSM Modules.

The processor or controller, to which the GSM/GPRS Module is connected to, is responsible for sending the AT Commands to the module. In response, the GSM Module performs command specific tasks like answering a phone call; send an SMS Message, etc.Even through the AT Commands may seem generic; it is advisable to refer with the data provided by the manufacturer of the GSM Module for correct and complete list of AT Commands.

Syntax of AT Commands

Generally, AT Commands consists of three parts: the Prefix, the Body or Command and the Termination. The Prefix part of the command consists of either “AT” or “at”. The body or command is the actual command given to the GSM Module. The Termination character is by default Carriage Return <CR>.

Before seeing an example, we should know that AT Commands are categorized in to three types: Basic AT Commands, S Parameter AT Commands and Extended AT Commands.

Example for the Basic Commands: ATCMD1<CR>, where AT is the prefix of the command line, CMD1 is the body of the command and <CR> command terminator character.

NOTE: Basic commands never begin with +. Example for Extended Commands: AT+CMD1<CR>.
NOTE: Extended AT Commands always begin with +.

NOTE: The Carriage Return <CR> will be omitted from the next command example or syntax. You have to assume them as a part of the command even though they are not inserted in the text here.

Types of AT Command Operations

Based on the operation performed by the AT Commands, they are again divided in to four types: Test Commands, Read Commands, Write Commands and Execution Commands. We will now see the definition and syntax of all these command types.

Test Commands: These commands are used to test whether the command exists (supported by the GSM GPRS Module) or not and also checks for the range of a command’s subparameters. When a Test Command is given to the GSM GPRS Module, it returns the list of all the parameters and also the range set of the parameters.

The syntax of a Test Command is ATCMD1=? <CR>

Example for Test Command: AT+CGMI=? (Request manufacturer identification)

Read Commands: Read Commands will return the current value of the parameter. Using these commands, we can read the current settings of the GSM GPRS Module.The syntax for Read Commands is: ATCMD1? <CR>

Example for Read Command: AT+CSCA? (Query for Service Center)

Write or Set Commands: Set Commands will attempt to change or modify the settings of the GSM GPRS Module by setting a new parameter for the particular command.

The syntax for Set Commands is: ATCMD1=value1, value2, value3…valuen<CR> An

example for Set Command: AT+CMGF=1 (Set Message format to TEXT Mode).

Execution Command: These commands perform an operation like send an SMS, retrieving information about battery charging status etc. They read the non – variable sub parameters that areaffected by the GSM Module.

Syntax of Execution Commands: ATCMD1<CR>

Example for Execution Commands: AT+CMGS=<number><CR> <text message> <CTRL-Z> (Sends text message to the number).

Information Responses and Final Codes

After sending the AT Commands to the GSM GPRS Module, we have look for the response. For example, if we send the command as AT+CGMI<CR> to the GSM Module, then the response would be as follows.

<CR><LF>Apple<CR><LF>

<CR><LF>OK<CR><LF>

Here, <CR> is Carriage Return and <LF>is Line Feed.

In a HyperTerminal, if you entered AT+CGMI<CR>, the response will look something like this. AT+CGMI <– Command entered

Apple <– Information Response OK <– Final Code

The syntax of the information response and final command is as follows:

<Carriage Return><Line Feed> <Information Response / Final Result Code> <Carriage Return><Line Feed>

<CR><LF><Response><CR><LF>

NOTE: The sequence of execution of commands will be first commands, then second command, followed bythe rest i.e. a sequential execution of commands.

If there is an error anywhere in the execution, an error code is returned by the GSM Module and the execution of further commands is terminated.

Frequently used AT Commands

In this list, you can find out some of the most commonly used AT Commands. For a complete list of AT Commands and their definitions, it is advised to refer the manufacturer data. The <Carriage Return> or

<CR> is denoted by this symbol ↲.

To check the communication between the GSM Module and the host (Computer)AT ↲

OK

To make a voice callATD9848032919; ↲

To answer or receive an incoming callATA ↲

To redial the last numberATDL ↲

To disconnect a callATH ↲

To set the message mode to text modeAT+CMGF=1 ↲

OK

To send a text message AT+CMGS=”9848032919” ↲

To Message CTRL+Z

3.7 WEB CAMERA

A webcam is a video camera that feeds or streams an image or video in real time to or through a computer network, such as the Internet. Webcams are typically small cameras that sit on a desk, attach to a user's monitor, or are built into the hardware. Webcams can be used during a video chat session involving two or more people, with conversations that include live audio and video.

Webcam software enables users to record a video or stream the video on the Internet. As video streaming over the Internet requires much bandwidth, such streams usually use compressed formats.

The maximum resolution of a webcam is also lower than most handheld video cameras, as higher resolutions would be reduced during transmission. The lower resolution enables webcams to be relatively inexpensive compared to most video cameras, but the effect is adequate for video chat sessions.

Fig 3.8.1: Web Camer

CH APTER 4

SOFTWARE IMPLEMENTATION

Python

Python is a general purpose, dynamic, high level and interpreted programming language. It supports Object Oriented programming approach to develop applications. It is simple and easy to learn and provides lots of high-level data structures. It is easy to learn yet powerful and versatile scripting language which make sit attractive for Application Development. It's syntax and dynamic typing with its interpreted nature, makes it an ideal language for scripting and rapid application development. It supports multiple programming patterns, including object oriented, imperative and functional or procedural programming styles. It is not intended to work on special area such as web programming. That is why it is known as multipurpose because it can be used with web, enterprise, 3D CAD etc. We don't need to use data types to declare variable because it is dynamically typed so we can write a=10 to assign an integer value in an integer variable. It makes the development and debugging fast because there is no compilation step included in python development and edit-test-debug cycle is very fast.

Python Features

- Easy to Learn and Use
- Expressive Language
- Interpreted Language
- Cross-platform Language Free and Open Source
- Object-Oriented Language
- Extensible
- Large Standard Library
- GUI Programming Support
- Integrated

Python History

- Python laid its foundation in the late 1980s.
- The implementation of Python was started in the December 1989 by Guido Van Rossum at CWI in Netherland.
- In February 1991, van Rossum published the code (labelled version 0.9.0) to alt.sources.
- In 1994, Python 1.0 was released with new features like: lambda, map, filter, and reduce.
- Python 2.0 added new features like: list comprehensions, garbage collection system.
- On December 3, 2008, Python 3.0 (also called "Py3K") was released. It was designed to rectify fundamental flaw of the language.

