INTEGRATED SECURITY SYSTEM FOR VEHICLE AND PASSENGER

A Project
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A thesis report submitted to the department of mechanical engineering for the partial fulfillment of the award of degree of "Bachelor of Science in Mechanical Engineering".

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DECLARATION

This is hereby declared that this thesis or any part of this thesis has not been submitted elsewhere for the award of any degree or diploma.

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ABSTRACT

The global road safety crisis can be seen by observing the high number of fatalities and injuries caused by road accidents. In many cases, family members or emergency services are not notified in a timely manner. This results in a delayed response time of the rescue service, which can result in the death of an individual or cause serious injury. The purpose of this work is to reduce the response time of rescue services in situations such as traffic accidents or other emergencies such as fire, theft / robbery and emergency medical care. Accidents due to driver drowsiness can be prevented using eye blink sensors. The driver is supposed to wear the eye blink sensor frame throughout the course of driving and blink has to be for a couple of seconds to detect drowsiness. Any random changes in steering movement leads to reduction in wheel speed. The outcome is that the vibrator attached to eye blink sensor's frame vibrates if the driver falls asleep. The wheel is slowed or stopped depending on the condition. This is how the driver can be alerted during drowsiness and the owner can be notified simultaneously. Here we use Arduino Pro Mini, Buck Converter, battery, Buzzer, Eye Blink Sensor, GSM, GPS, LCD Display etc. The main controller of this system is Arduino Pro Mini.

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LIST OF ABBREVIATIONS

AC	Alternating current
AVR	Automatic voltage regulation
DC	Direct current
GPS	Global Positioning System
GSM	Global System For Mobile Communication
IC	Internal circuit
ICSP	In circuit serial programming
I/O	Input output
LCD	Liquid crystal display
MISO	Master in slave out
PWM	Pulse width modulation
RX	Receiver
SD	Storage device
TX	Transmitter
USB	Universal Serial Bus

CHAPTER 1
INTRODUCTION

1.1 Background

As far as we know, traffic accidents are on the rise and it has become one of the main problems in cities. This is because of the high use of cars like this, the increase in bicycle accidents, as well as the speeding of drivers. And the reason is that in the absence of advanced technology, the severity of accidents is declining. Appropriate, efficient, and standardized solutions need to be put in place to reduce the incidence of accidents in the country. At present, there is no advanced, efficient technology to reduce and detect accidents. [1]

It also increases the likelihood of the victim's death by delaying the arrival of the ambulance to the scene of the accident, as well as delaying the delivery of information about the health of the victim to the hospital. The existing system can detect accidents and track the car, and it will take more time to reach the hospital, so the system will delay the treatment of the victim. In the proposed system, the time between the accident and the provision of necessary facilities is delayed and the victim is not treated with the necessary medical facilities. [3]

Accidents are common in urban areas, and many of these types of accidents can be easily handled, but some accidents occur when the visibility is low at night, making it difficult for the ambulance driver to locate the scene. Citizen phone calls help. If the driver knows the exact location of the accident, the time between the scene and the hospital will be significantly reduced. The main purpose of this article is to help reduce the time factor in the event of an accident. There are many cases of people who have an accident at night and have lost consciousness, so it takes hours for someone to find out and report it to the government. So saving such precious time really saves lives. [4]

1.2 Objectives

The main objective of this project is to develop a **Integrated Security System for Vehicle and Passenger**, GPS tracking and automatic notification to rescue team. Our objectives are pointed out below:

- To study of the **Integrated Security System for Vehicle and Passenger.**
- To design and construct of a Integrated Security System for Vehicle and Passenger.
- To implement and study of take proper step to reduce the accident.

1.3 Motivation

In the era of development, advancement and pace we attained efficiency, mobility, flexibility and comfort but we need safe guard as well as. We, as students of electrical side has thus got motivation to design such a system that ensures protection of different vehicle and aware us even if we are distant from this vehicle. Knowing the location of the vehicle after the accident, if rescue workers are sent there soon, people's lives will be saved. This project physically gives us little hope to advance a bit for protection of accident vehicle. The motivation behind developing an Integrated Security System for Vehicles and Passengers with the features you mentioned can be multifaceted. Here are some key motivations:One of the primary motivations is to improve road safety. Features like overspeed detection, drowsiness detection, and accident detection can help prevent accidents and reduce the severity of collisions, potentially saving lives.

Many accidents on the road are caused by human error, such as speeding or driving while fatigued. By implementing technologies that monitor and intervene when necessary, you aim to reduce accidents caused by these factors.The system's features, especially accident detection and location tracking, are designed to protect passengers in the event of a collision. Quick notification of emergency services and appropriate safety measures (e.g., airbag deployment) can make a significant difference in passenger safety. Drowsiness detection and other driver monitoring systems not only enhance safety but also improve the overall driving experience. Alerting the driver when they are fatigued can prevent accidents and make long journeys more comfortable.The ability for vehicle owners to communicate with their vehicles can be useful for maintenance reminders, security alerts (e.g., theft detection),

and even providing a way to locate the vehicle in case of theft. In some regions, there may be regulatory requirements or incentives for implementing safety features in vehicles.

1.4 Structure of the Project

This Project is organized as follows:

Chapter 1 Introduction**:** The first chapter contains the statement of the introduction, our background study for the project, problem statement, objectives of the study and the project outline.

Chapter 2 Literature Review**:** The chapter two contains our introduction, literature review part.

Chapter 3 Hardware and Software Analysis**:** Chapter three describes the theoretical model. Here we mainly discuss about proposed system Hardware and software development of our project etc.

Chapter 3 Methodology**:** Chapter three describes the theoretical model. Here we mainly discuss about proposed system architecture in details with having block diagram, circuit diagram, structural diagram, project working principle, complete project image etc.

Chapter 4 Result and Discussion**:** Chapter four deals with the result and discussion and discuss about our project advantages and application.

Chapter 5 Conclusion**:** Chapter five all about our project conclusion and future scope.

CHAPTER 2
LITERATURE REVIEW

2.1 Introduction

This chapter is arranged on Literature Review. Here's a look at some of last year's literature, like our project. By reading them, we can overcome the mistakes of the previous project and make a more effective project.

2.2 Related Research/ Works

Hari Sankar et al., [1] recommend a full response to each collision with a vehicle identification and rescue vehicle. When a car collides with a car identification device in a car, the entire server sends a nearby ambulance with the car to the collision. An Android device using an ambulance will help drivers quickly and securely collect area details. Automation of collision by recognizing and sending the vehicle, along with training the ambulance driver.

Nicky Kattukkaran and others. The relevant accelerator in the car recognizes the inclination of the car and the heartbeat sensor in the user's physics recognizes the abnormality of the heartbeat and understands the importance of the car. Thus, the devices select the selector via Bluetooth and send the laptop to a smartphone connected to the accelerator and heart rate sensor. The Android device on the mobile phone sends text content material text messages to nearby clinics and friends. In addition, the application shares the actual location of the time-saving hospital.

Adnan bin Fayez et al., [3] have developed a fully-fledged Android system that can detect the situation unexpectedly and send emergency warning messages to nearby police stations and fitness centers. The device is equipped with an external pressure sensor that removes the external pressure of the body. It measures speed and switching points with GPS and accelerator sensors, respectively, on Android phones. By checking the conditions, this software program is helpful in reducing false alarm fees.

D Selvathi et al. The prevention area includes Smart Helmet. If these two preconditions are not met, the rails will no longer be on the engine. The micro-controller controls the transmission capability and fires as a result of the retreat. In addition, the component can detect the collision with a car in any area and assess the collision of the car with the predefined numbers with the GSM module. The micro-controller continuously archives all the parameters of the car to prevent and acknowledge the collision of the car.