Raspbian

Raspbian is the recommended operating system for normal use on a Raspberry Pi. .Raspbian is a free operating system based on Debian, optimized for the Raspberry Pi hardware. Raspbian comes with over 35,000 packages; precompiled software bundled in a nice format for easy installation on your Raspberry Pi. Raspbian is a community project under active development, with an emphasis on improving the stability and performance of as many Debian packages as possible.

Steps for Installing Raspbian OS

Step1: Download Raspbian

Step2: Unzip the file.

The Raspbian disc image is compressed, so you'll need to unzip it. The file uses the ZIP64 format, so depending on how current your built-in utilities are, you need to use certain programs to unzip it. If you have any trouble, try these programs recommended by the Raspberry Pi Foundation:

- Windows users, you'll want 7-Zip.
- Mac users, The Unarchiver is your best bet.
- Linux users will use the appropriately named Unzip.

Step3: Write the disc image to your micro-SD card

Next, pop your micro-SD card into your computer and write the disc image to it. You'll need aspecific program to do this:

- Windows users, your answer is Win32 Disk Imager.
- Mac users, you can use the disk utility that's already on your machine.
- Linux people, Etcher – which also works on Mac and Windows – is what the Raspberry Pi Foundation recommends.

The process of actually writing the image will be slightly different across these programs, but it's pretty self-explanatory no matter what you're using. Each of these programs will have you select the destination (make sure you've picked your micro-SD card!) and the disc image (the unzipped Raspbian file). Choose, double- check, and then hit the button to write.

Step4: Put the micro-SD card in your Pi and boot up

Once the disc image has been written to the micro-SD card, you're ready to go! Put that sucker into your raspberry Pi, plug in the peripherals and power source, and enjoy. The current edition to Raspbian will boot directly to the desktop. Your default credentials are username pi and password raspberry.

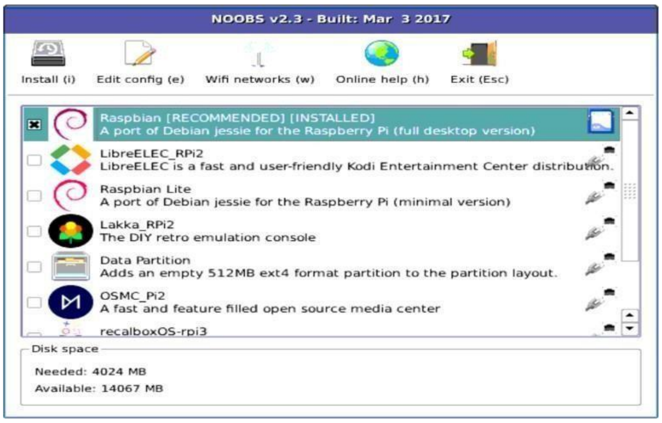


Fig 4.1: Raspbian Software

Advantages

- Efficiency
- Automation
- Compactness
- Reliability
- Connectivity
- Integration
- Scalability

Applications

- Data Transmission
- Over-Speeding Threshold

4.3 PROPOSED SYSYTEM

4.3.1 BLOCK DIAGRAM

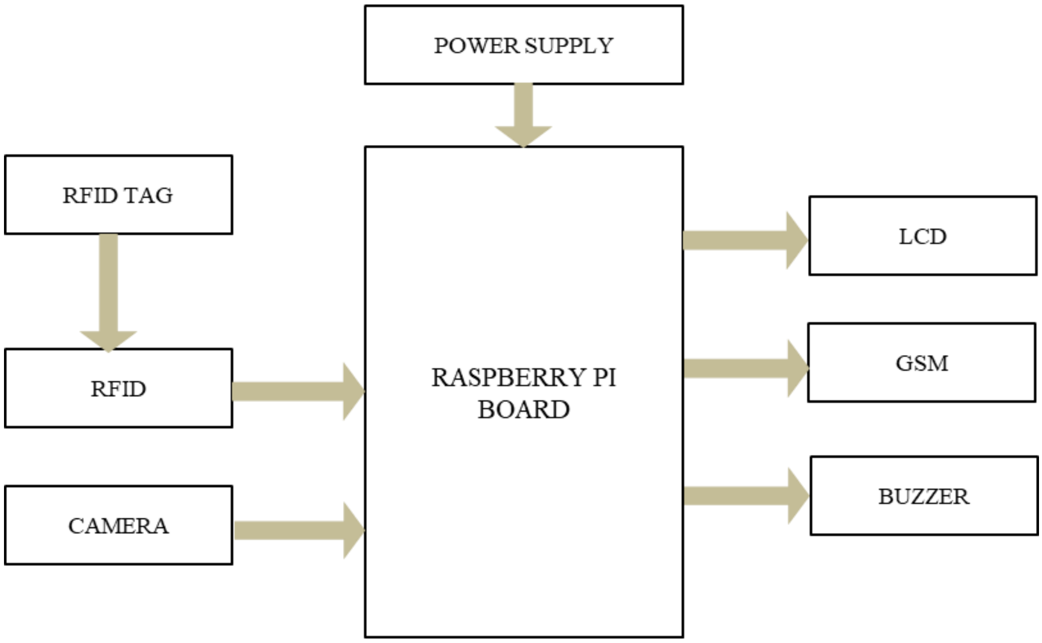


Fig 4.3.1: Block diagram for the IoT-based Smart detection of Over Speeding Vehicle