Chunxiao Liao, et. al introduced the "Mobile Shore-Based Smart Traffic Accident Detection System" in 2017. The article presents a framework for smart car crashes based on the nearby mobile Edge computer-based, idle and recyclable and car-certified proof. Our framework uses basic mobile phones to increase speed and speed, and to identify images that display error-prone scenes, to recognize computerized error-detection if false positives occur, and to advise environmental factors and divisions, such as clinics and transportation departments.

Sanjana. K.R, et. In 2015, the Emergency Services Center introduced the "Smart Traffic Lights with Automatic Rescue System." They used a sensor to create a frame that automatically identifies street accidents, advising them to use GSM to manage crises and close them by family members. It is fully computerized, using Google's guides to locate the fault, control traffic lights and reach the emergency center in a timely manner. This framework will be viable in countries with a large population, such as India.

CHAPTER 3

HARDWARE AND SOFTWARE ANALYSIS

3.1 Introduction

In this section, we will discuss elaborately about our hardware design of "**Integrated Security System for Vehicle and Passenger**" and the component description, features, working procedure and description of our all equipment. The system hardware fabricates composed of micro-controller unit, Ultrasonic sensor, GSM, GPS, Gear Motor, Relay, Buzzer, Flame sensor Battery, Eye Blink Sensor and many more related components.

3.2 Hardware List

- Arduino Pro Mini
- Battery
- Buck Converter
- Eye Blink Sensor
- IR Sensor
- Gear Motor
- Relay
- GSM
- GPS
- Buzzer
- LCD Display

3.3 Arduino Pro Mini

The Arduino Pro Mini is a micro-controller board based on the ATmega168. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, an on-board resonator, a reset button, and holes for mounting pin headers. A six pin header can be connected to an FTDI cable to provide USB power and communication to the board.

Specification

- Micro-controller ATmega168
- Operating Voltage: 3.3V or 5V (depending on model)
- Input Voltage: 3.35 -12 V (3.3V model) or 5 - 12 V (5V model)
- Digital I/O Pins: 14 (of which 6 provide PWM output)
- Analog Input Pins: 6
- DC Current per I/O Pin: 40 mA
- Flash Memory: 16 KB (of which 2 KB used by boot loader)
- SRAM: 1 KB
- EEPROM: 512 bytes
- Clock Speed: 8 MHz (3.3V model) or 16 MHz (5V model)

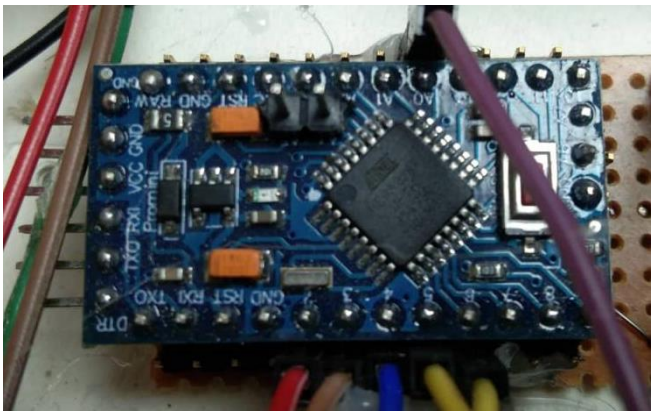

Figure 3.1: Arduino Pro Mini

Pin Out

Each of the 14 digital pins on the Pro Mini can be used as an input or output, using pin Mode(), digital Write(), and digital Read() functions. They operate at 3.3 or 5 volts (depending on the model). Each pin can provide or receive a maximum of 40 mA and has an internal pull-up resistor (disconnected by default) of 20-50 kOhms. In addition, some pins have specialized functions:

- Serial: 0 (RX) and 1 (TX). Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the TX-0 and RX-1 pins of the six pin header. [9]

- External Interrupts: 2 and 3. These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value. See the attach Interrupt() function for details. [10]

- PWM: 3, 5, 6, 9, 10, and 11. Provide 8-bit PWM output with the analog Write() function. [11]

- SPI: 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). These pins support SPI communication, which, although provided by the underlying hardware, is not currently included in the Arduino language. [6]

- LED: 13. There is a built-in LED connected to digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off.

  The Pro Mini has 6 analog inputs, each of which provide 10 bits of resolution (i.e. 1024 different values). Four of them are on the headers on the edge of the board; two (inputs 4 and 5) on holes in the interior of the board. The analog inputs measure from ground to VCC. Additionally, some pins have specialized functionality:

There is another pin on the board:

- Reset. Bring this line LOW to reset the micro controller. Typically used to add a reset button to shields which block the one on the board.

  See also the mapping between Arduino pins and ATmega168 ports. [12]

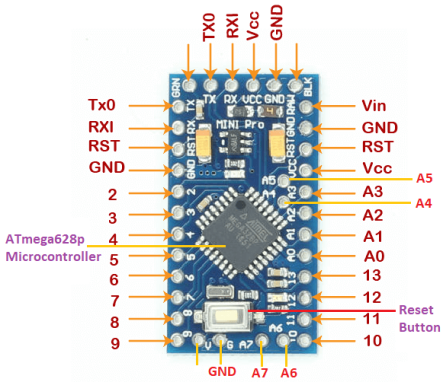

Figure 3.2: Arduino Pro Mini Pin Out

The high-performance Microchip Pico Power 8-bit AVR RISC-based micro controller combines 32KB ISP flash memory with read-while-write capabilities, 1024B EEPROM, 2KB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, a 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts. By executing powerful instructions in a single clock cycle, the device achieves throughputs approaching 1 MIPS per MHz, balancing power consumption and processing speed. [8]

Micro controller IC ATmega328p

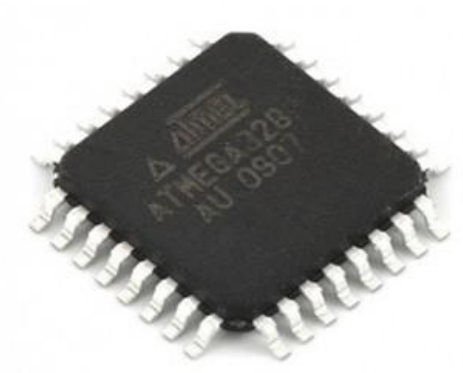

Figure 3.3: Micro controller IC AT Mega 328p

3.4 5V Regulator IC

Voltage sources in a circuit may have fluctuations resulting in not providing fixed voltage outputs. A voltage regulator IC maintains the output voltage at a constant value. 7805 IC, a member of 78xx series of fixed linear voltage regulators used to maintain such fluctuations, is a popular voltage regulator integrated circuit (IC). The xx in 78xx indicates the output voltage it provides. 7805 IC provides +5 volts regulated power supply with provisions to add a heat sink. [14]

7805 IC Rating:

- Input voltage range 7V- 35V
- Current rating Ic = 1A
- Output voltage range V. Max=5.2V ,V. Min=4.8V