4.3.2 FLOW CHART

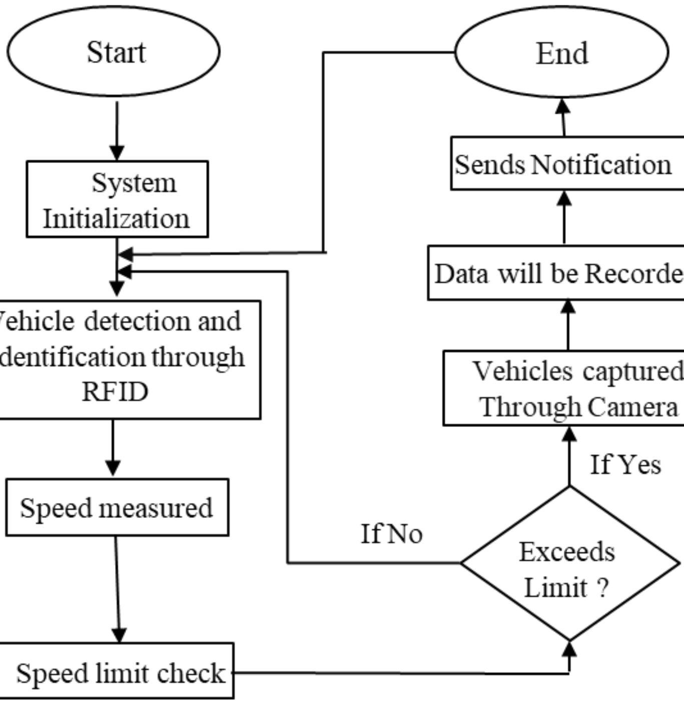


Fig 4.3.2: Flow chart for the IoT-based Smart detection of Over Speeding Vehicle

4.3.3 CIRCUIT DIAGRAM

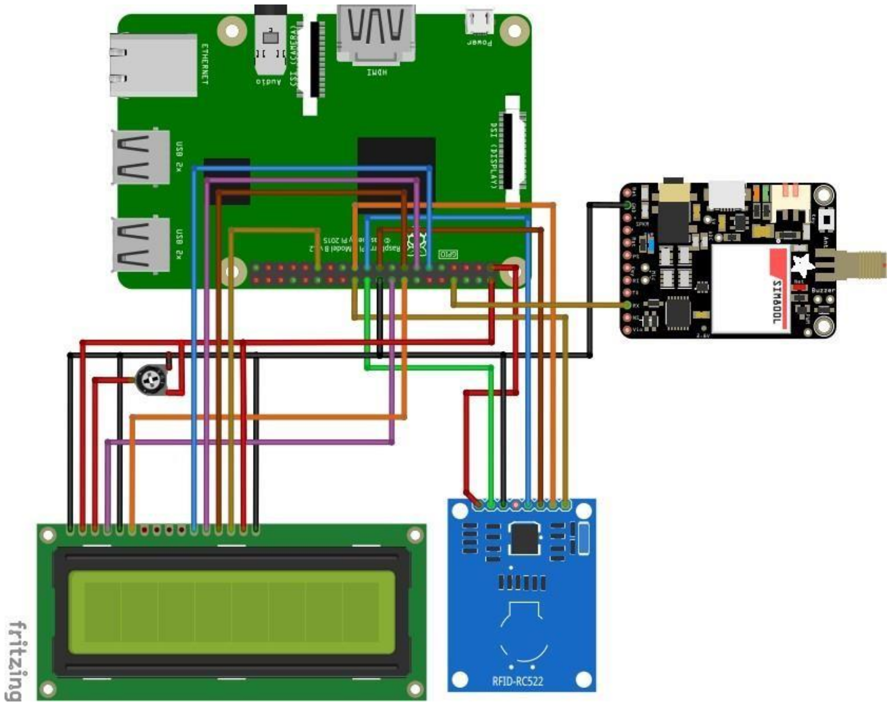
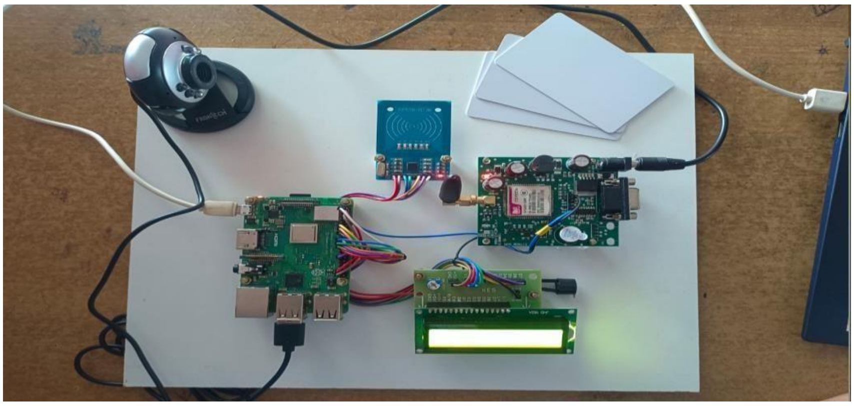


Fig 4.3.3: Circuit Diagram for the IoT-based Smart detection of Over Speeding Vehicle

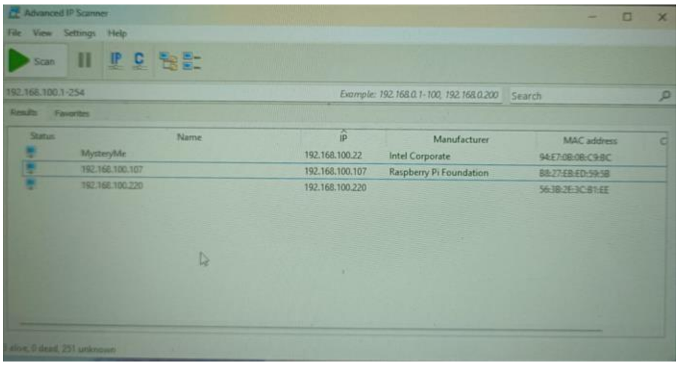
CHAPTER 5

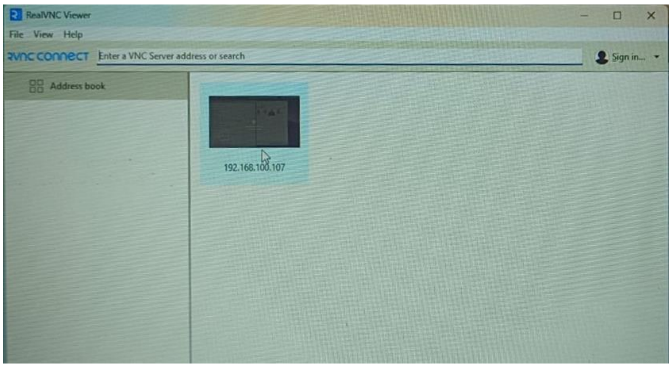
RESULT

The project successfully designed an advanced system that automatically detects and reports over-speeding vehicles, leveraging IoT technology. By using RFID cards for vehicle identification, cameras for capturing images, and an integrated LCD display, the system effectively identifies vehicles exceeding the speed limit. This results in enhanced road safetyby holding drivers accountable and reducing the dependency on manual monitoring. The innovative feature of the system is its ability to adapt vehicle speed based on road conditions autonomously, thereby ensuring a safer driving environment.