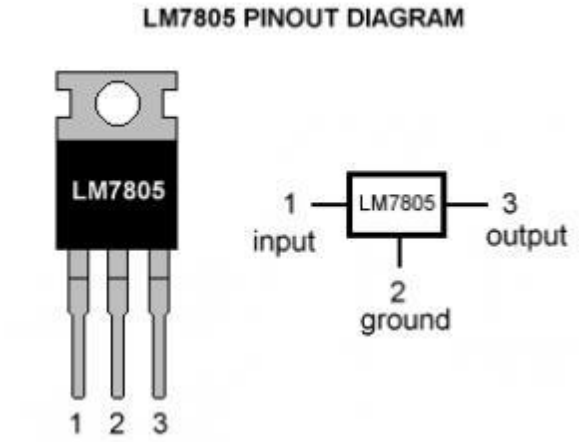

Figure 3.4: 5V Regulator IC

3.5 Buck Converter

A **buck converter** (**step-down converter**) is a DC-to-DC power converter which steps down voltage (while drawing less average current) from its input (supply) to its output (load). It is a class of switched-mode power supply (SMPS) typically containing at least two semiconductors (a diode and a transistor, although modern buck converters frequently replace the diode with a second transistor used for synchronous rectification) and at least one energy storage element, a capacitor, inductor, or the two in combination. To reduce voltage ripple, filters made of capacitors (sometimes in combination with inductors) are normally added to such a converter's output (load-side filter) and input (supply-side filter). It is called a buck converter because the voltage across the inductor "bucks" or opposes the supply voltage. [5]

Figure 3.5: DC -DC Buck Converter

DC-DC Buck Converter Step Down Module LM2596 Power Supply is a step-down(buck) switching regulator, capable of driving a 3-A load with excellent line and load regulation. These devices are available in fixed output voltages of 3.3 V, 5 V, 12 V, and an adjustable output version. The LM2596 series operates at a switching frequency of 150kHz, thus allowing smaller sized filter components than what would be required with lower frequency switching regulators. [6]

Specifications of DC-DC Buck Converter Step Down Module LM2596 Power Supply :

- Conversion efficiency: 92%(highest)
- Switching frequency: 150KHz
- Output ripple: 30mA9maximum)
- Load Regulation: ± 0.5%
- Voltage Regulation: ± 0.5%
- Dynamic Response speed: 5% 200uS
- Input voltage:4.75-35V
- Output voltage:1.25-26V(Adjustable)
- Output current: Rated current is 2A, maximum 3A (Additional heat sink is required)
- Conversion Efficiency: Up to 92% (output voltage higher, the higher the efficiency)
- Switching Frequency: 150KHz

- Rectifier: Non-Synchronous Rectification
- Module Properties: Non-isolated step-down module (buck)
- Short Circuit Protection: Current limiting, since the recovery
- Operating Temperature: Industrial grade (-40 to +85) (output power 10W or less)

3.6 Gear Motor

Gear motors are mechanisms that adjust the speed of electric motors, leading them to operate at a certain speed. They are composed of a series of gears that make up a kinematic chain, working on a set of rotary parts. Their main purpose is to allow the reduction from an initial high speed to a lower one without negatively affecting the mechanism. In addition to this adjustment, a gear motor is in charge of adjusting the mechanical power of a system. [14]

Figure 3.6: Gear Motor

Mechanical components that complement gear motors

Gear motors are composed of an electric motor and gears, which form the kinematic chain – the fundamental component of the gear ratio.

Kinematic chain

A motor's speed reducer is composed of a speed reducer and its gears. This speed reducer is basically a variable speed drive that allows for the speed to be reduced and increased at the output shaft.

Gears

Gears are toothed wheels made of metal or plastic (and new materials with each passing day) that transmit motion when meshing with each other. They are defined by their number of teeth and their size. In addition, they may have straight-cut or helical teeth.

Motors

The five types of motors that see the most use in gear motors are:

- Brushed motors, with brushes normally made out of carbon. They are bidirectional and may be used with DC or AC. They have a service life of about 3000 hours.
- Asynchronous motors, which are brush-less single-direction motors. They are highly limited.
- Synchronous brush-less motors, which may be single-direction or bidirectional. They have a constant speed if the frequency of the power source is stable.
- Brush-less DC motors that use a driver and can attain high speeds.
- Stepper DC brush-less motors. They can be positioned with an average precision of 7.5º.

3.7 Resistor

A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element. Resistors act to reduce current flow, and, at the sometime, act to lower voltage levels within circuits. Resistors may have fixed resistances or variable resistances, such as those founding thermostats, visitors, trimmers, photo resistors, hamsters and potentiometer. The current through a resistor is in direct proportion to the voltage across the resistor's terminals. This relationship is represented by Ohm's law. [10]

Figure 3.7: Resistor

Theory of operation

The behavior of an ideal resistor is dictated by the relationship specified by Ohm ‘slaw:

$$V = I.R$$

Ohm's law states that the voltage (V) across a resistor is proportional to the current (I), where the constant of proportionality is the resistance (R).

Equivalently, Ohm's law can be stated:

$$I = V/R$$

This formulation states that the current (I) is proportional to the voltage (V) and inversely proportional to the resistance (R). This is directly used in practical computations. For example, if a 300-ohm resistor is attached across the terminals of a12 volt battery, then a current of12 / 300 = 0.04 amperes flows through that resistor.

3.8 Relay

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers: they repeated the signal coming in from one circuit and re-transmitted it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations.

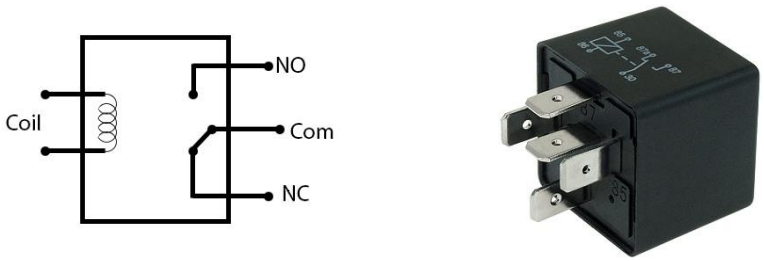

Figure 3.8: Relay

A type of relay that can handle the high power required to directly control an electric motor or other loads is called a contactor. Solid-state relays control power circuits with no moving

parts, instead using a semiconductor device to perform switching. Relays with calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload or faults; in modern electric power systems these functions are performed by digital instruments still called "protective relays".

Magnetic latching relays require one pulse of coil power to move their contacts in one direction, and another, redirected pulse to move them back. Repeated pulses from the same input have no effect. Magnetic latching relays are useful in applications where interrupted power should not be able to transition the contacts. Magnetic latching relays can have either single or dual coils. On a single coil device, the relay will operate in one direction when power is applied with one polarity, and will reset when the polarity is reversed. On a dual coil device, when polarized voltage is applied to the reset coil the contacts will transition. AC controlled magnetic latch relays have single coils that employ steering diodes to differentiate between operate and reset commands. The relay module is the one in the figure below.

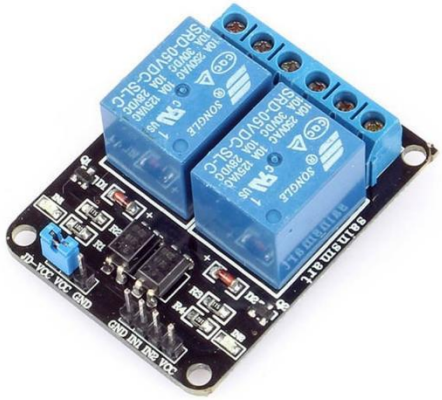

Figure 3.9: Relay Module.

This module has two channels (those blue cubes). There are other varieties with one, four and eight channels. [11]

Main's voltage connections.

In relation to mains voltage, relays have 3 possible connections:

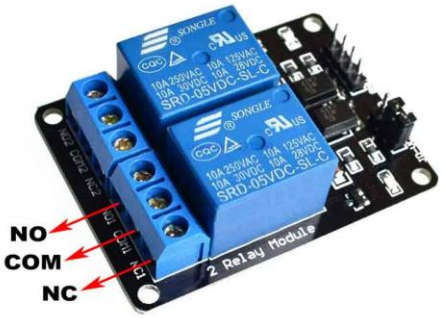

Figure 3.10: Main's voltage connections.

COM: common pin

NO (Normally Open): there is no contact between the common pin and the normally open pin. So, when you trigger the relay, it connects to the COM pin and supply is provided to a load

NC (Normally Closed): there is contact between the common pin and the normally closed pin. There is always connection between the COM and NC pins, even when the relay is turned off. When you trigger the relay, the circuit is opened and there is no supply provided to a load.

Pin wiring

The connections between the relay module and the Arduino are really simple:

GND: goes to ground

IN: controls the first relay (it will be connected to an Arduino digital pin)

IN2: controls the second relay (it should be connected to an Arduino digital pin if you are using this second relay. Otherwise, you don't need to connect it)

VCC: goes to 5V

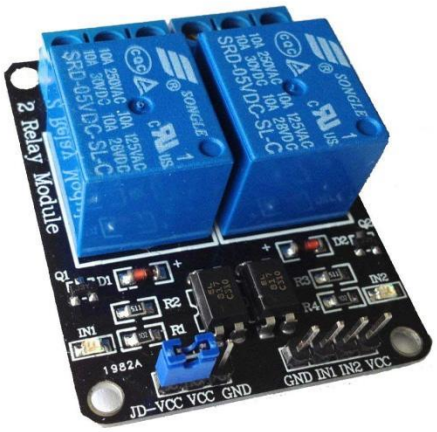

Figure 3.11: Voltage connections.

3.9 Battery

Lithium batteries are primary batteries that have metallic lithium as an anode. These types of batteries are also referred to as lithium-metal batteries. They stand apart from other batteries in their high charge density and high cost per unit. Depending on the design and chemical compounds used, lithium cells can produce voltages from 1.5 V (comparable to a zinc–carbon or alkaline battery) to about 3.7 V.

Disposable primary lithium batteries must be distinguished from secondary lithium-ion or a lithium-polymer,[1] which are rechargeable batteries. Lithium is especially useful, because its ions can be arranged to move between the anode and the cathode, using an intercalated lithium compound as the cathode material but without using lithium metal as the anode material. Pure lithium will instantly react with water, or even moisture in the air; the lithium in lithium ion batteries is in a less reactive compound.

Lithium batteries are widely used in portable consumer electronic devices. The term "lithium battery" refers to a family of different lithium-metal chemistry, comprising many types of cathodes and electrolytes but all with metallic lithium as the anode. The battery requires from 0.15 to 0.3 kg of lithium per kWh. As designed these primary systems use a charged cathode, that being an electro-active material with crystallographic vacancies that are filled gradually during discharge. [7]

Figure 3.12: 3.7V Battery

Product Specification

Voltage	**3.7 V**
Product Type	Lithium-Ion
Battery Capacity	2200mAh
Weight	45 g
Model Number	ICR 18650

3.10 GSM

At the heart of the module is a SIM800L GSM cellular chip from Sim Com. The operating voltage of the chip is from **3.4V to 4.4V**, which makes it an ideal candidate for direct LiPo battery supply. This makes it a good choice for embedding into projects without a lot of space.

Figure 3.13: GSM Module

All the necessary data pins of SIM800L GSM chip are broken out to a 0.1″ pitch headers. This includes pins required for communication with a micro-controller over **UART**. The module supports baud rate from **1200bps** to **115200bps** with Auto-Baud detection.

The module needs an external antenna to connect to a network. The module usually comes with a **Helical Antenna** and solders directly to NET pin on PCB. The board also has a U.FL connector facility in case you want to keep the antenna away from the board.

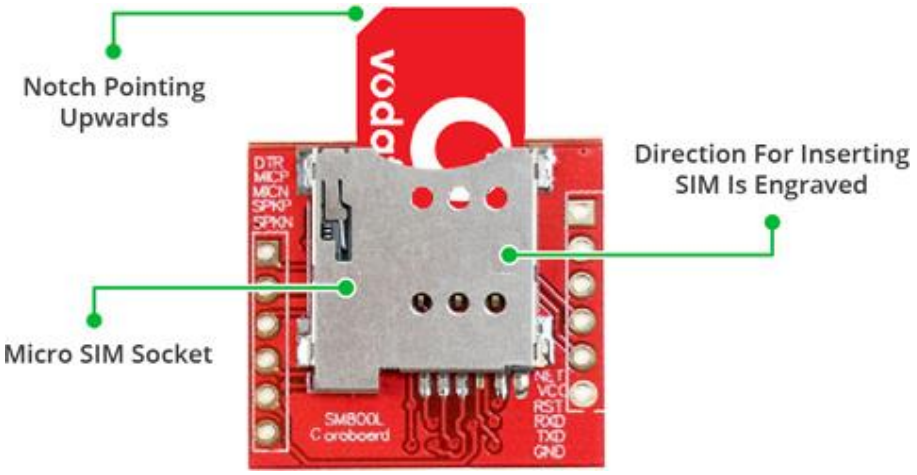

Figure 3.14: GSM Module Introducing

There's a SIM socket on the back! Any activated, **2G micro SIM card** would work perfectly. Correct direction for inserting SIM card is normally engraved on the surface of the SIM socket. This module measures only 1 inch² but packs a surprising amount of features into its little frame. Some of them are listed below:

- Supports Quad-band: GSM850, EGSM900, DCS1800 and PCS1900
- Connect onto any global GSM network with any 2G SIM
- Make and receive voice calls using an external 8Ω speaker & electret microphone
- Send and receive SMS messages
- Send and receive GPRS data (TCP/IP, HTTP, etc.)
- Scan and receive FM radio broadcasts
- Transmit Power:
    - Class 4 (2W) for GSM850
    - Class 1 (1W) for DCS1800
- Serial-based AT Command Set
- FL connectors for cell antennae
- Accepts Micro SIM Card

SIM800L GSM Module Pinout

The SIM800L module has total 12 pins that interface it to the outside world. The connections are as follows:

Figure 3.15: GSM Module Pinout

NET is a pin where you can solder Helical Antenna provided along with the module. VCC supplies power for the module. This can be anywhere from 3.4V to 4.4 volts. Remember connecting it to 5V pin will likely destroy your module! It doesn't even run on 3.3 V! An external power source like Li-Po battery or DC-DC buck converters rated 3.7V 2A would work. RST (Reset) is a hard reset pin. If you absolutely got the module in a bad space, pull this pin low for 100ms to perform a hard reset. RxD (Receiver) pin is used for serial communication.

TxD (Transmitter) pin is used for serial communication.

GND is the Ground Pin and needs to be connected to GND pin on the Arduino.

RING pin acts as a Ring Indicator. It is basically the ‘interrupt’ out pin from the module. It is by default high and will pulse low for 120ms when a call is received. It can also be configured to pulse when an SMS is received.

DTR pin activates/deactivates sleep mode. Pulling it HIGH will put module in sleep mode, disabling serial communication. Pulling it LOW will wake the module up.

MIC± is a differential microphone input. The two microphone pins can be connected directly to these pins.

SPK± is a differential speaker interface. The two pins of a speaker can be tied directly to these two pins.