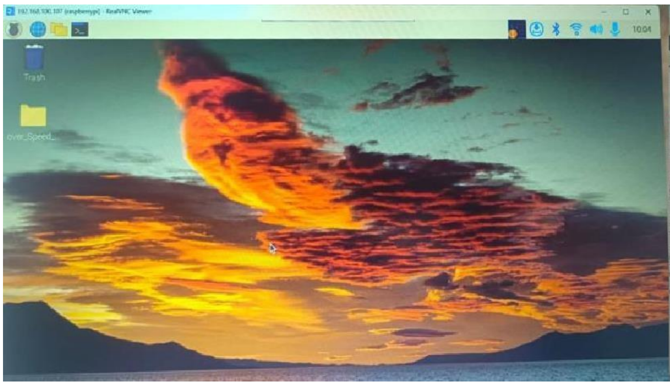
Hardware kit of the system

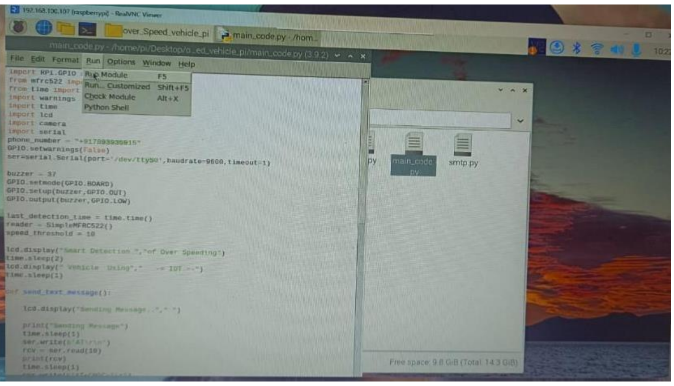




IP address scanning of devices

Connecting to VNC with IP address



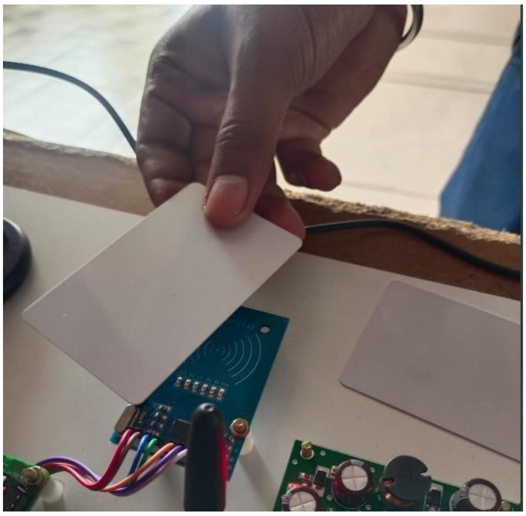


Dedicated Virtual Network (VNC) for the system

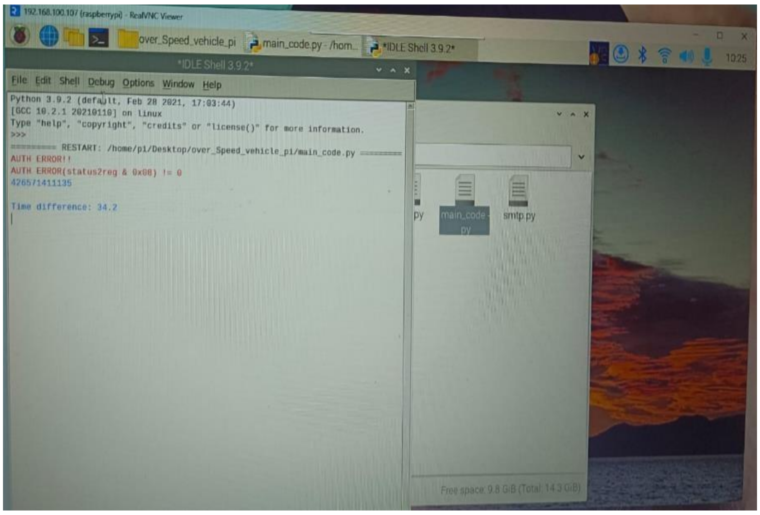
Running the code for the result

Project title indication on LCD

Initialization

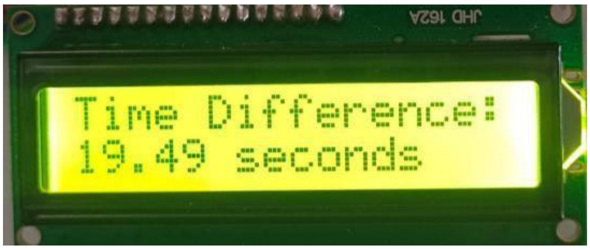


Vehicle/RFID Tag Tracking



Detected speed of the particular Tag

(a)

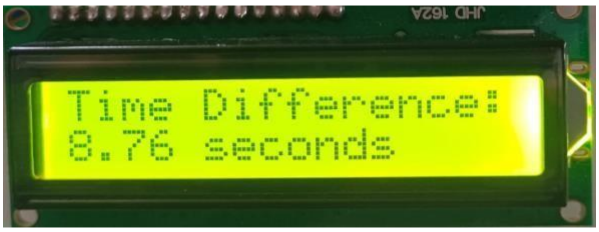


(b)

(c)

Normal Speed detection of Vehicle

(a)



(b)

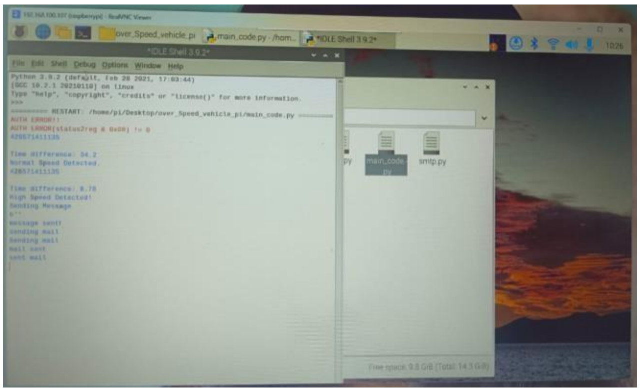
(c)

(d)

(e)

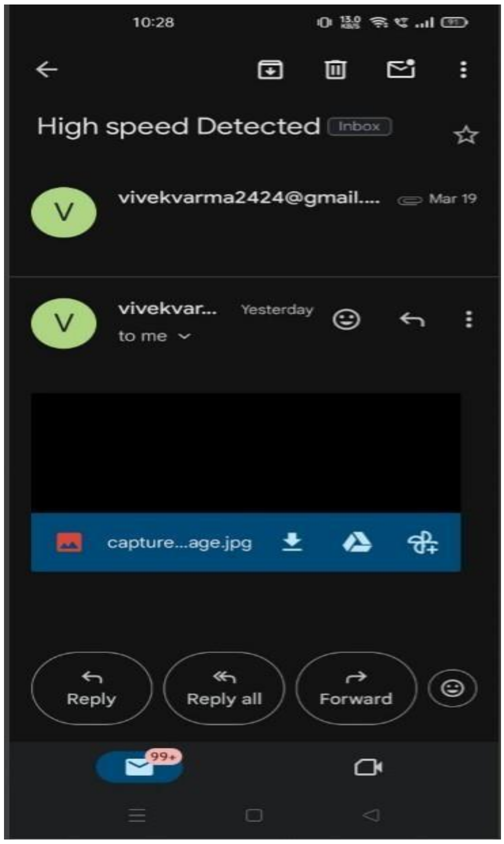
(f)