3.11 GPS

The GPS module is a well-performing complete GPS receiver with a built-in 25 x 25 x 4mm ceramic antenna, which provides a strong satellite search capability. With the power and signal indicators, you can monitor the status of the module. Thanks to the data backup battery, the module can save the data when the main power is shut down accidentally. Its 3mm mounting holes can ensure easy assembly on your aircraft, which thus can fly steadily at a fixed position, return to Home automatically, and automatic waypoint flying, etc. Or you can apply it on your smart robot car for automatic returning or heading to a certain destination, making it a real "smart" bot! The schematic diagram of the module is shown as below: [14]

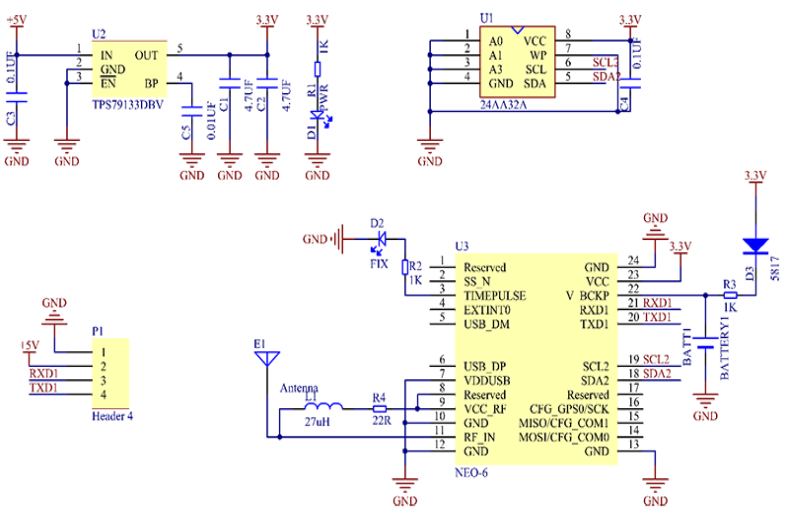

Figure 3.16: Schematic Diagram Of GPS

This is a complete GPS module that is based on the GPS. This unit uses the latest technology from Ublox to give the best possible positioning information and includes a larger built-in 25 x 25mm active GPS antenna with a UART TTL socket. A battery is also included so that you can obtain a GPS lock faster. This is an updated GPS module that can be used with ardupilot mega v2. This GPS module gives the best possible position information, allowing for better performance with your Ardupilot or other Multi rotor control platform.[15]

Features:

1. 5Hz position update rate
2. Operating temperature range: -40 TO 85°CUART TTL socket
3. EEPROM to save configuration settings
4. Rechargeable battery for Backup
5. The cold start time of 38 s and Hot start time of 1 s
6. Supply voltage: 3.3 V
7. Configurable from 4800 Baud to 115200 Baud rates. (default 9600)
8. Super Sense ® Indoor GPS: -162 dBm tracking sensitivity
9. Support SBAS (WAAS, EGNOS, MSAS, GAGAN)
10. Separated 18X18mm GPS antenna

Figure 3.17: GPS

3.12 Buzzer

There are many ways to communicate between the user and a product. One of the best ways is audio communication using a buzzer IC. So during the design process, understanding some technologies with configurations is very helpful. So, this article discusses an overview of an audio signaling device like a beeper or a buzzer and its working with applications.An audio signaling device like a beeper or buzzer may be electromechanical or piezoelectric or mechanical type. [9]

Figuire 3.18: Buzzer

How to Choose a Buzzer?

While choosing a buzzer or speaker, many principles need to consider like the following.

- Size of the product
- Consumption of Current
- Type of terminal
- Frequency Voltage
- Volume
- Type
- AC/DC Voltage
- The tone is Continuous/Pulsed
- Fixing – Pins, Leads/Surface Mount
- Output of Sound
- Feedback Option
- Piezo Elements

Types of Buzzer

A buzzer is available in different types which include the following.

- Piezoelectric
- Electromagnetic
- Mechanical
- Electromechanical
- Magnetic

Specifications

The **specifications of the buzzer** include the following.

- Color is black
- The frequency range is 3,300Hz
- Operating Temperature ranges from – 20° C to +60°C
- Operating voltage ranges from 3V to 24V DC
- The sound pressure level is 85dBA or 10cm
- The supply current is below 15mA

How to use a Buzzer?

A buzzer is an efficient component to include the features of sound in our system or project. It is an extremely small & solid two-pin device thus it can be simply utilized on breadboard or PCB. So in most applications, this component is widely used.

There are two kinds of buzzers commonly available like simple and readymade. Once a simple type is power-driven then it will generate a beep sound continuously. A readymade type looks heavier & generates a Beep. Beep. Beep. This sound is because of the internal oscillating circuit within it.

This buzzer uses a DC power supply that ranges from 4V – 9V. To operate this, a 9V battery is used but it is suggested to utilize a regulated +5V/+6V DC supply. Generally, it is connected through a switching circuit to switch ON/OFF the buzzer at the necessary time interval.

Buzzer Circuit Diagram

The **circuit diagram of the water level indicator using the buzzer** is shown below. This circuit is used to sense or detect the water level within the tank or washing machine or pool, etc. This circuit is very simple to design using few components such as a transistor, buzzer, 300K variable resistor, and power supply or 9V battery.

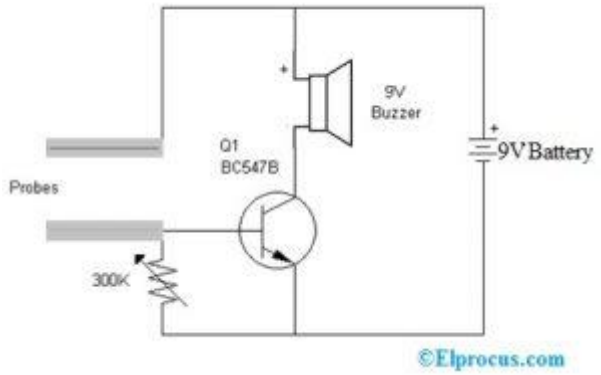

Figure 3.19: Water Level Circuit using Buzzer

3.13 LCD Display

LCD (Liquid Crystal Display) screen is an electronics 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.

Features of LCD Display:

5 x 8 dots with cursor

Built-in controller (KS 0066 or Equivalent) + 5V power supply (Also available for + 3V)

1/16 duty cycle B/L to be driven by pin 1, pin 2 or pin 15, pin 16 or A.K (LED) N.V. optional for + 3V power supply.

Figure 3.20: 16*2 LCD Display

3.14 Eye Blink Sensor

This Eye Blink sensor senses the eye blink using infrared. The Variation Across the eye will vary as per eye blink. If the eye is closed the output is high otherwise the output is low. The eye blink sensor is an infrared sensor. It contains two parts. A transmitter and a receiver. The transmitter continuously emits infrared waves onto the eye. While the receiver continuously looks for variations in the reflected waves which indicates that the eye has blinked. If the eye is closed that means it will give high output. If the eye is open then it will give a low output. This sensor can be used in a very different variety of robotics and mechatronics projects as it provides excellent results and is very economical. [2]

Figure 3.21: Eye Blink Sensor

Feature and Specification:

- EYE BLINK indication by LED
- Instant output digital signal for directly Connecting to the micro-controller
- Compact Size
- Working Voltage +5V DC
- TTL output 5V or 0V
- use for digital Eye Blink monitor
- use for Vehicle Accident prevention.
- Suite for real-time driving applications.
- Onboard 3-pin header
- Facility to interface micro-controller devices
- Sensor device: QRD1114

3.15 IR Sensor

An infrared sensor is an electronic device, that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measure only infrared radiation, rather than emitting it that is called a passive IR sensor. Usually, in the infrared spectrum, all the objects radiate some form of thermal radiation. These types of radiations are invisible to our eyes, that can be detected by an infrared sensor. The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photo diode that is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photo diode, the resistances and the output voltages will change in proportion to the magnitude of the IR light received.