High Speed detection of Vehicle



(g)

(h)



(i)

CHAPTER 6

CONCLUSION

The project has an RFID tag which indicates the vehicle when it enters a speed limit zone. Henceby using slotted couplers the speed of the vehicle is monitored and using pwm technique the micro controller unit controls the speed; the speed of the vehicle be maintained in the limited speed without the intervention of the driver. If this can be implemented effectively rash driving and over speed canbe reduced to a large extend, thus decreasing the total number of road accidents in our country. The conclusion underscores the critical importance of addressing over-speeding through advanced technological solutions. By combining IoT devices such as RFID cards and cameras with automated detection and reporting mechanisms, the proposed system presents a promising approach to improving road safety. The integration of these technologies not only enables real-time monitoring and enforcement but also reduces the need for manual intervention, making the process more efficient and scalable. Furthermore, the emphasis on adaptability in vehicle speed based on road conditions highlights the potential for autonomous systems to contribute significantly to a safer driving environment.

FUTURE SCOPE

The project described presents a significant advancement in road safety technology by integratingIoT, RFID cards, cameras, and an LCD display to automatically detect and report over-speeding vehicles. As technology continues to evolve, the future scope for this project is vast and promising, with numerous avenues for further development and enhancement. Firstly, future iterations of this system could incorporate more sophisticated sensors and machine learning algorithms to improve speed detection accuracy and minimize false positives. By leveraging advancements in computer vision and AI, the system could better differentiate between vehicles, pedestrians, and other objects on the road, ensuring more reliable detection of over-speeding instances. Furthermore, there is potential to expand the scope of the system beyond over-speeding detectionto address other safety hazards on the road, such as reckless lane changes, tailgating, or distracted driving.

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SOURCE CODE

MAIN CODE

```
import RPi.GPIO as GPIO
from mfrc522 import SimpleMFRC522
from time import sleep
import warnings
import time
import lcd
import camera
import serial
phone_number = "+91**********"
GPIO.setwarnings(False)
ser=serial.Serial(port='/dev/ttyS0',baudrate=9600,timeout=1)

buzzer = 37
GPIO.setmode(GPIO.BOARD)
GPIO.setup(buzzer,GPIO.OUT)
GPIO.output(buzzer,GPIO.LOW)

last_detection_time = time.time()
reader = SimpleMFRC522()
speed_threshold = 10

lcd.display("Smart Detection ","of Over Speeding")
time.sleep(2)
lcd.display(" Vehicle Using"," -= IOT =-")
time.sleep(1)

def send_text_message():

    lcd.display("Sending Message.."," ")

    print("Sending Message")
    time.sleep(1)
    ser.write(b'AT\r\n')
    rcv = ser.read(10)
    print(rcv)
    time.sleep(1)
    ser.write(b"AT+CMGF=1\r")
    time.sleep(3)
    #ser.write(b'AT+CMGS="+917893755859"\r')
    ser.write(f"AT+CMGS=\"{phone_number}\"\r".encode())
    h=f"high speed detected"
    time.sleep(3)
    ser.reset_output_buffer()
    time.sleep(1)
    ser.write(str.encode(h+chr(26)))
    time.sleep(2)
    print("message sent…")
```

```
    time.sleep(10)

#Smart detection of over speeding vehicle using IoT
try:
    while True:
        id, text = reader.read()
        print(id)
        print(text)
        GPIO.output(buzzer,GPIO.HIGH)
        time.sleep(0.2)
        GPIO.output(buzzer,GPIO.LOW)
        lcd.display("RFID: ",str(id))
        time.sleep(1)

        current_time = time.time()
        time_difference = current_time - last_detection_time
        interval = round(time_difference,2)
        print("Time difference:", interval)
        lcd.display("Time Difference:",str(interval)+" seconds")

        if time_difference < speed_threshold:
            lcd.display("High speed","Detected ")
            print("High Speed Detected!")
            send_text_message()
            GPIO.output(buzzer,GPIO.HIGH)
            camera.capture_and_send_Mail()
            GPIO.output(buzzer,GPIO.LOW)
        else:
            print("Normal Speed Detected.")
            lcd.display("Normal ","speed detected")

            last_detection_time = current_time
            time.sleep(1)
finally:
        GPIO.cleanup()
```

CAMERA CODE

```
import cv2
import numpy as np
import time
import smtp
import lcd

# Function to capture and save the picture
def capture_and_send_Mail():
    cap = cv2.VideoCapture(0) # Use camera 0 (default)

    # Check if the camera opened successfully
```

```
    if (cap.isOpened() == False):
        print("Error: Could not open the camera.")
        return

    # Capture the frame and save it in the current directory
    ret, frame = cap.read()
    time.sleep(2)
    cv2.imwrite('captured_pic.jpg', frame)
    print("sending mail")
    lcd.display("Sending Mail...","")
    smtp.send_mail('captured_pic.jpg')
    print("sent mail")

    # Release the camera and close the window
    cap.release()
    cv2.destroyAllWindows()


def display_camera_feed():
    cap = cv2.VideoCapture(0) # Use camera 0 (default)

    # Check if the camera opened successfully
    if (cap.isOpened() == False):
        print("Error: Could not open the camera.")
        return

    # Loop through each frame and display it
    while(True):
        ret, frame = cap.read()
        cv2.imshow('frame', frame)

        # Break the loop and release the camera when the 'q' key is pressed
        if cv2.waitKey(1) & 0xFF == ord('q'):
            break

    # Release the camera and close the window
    cap.release()
    cv2.destroyAllWindows()
if __name__== "_main_":
    lcd.display("initializing..","")
    time.sleep(1)
    lcd.display("Camera Feed","is runnig")
    display_camera_feed()
    #capture_save_image()
```

SMTP CODE

```
import smtplib
import time

from email.mime.text import MIMEText
```

```
from email.mime.multipart import MIMEMultipart
from email.mime.image import MIMEImage

sender_email = "embedded44@gmail.com"
receiver_email = "embedded@takeoffprojects.com"
sender_password = "************"

smtp_server = "smtp.gmail.com"
smtp_port = 587
duration = 5
start_time = time.time()


def send_mail(image_path):

    print("Sending mail")
    time.sleep(2)

    msg = MIMEMultipart()
    msg['From'] = sender_email
    msg['To'] = receiver_email
    msg['Subject'] = f"High speed Detected"

    # Attach the image
    with open(image_path, 'rb') as img_file:
        img_data = MIMEImage(img_file.read(), name="captured_image.jpg")
        msg.attach(img_data)

    # Establish a connection to the SMTP server
    with smtplib.SMTP(smtp_server, smtp_port) as server:
        server.starttls()
        server.login(sender_email, sender_password)
        server.sendmail(sender_email, receiver_email, msg.as_string())

    print("mail sent")
    time.sleep(2)

if__name__== "_main_":
    send_mail("captured_image.jpg")
```

LCD CODE

```
import time
import RPi.GPIO as GPIO
import warnings
GPIO.setwarnings(False)
# Define GPIO pins for LCD

LCD_RS = 18
LCD_E = 16
LCD_D4 = 11
```

```
LCD_D5 = 13
LCD_D6 = 15
LCD_D7 = 29


# Define some device constants
LCD_WIDTH = 16 # Maximum characters per line
LCD_CHR = True
LCD_CMD = False
LCD_LINE_1 = 0x80 # LCD RAM address for the 1st line
LCD_LINE_2 = 0xC0  # LCD RAM address for the 2nd line

GPIO.setmode(GPIO.BOARD)
GPIO.setup(LCD_E, GPIO.OUT)
GPIO.setup(LCD_RS, GPIO.OUT)
GPIO.setup(LCD_D4, GPIO.OUT)
GPIO.setup(LCD_D5, GPIO.OUT)
GPIO.setup(LCD_D6, GPIO.OUT)
GPIO.setup(LCD_D7, GPIO.OUT)


def init():
    byte(0x33, False) # 110011 Initialise
    byte(0x32, False)  # 110010 Initialise
    byte(0x06, False)  # 000110 Cursor move direction
    byte(0x0C, False) # 001100 Display On, Cursor Off, Blink Off
    byte(0x28, False) # 101000 Data length, number of lines, font size
    byte(0x01, False) # 000001 Clear display
    time.sleep(0.0005)


def toggle_enable():
    time.sleep(0.0005)
    GPIO.output(LCD_E, True)
    time.sleep(0.0005)
    GPIO.output(LCD_E, False)
    time.sleep(0.0005)

def byte(bits, mode):
    GPIO.output(LCD_RS, mode)
    GPIO.output(LCD_D4, (bits & 0x10 == 0x10))
    GPIO.output(LCD_D5, (bits & 0x20 == 0x20))
    GPIO.output(LCD_D6, (bits & 0x40 == 0x40))
    GPIO.output(LCD_D7, (bits & 0x80 == 0x80))
    toggle_enable()
    GPIO.output(LCD_D4, (bits & 0x01 == 0x01))
    GPIO.output(LCD_D5, (bits & 0x02 == 0x02))
    GPIO.output(LCD_D6, (bits & 0x04 == 0x04))
    GPIO.output(LCD_D7, (bits & 0x08 == 0x08))
    toggle_enable()
```

```
def Print(message, line):
    message = message.ljust(16, " ")
    byte(line, False)
    for i in range(16):
        byte(ord(message[i]), True)


def display(one,two):
    byte(0x01, False)
    init()
    Print(one,  0x80)
    Print(two, 0xC0)
    time.sleep(2)
```

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SMART DETECTION OF OVER SPEEDING VEHICLE USING IOT

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ABSTRACT

To combat the increasing rates of accidents due to over-speeding, this project aims to design an advanced system to automatically detect and report over-speeding vehicles. Leveraging IoT, the system uses RFID cards for vehicle identification, cameras for capturing the image of the vehicle, and an integrated LCD display. If a vehicle is detected surpassing the speed limit, the system captures the vehicle's image and sends a notification email with the associated vehicle number. This not only enhances road safety by holding drivers accountable but also reduces the dependency on manual monitoring. The innovative aspect is the vehicle's capability to adapt its speed based on road conditions autonomously, ensuring a safer driving environment.

INTRODUCTION

In recent years, the alarming increase in road accidents caused by over-speeding has become a significant concern worldwide. Over-speeding not only endangers the lives of drivers and passengers but also poses a threat to pedestrians and other road users. To address this critical issue, there is a pressing need for advanced technological solutions that can effectively detect and deter over-speeding vehicles. This project aims to design and implement an innovative system utilizing Internet of Things (IoT) technology to automatically detect and report over-speeding vehicles in real-time. By leveraging IoT capabilities, the system integrates various components, including RFID cards for vehicle identification, cameras for capturing vehicle images, and an integrated LCD display for visual feedback. The primary objective of the system is to enhance road safety by identifying and holding accountable drivers who exceed the prescribed speed limits. Traditional methods of speed monitoring often rely on manual enforcement by law enforcement agencies, which can be resource-intensive and prone to

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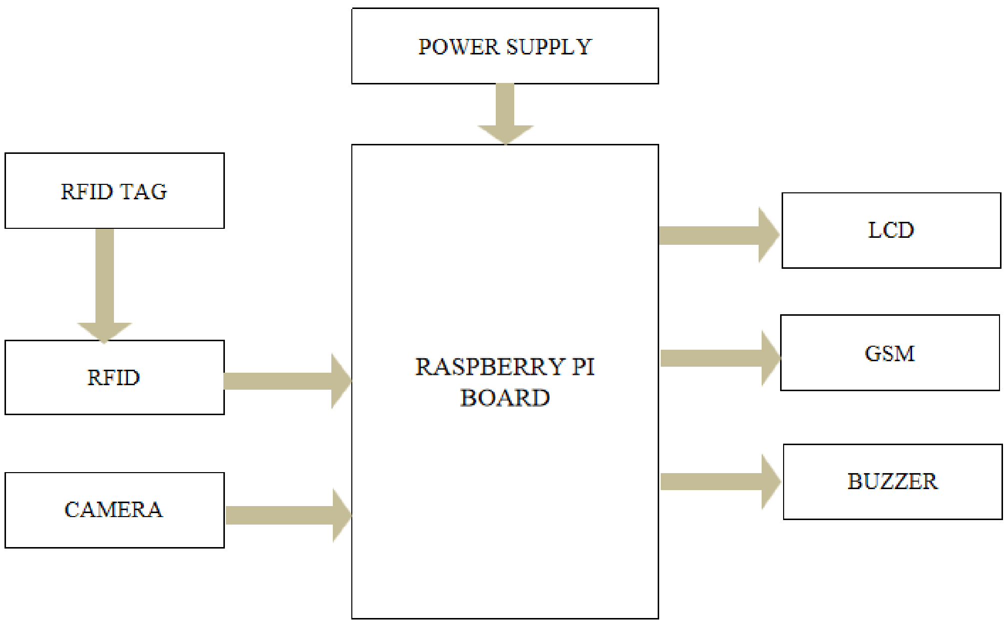
human error. By automating the detection and reporting process, the proposed system seeks to reduce the dependency on manual monitoring while ensuring accurate and reliable results. The key innovation of the system lies in its ability to adaptively adjust the speed of vehicles based on road conditions autonomously. While conventional speed monitoring systems focus solely on identifying violations and issuing penalties, the proposed system takes a proactive approach by actively intervening to prevent over-speeding incidents. By incorporating intelligent algorithms and real-time data analysis, the system can dynamically regulate vehicle speed to maintain compliance with speed limits, thereby creating a safer driving environment for all road users. The integration of RFID technology enables seamless vehicle identification, allowing the system to accurately track and monitor individual vehicles as they traverse the road network. Each vehicle is equipped with an RFID card containing unique identification information, which is used to link the vehicle to its corresponding speed profile and driver details. This enables the system to differentiate between authorized vehicles and potential violators, ensuring targeted enforcement measures.