Figure 3.22: IR Sensor

An infrared sensor circuit is one of the basic and popular sensor module in an electronic device. This sensor is analogous to human's visionary senses, which can be used to detect obstacles and it is one of the common applications in real-time. This circuit comprises of the following components:

- LM358 IC 2 IR transmitter and receiver pair
- Resistors of the range of kilo-ohms.
- Variable resistors.
- LED (Light Emitting Diode).

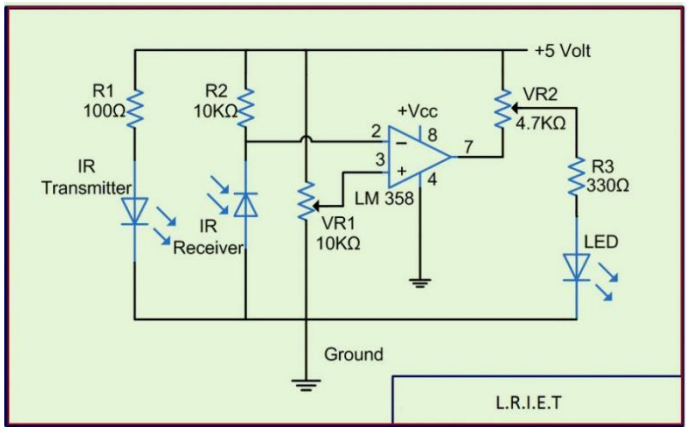

Figure 3.23: Schema Diagram of IR Sensor

In this project, the transmitter section includes an IR sensor, which transmits continuous IR rays to be received by an IR receiver module. An IR output terminal of the receiver varies depending upon its receiving of IR rays. Since this variation cannot be analyzed as such,

therefore this output can be fed to a comparator circuit. Here an operational amplifier (op-amp) of LM 339 is used as comparator circuit.[9]

When the IR receiver does not receive a signal, the potential at the inverting input goes higher than that non-inverting input of the comparator IC (LM339). Thus the output of the comparator goes low, but the LED does not glow. When the IR receiver module receives signal to the potential at the inverting input goes low. Thus the output of the comparator (LM 339) goes high and the LED starts glowing. Resistor R1 (100), R2 (10k) and R3 (330) are used to ensure that minimum 10 mA current passes through the IR LED Devices like Photodiode and normal LEDs respectively.

- Resistor VR2 (preset=5k) is used to adjust the output terminals. Resistor VR1 (preset=10k) is used to set the sensitivity of the circuit Diagram. Read more about IR sensors

3.16 Arduino Software

An intelligent micro-controller unit called the Arduino Uno can be programmed with the Arduino software. There is no need to install any software other than the Arduino first. From the Tools Board menu (according to your on-board micro-controller) select "Arduino Unio A" using the hardware programmer.

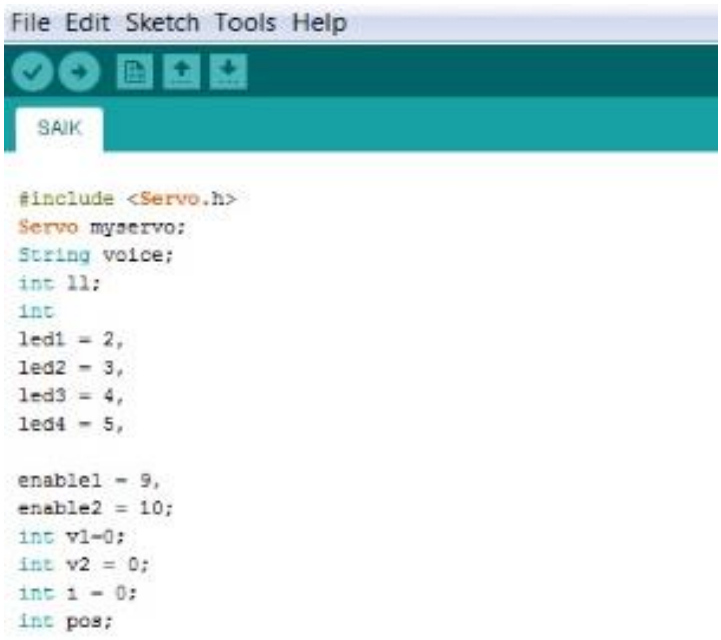

Figure 3.24: Arduino Software Interface IDE

The communication uses the native STK 500 protocol (reference C header file). We can bypass the boot loader and program the micro-controller under the ICSP (In Circuit Serial Programming) heading. Atmeg16U2 firmware source code (or 8U2 on The Rev1 and Rev2) Atmega 16U2/8U2 boards are loaded with a DFU boot loader, which can be enabled at: On the Rev 1: board, attach a solder jumper to the back of the board. Rev 2 or later: There is a resistor that pulls the 8U2/16U2 HWB wires to ground, making it easy to put in DFU mode. The Arduino Uno is the latest smart micro-controller unit and has Several advantages for communicating with other Arduino computers or other micro-controllers.

The ATMA 328 provides URT TTL with Communication Protocol (5V), available in digital PIN 0 - (RX) for data retrieved with PIN No. 1 (TX) for data transmission. The system port communicates via USB Atimega 16U2 in the port and comes out as a low-end port with computer software. '16U2 firmware uses standard USB CMM driver and no external drivers required. Anyway, Windows needs an .inf file.The Arduino file system contains a serial viewer that allows sending easy text data to and from Arduino boards. The RX and TX connectors will flash on the board when transferring data via USB-to-serial connector and USB connection to the computer (but not for serial communication on pins 0 and 1).

The software system library allows seamless communication within any digital PIN. The Atmeg 328 supports I2C information communication (TWI) and SPI. The Arduino software includes a wire library to support the use of the I2C car. Arduino programs are written in C or C ++ and the program code written for Arduino is called Sketch. Arduino IDE uses GNU and AVR LBC toolkit to compile programs, as well as upload programs using Android. For example, software for Arduino can be developed using the Arduino platform using Atmel micro-controllers, around the development of Atmel, AVR Studio or even the new Atmel Studio.

3.17 Easy EDA

Easy EDA is a web-based EDA tool suite that enables hardware engineers to design, simulate, share-publicly and privately-and discuss schematics, simulations and printed circuit boards. Other features include the creation of a bill of materials, Gerber files and pick

and place files and documentary outputs in PDF, PNG and SVG formats. Easy EDA allows the creation and editing of schematic diagrams, SPICE simulation of mixed analogue and digital circuits and the creation and editing of printed circuit board layouts and, optionally, the manufacture of printed circuit boards.

Subscription-free membership is offered for public plus a limited number of private projects. The number of private projects can be increased by contributing high quality public projects, schematic symbols, and PCB footprints and/or by paying a monthly subscription.Registered users can download Gerber files from the tool free of charge; but for a fee, Easy EDA offers a PCB fabrication service. This service is also able to accept Gerber file inputs from third party tools.

Figure 3.25: Easy EDA Software Interface

CHAPTER 4
METHODOLOGY

4.1 Methodologies for the project

Used methodology for the project:

- Creating an idea for the design and construction of "**Integrated Security System for Vehicle and Passenger System".** And designing a block diagram & circuit diagram to know which components we need to construct it.

- Collecting all the components and programming the micro-controller to control our desired system.

- Setting up all the components in a PCB board & soldering. Then assembling all the blocks in a board and finally running the system to check if it actually works or not.

4.2 System Design and Components

The main processing brain of the system is the Arduino Pro Mini. Firstly, to run the micro-controller battery supply the main voltage. Then the system will be on and ready for operation. Here this system will able to measure the system condition and able to take command. Here we use Battery, Buck Converter Arduino Pro Mini, Eye Blink Sensor, Buzzer, relay, gear motor, GPS, GSM, LCD Display etc. All of this equipment's are combined work together and full fill our required as we desire.

4.3 Block Design Specifications

In this diagram we will show by block the individual parts.

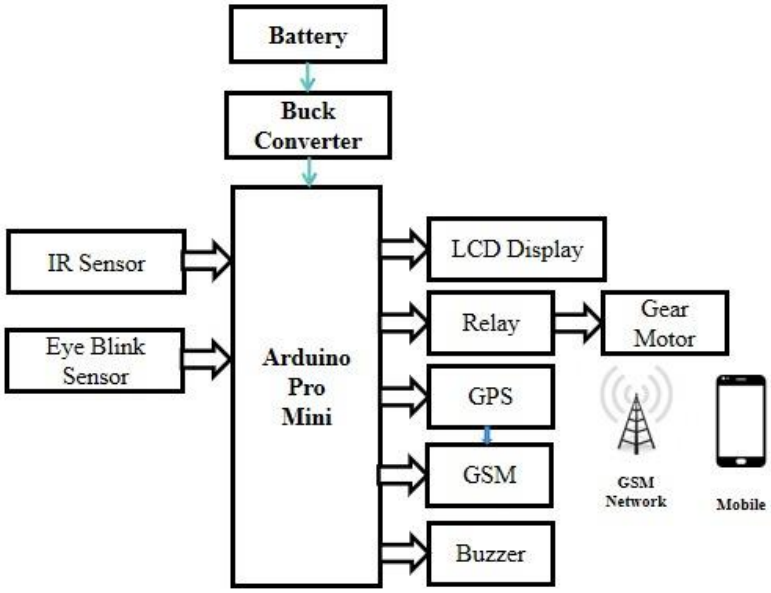

Figure 4.1: Block Diagram

4.4 Circuit Design Analysis

The schematic diagram here is representing the electrical circuit and the components of our System. Here we connect equipment with he smart wire connection.

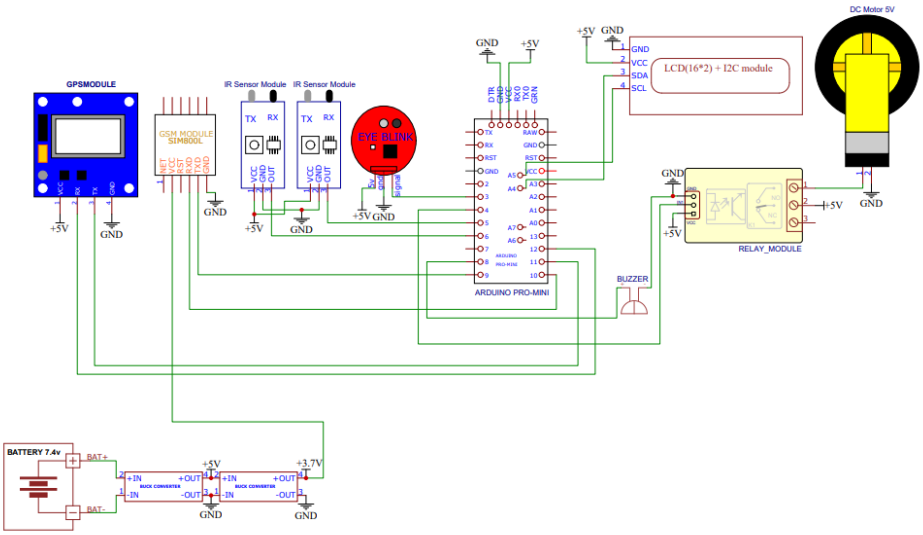

Figure 4.2: Circuit Diagram of our system

4.5 Working Principle

In our project we have a power source that is battery. In this project we have used an Arduino Pro Mini for operate this system. The working principle of the Integrated Security System for Vehicle and Passenger System involves the integration and coordination of the various components. The system is powered by a battery as the power source. The buck converter regulates the battery voltage to provide a stable power supply to the components. Here we use Arduino Pro Mini, Buck Converter, battery, relay, Eye Blink Sensor, Buzzer, GSM, GPS, LCD Display, Gear Motor etc. When driver will feel sleep and eye close for long time then our Eye Blink sensor detect the eye condition then will be aware the driver and the car will automatically stop and Buzzer will be sound. Here we use GSM module will help the send a text in rescue team. Once the system is activated then if the car has an accident somewhere, it will immediately send a text (Location Link) to the phone via GSM. And GPS Module track the vehicle location. This will save the lives of the passengers in the car by rescuing them very quickly. This is the main procedure of our System.