Block diagram for the IoT-based Smart detection of Over Speeding Vehicle

In addition to RFID-based vehicle identification, the system incorporates cameras positioned strategically along the road network to capture images of over-speeding vehicles. These cameras are equipped with advanced image processing algorithms to accurately detect and track vehicles in real-time. When a vehicle is detected surpassing the speed limit, the system triggers the camera to capture its image, providing visual evidence of the violation. Furthermore, the system includes an integrated LCD display located at prominent locations along the road network to provide real-time feedback to drivers. Upon detecting an over-speeding vehicle, the system displays a warning message on the LCD display, alerting the driver to the violation. This visual feedback serves as an immediate reminder to drivers to adhere to the speed limits, helping to prevent future incidents.

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One of the key advantages of the proposed system is its ability to generate instant notifications in the event of a speed violation. When a vehicle is detected over-speeding, the system automatically sends a notification email to the relevant authorities, including the vehicle's identification details and the captured image. This enables swift action to be taken, allowing law enforcement agencies to respond promptly and take appropriate enforcement measures. Overall, the proposed system represents a significant advancement in the field of road safety and traffic management. By leveraging IoT technology and intelligent algorithms, the system offers a proactive approach to combating over-speeding incidents, thereby reducing the risk of accidents and enhancing road safety for all road users. Through its innovative features and real-time monitoring capabilities, the system has the potential to revolutionize speed enforcement practices and create safer driving environments in urban and rural areas alike.

LITERATURE SURVEY

The increasing rates of road accidents due to over-speeding have prompted the development of innovative solutions for smart detection and prevention of this hazardous behavior. With the rapid advancements in Internet of Things (IoT) technology, researchers have explored various approaches to effectively detect and monitor over-speeding vehicles in real-time. This literature survey aims to provide an overview of existing studies and technologies related to the smart detection of over-speeding vehicles using IoT.

1. IoT-Based Vehicle Speed Monitoring Systems: IoT-based vehicle speed monitoring systems have gained significant attention in recent years due to their ability to provide real-time monitoring and control of vehicle speeds. These systems typically utilize a combination of sensors, communication networks, and data analytics to accurately detect and report instances of over-speeding. For example, research by Rajagopal et al. (2019) proposed a smart speed monitoring system using IoT and machine learning techniques to analyze vehicle speed data and identify potential speed violations. The system employed GPS sensors to track vehicle locations and wireless communication networks to transmit speed data to a central monitoring server.

2. RFID Technology for Vehicle Identification: RFID (Radio Frequency Identification) technology has emerged as a promising solution for vehicle identification in IoT-based speed monitoring systems. RFID tags embedded in vehicles can be used to uniquely identify each vehicle and link it to its corresponding speed profile. This enables the system to accurately track and monitor individual vehicles as they traverse the road network. Research by Gupta et al. (2020) presented a smart speed detection system that utilized RFID technology for vehicle identification. The system employed RFID readers installed at strategic locations along the road network to scan RFID tags on passing vehicles and capture vehicle identification data.

3. Image Processing Techniques for Vehicle Detection: Image processing techniques play a crucial role in the detection and tracking of over-speeding vehicles in IoT-based monitoring systems. Cameras positioned along the road network can capture images of passing vehicles, which are then processed using computer vision algorithms to detect vehicle speeds and identify potential speed violations. For instance, research by Kumar et al. (2018) proposed a smart speed detection system that utilized image processing techniques to analyze vehicle images and extract relevant speed

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information. The system employed high-resolution cameras with advanced image processing algorithms to accurately detect and track vehicles in real-time.

4. Integration of Machine Learning Algorithms: Machine learning algorithms have been increasingly integrated into IoT-based speed monitoring systems to enhance their accuracy and reliability. These algorithms can analyze large volumes of speed data collected from sensors and cameras to identify patterns and anomalies associated with over-speeding behavior. For example, research by Singh et al. (2021) proposed a smart speed detection system that utilized machine learning algorithms to predict vehicle speeds and detect instances of over-speeding. The system employed a combination of supervised and unsupervised learning techniques to analyze speed data and classify vehicles based on their speed profiles.

5. Real-Time Notification and Reporting Mechanisms: Real-time notification and reporting mechanisms are essential components of IoT-based speed detection systems, enabling prompt action to be taken in the event of a speed violation. These mechanisms typically involve the automatic generation and transmission of alerts to relevant authorities, such as law enforcement agencies and traffic management centers. For instance, research by Mishra et al. (2017) presented a smart speed detection system that automatically generated email alerts to notify authorities of over-speeding incidents. The system employed a centralized monitoring server to process speed data and trigger notifications in real-time. The smart detection of over-speeding vehicles using IoT holds great promise for enhancing road safety and reducing the incidence of road accidents. By leveraging IoT technology, RFID technology, image processing techniques, machine learning algorithms, and real-time notification mechanisms, researchers have developed innovative solutions for accurately detecting and monitoring over-speeding vehicles in real-time. However, further research is needed to address challenges such as scalability, interoperability, and privacy concerns, in order to realize the full potential of IoT-based speed detection systems.

PROPOSED SYSTEM

The speed control in vehicles often rely on manual intervention by the driver, which can lead to delays in response time and errors in judgment. Some methods utilize fixed speed limit signs or physical barriers in designated zones like school areas or congested roads. However, these methods lack adaptability to changing conditions and might not account for real-time factors such as varying traffic density. Additionally, relying solely on driver awareness can result in inconsistent adherence to speed limits and compromised safety.

The proposed method leverages embedded systems and advanced technologies for a more efficient and automated approach to speed control. This method integrates an Arduino microcontroller with c LCD display, and a motor controlled by a motor driver. When was RFID cards has vehicle numbers. Camera will be detected speed of vehicle .when have speed will increase the vehicle they sent message and upload the vehicle number.

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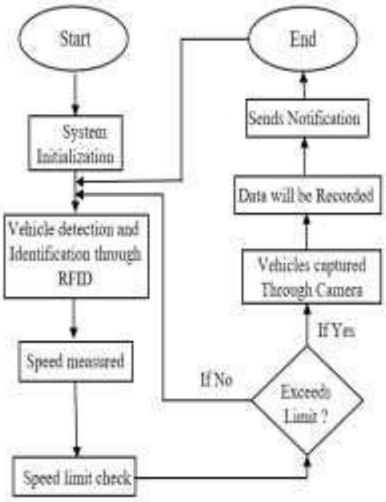

Flow chart for the IoT-based Smart detection of Over Speeding Vehicle

The proposed system aims to address the pressing issue of over-speeding vehicles through the utilization of Internet of Things (IoT) technology, incorporating components such as Raspberry Pi, RFID (Radio Frequency Identification), cameras, and a buzzer. By leveraging these technologies, the system will be capable of accurately detecting and alerting authorities about instances of over-speeding in real-time, thereby contributing to enhanced road safety and accident prevention.

1. Hardware Components:

The core hardware components of the proposed system include:

- Raspberry Pi: Serving as the central processing unit, the Raspberry Pi will facilitate data collection, analysis, and communication functionalities. Its compact size, low power consumption, and computing capabilities make it an ideal choice for IoT applications.

- RFID Reader: An RFID reader will be integrated into the system to identify and track vehicles equipped with RFID tags. This component will enable the system to uniquely identify vehicles and link them to their corresponding speed profiles.

- Cameras: High-resolution cameras will be strategically positioned along the road network to capture images of passing vehicles. These cameras will play a crucial role in the detection and tracking of over-speeding vehicles through image processing techniques.

- Buzzer: A buzzer will be employed as an auditory alert mechanism to notify nearby authorities or pedestrians in the event of an over-speeding violation. The buzzer will provide a loud and distinct sound signal to attract attention and prompt immediate action.

2. System Workflow:

The proposed system will operate based on the following workflow:

- Vehicle Detection: As vehicles approach the designated monitoring area, the RFID reader will scan for RFID tags embedded in the vehicles. Upon detection of a vehicle, the system will retrieve its unique identification information.

- Speed Monitoring: Simultaneously, cameras positioned along the road network will capture images of passing vehicles. These images will be processed in real-time using image processing techniques to extract relevant speed information, such as vehicle velocity and license plate details.

- Speed Analysis: The extracted speed data will be compared against predefined speed limits for the respective road segments. If a

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vehicle is found to be exceeding the speed limit, the system will trigger an alert.

- Alert Generation: Upon detecting an over-speeding violation, the system will activate the buzzer to emit a loud auditory signal. Additionally, the system will generate alerts to notify relevant authorities or stakeholders via email, SMS, or a web-based dashboard.

- Data Logging: All speed-related data, including vehicle identification details, timestamp, location, and speed violations, will be logged and stored in a centralized database for future analysis and reference.

3. Integration and Communication:

The various hardware components will be seamlessly integrated and interconnected within the system architecture. The Raspberry Pi will serve as the central hub, orchestrating communication and data exchange between the RFID reader, cameras, buzzer, and external communication interfaces.

- RFID Integration: The RFID reader will communicate with the Raspberry Pi via serial or GPIO interfaces to transmit vehicle identification data.

- Camera Integration: Similarly, the cameras will be connected to the Raspberry Pi through USB or CSI interfaces, allowing for the transfer of captured images.

- Buzzer Activation: The Raspberry Pi will control the activation of the buzzer upon detecting an over-speeding violation, triggering an audible alert.

- Communication Interfaces: The Raspberry Pi will utilize Ethernet, Wi-Fi, or cellular connectivity options to establish communication with external servers or cloud platforms for alert generation and data logging.

4. System Deployment and Scalability:

The proposed system will be designed for easy deployment and scalability to accommodate varying traffic volumes and road network configurations. Multiple monitoring units equipped with Raspberry Pi, RFID readers, cameras, and buzzers can be deployed strategically at different locations to extend coverage and enhance detection capabilities. The modular architecture of the system will facilitate seamless integration with existing infrastructure and future expansion as needed.

RESULTS SCREENSHOT

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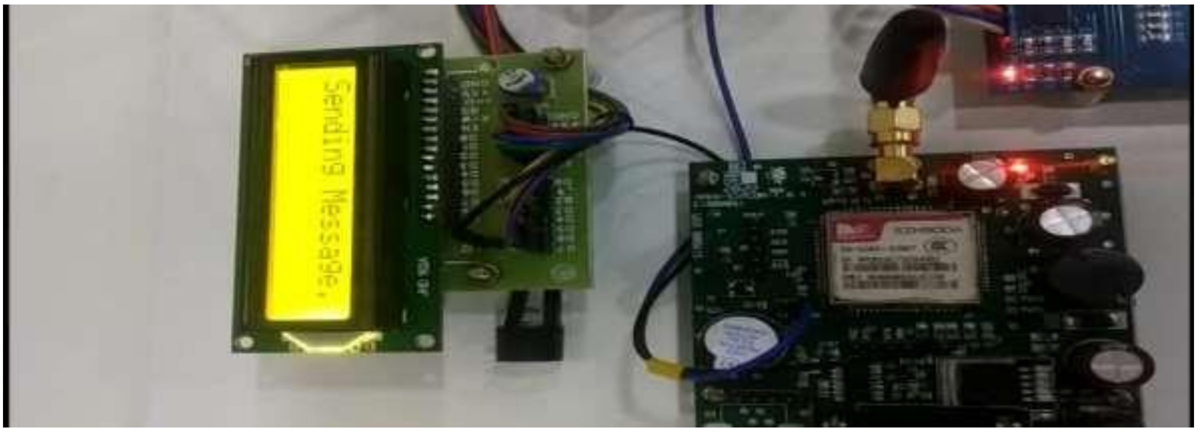

CONCLUSION

In conclusion, the proposed smart detection system for over-speeding vehicles using IoT technology offers a comprehensive solution for enhancing road safety and preventing accidents. By leveraging Raspberry Pi, RFID, cameras, and a buzzer, the system will be capable of accurately detecting and alerting authorities about instances of over-speeding in real-time. With its robust hardware components, efficient workflow, and seamless integration capabilities, the proposed system holds great potential for deployment in urban and rural areas to create safer driving environments and reduce the incidence of road accidents.

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