CHAPTER 5
DESIGN AND CONSTRUCTION

5.1 Experimental Setup of The System

Here is the structural setup of this design is given below -

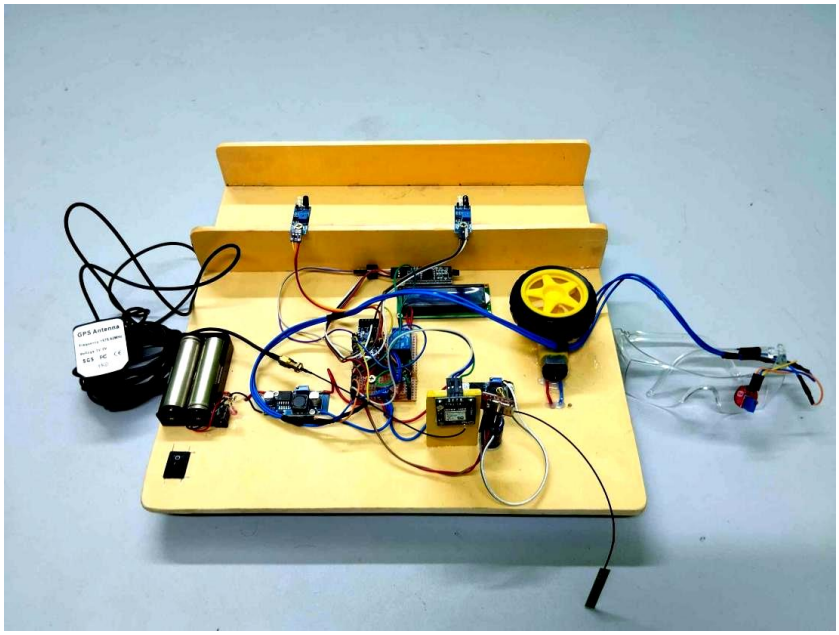

Figure 5.1: Isometric View Of The Structural set up

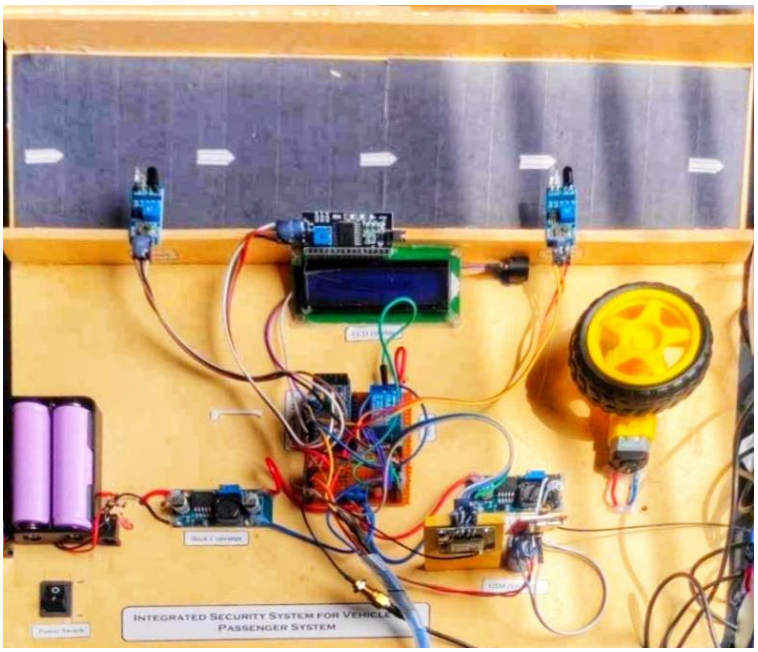

Figure 5.2 : Top View of Structural set up

5.2 Equipment Cost List

Sl.no	Particulars	Specification	Qty.	Unit Price (Taka)	Total (Taka)	Pric
1	Arduino	Pro Mini	1	580	580	
2	LCD Display	16*2	1	380	380	
3	Eye Blink Sensor		1	1680	1680	
4	Battery	3.7V	2	100	200	
5	Buck Converter	LM2596	2	140	280	
6	Gear Motor	6V	1	130	130	
7	Relay	5V	1	120	120	
8	GSM Module	SIM800L	1	450	450	
9	GPS		1	440	440	
10	Buzzer	5V-12V	1	50	50	
11	Others				1850	
				Total	6160/=	

CHAPTER 6
RESULTS AND DISCUSSION

6.1 Results

This chapter contains the results obtained and discussion about the full project. In our project making we used PVC boards for total hardware making. After finally completing this project, we ran it & we observed the output of this project. We can see that it is working well as expected. After making our project we observe it very careful. It works as we desire. Our project give output perfectly and all equipment are work perfectly. We check how much it works and we get perfect output from this project. The results of your Integrated Security System for Vehicles and Passengers project would depend on various factors, including the successful implementation of the features you've outlined, the goals of the project, and the specific benefits you aim to achieve. Here are some potential results and outcomes you can expect: The most significant result would be the enhancement of road safety. The system's features, such as over speed detection, drowsiness detection, and accident detection, should contribute to reducing accidents and improving overall road safety. By preventing accidents caused by factors like speeding or driver fatigue, the system can lead to a reduction in the number and severity of accidents involving your vehicles.

Enhanced Passenger Safety: The accident detection and location tracking features should improve passenger safety in the event of a collision, potentially reducing injuries and fatalities. Improved Driver Comfort: Drowsiness detection and other driver monitoring systems can make driving more comfortable and less stressful for drivers, potentially leading to a better driving experience. The ability for vehicle owners to communicate with their vehicles, receive alerts, and monitor their status can lead to increased owner satisfaction and loyalty. If there are regulatory requirements related to vehicle safety systems in your region, successfully implementing these features can ensure compliance and avoid legal issues.

The project may lead to further research and development opportunities in the field of vehicle safety and communication systems. Implementing such a system can promote a safety culture within your organization, emphasizing the importance of safety in vehicle design and operation. It's important to note that the success of the project will depend on effective planning, development, testing, and integration of the various components. Additionally, user feedback and ongoing maintenance and updates will be crucial for ensuring the long-term success and effectiveness of the integrated security system. Depending on your region, there may be specific regulations governing vehicle safety systems. Ensure that your system complies with these regulations to avoid legal issues. Consider the cost of implementing this system and how it will affect the pricing of your vehicles. Also, evaluate the potential return on investment in terms of reduced accidents and improved safety. Plan for the long-term scalability of the system, including updates and maintenance. As technology evolves, the system should remain relevant and adaptable. If necessary, provide training to vehicle owners on how to use the system effectively and safely. Clear instructions and user manuals can be helpful.

Software updates should address any identified issues or user suggestions. Remember that a project of this magnitude will likely involve a multidisciplinary team, including engineers, software developers, data scientists, legal experts, and user experience designers. Collaboration and careful planning are key to the successful development and deployment of this integrated security system.

Data Table & Experiment

SL NO:	Time (Sec)	Speed (km/h)	IR Sensor Distance	Testing Device	Result	Buzzer (ON/OFF)
01.	5sec	4km/h	5 inch	Hand	Normal Speed	OFF
02.	3sec	7km/h	5 inch	Car	Over Speed	ON
03.	7sec	2km/h	5 inch	Car	Normal Speed	OFF
04.	2sec	8.5km/h	5inch	Car	Over Speed	ON
05.	8sec	1.5km/h	5inch	Car	Normal Speed	OFF

This table's data is our projects IR sensor's results:

1. Firstly when we check IR sensor by move our hand in 5 second, the speed was 4 km/h and speed showed normal in LCD display, buzzer was off.
2. Secondly we moved a car in 3 second, the speed was 7 km/h and speed showed over speed in LCD display, buzzer was sound.
3. Thirdly we moved a car in 7 second, the speed was 2 km/h and speed showed normal in LCD display, buzzer was off.
4. Fourthly we moved a car in 2 second, the speed was 8.5 km/h and speed showed over speed in LCD display, buzzer was sound.
5. Fifthly we moved a car in 8 second, the speed was 1.5 km/h and speed showed normal in LCD display, buzzer was off.

Two IR sensor's distances was 5 inch, because it's fixed.

- Finally, we have completed our project successfully & check our project its run accurately according to our objective.
- At first, we start our system.
- When driver will feel sleep and eye close for long time then our Eye Blink sensor detect the eye condition then will be aware the driver and the car will automatically stop and buzzer will be sound.
- The GSM module will help send this text.
- Then GPS Module track the vehicle location.

6.2 Discussion

While working on our project, we did face some difficulties as it is a very complex system but the end results, we came up with were quite satisfactory. We have put the whole system through several tasks to validate our work and also have taken necessary notes for future improvements. Some future recommendations that we have involves improvement in system design and wiring, adding features for more efficient. Certainly, let's discuss some important aspects and considerations for the Integrated Security System for Vehicles and Passengers project we've outlined: Integrating multiple safety and communication features into a single system can be complex.

It's essential to ensure that all components work seamlessly together and that they don't interfere with each other. Compatibility and reliability are key. Safety should always be the primary focus of the project. The system's actions and alerts must be designed to enhance safety without causing undue stress or distraction to the driver. Choosing the right sensors and hardware components is critical. Consider factors such as accuracy, reliability, cost-effectiveness, and ease of integration. Each component, like the eye blink sensor or GPS module, should be carefully evaluated. Developing the software that processes sensor data, controls vehicle functions, and communicates with external devices (e.g., smartphones) requires expertise in programming and real-time data analysis. It's important to ensure the software is robust and secure. Consider the user interface for both the driver and the vehicle owner.

The user experience should be intuitive and not add to driver distraction. An LCD display and/or a mobile app should be user-friendly. As the system collects and transmits data, it's crucial to address data privacy concerns. Ensure that user data is protected and that you comply with relevant data privacy Depending on your region, there may be specific regulations governing vehicle safety systems. Ensure that your system complies with these regulations to avoid legal issues. Consider the cost of implementing this system and how it will affect the pricing of your vehicles. Also, evaluate the potential return on investment in terms of reduced accidents and improved safety. Plan for the long-term scalability of the system, including updates and maintenance. As technology evolves, the system should remain relevant and adaptable. If necessary, provide training to vehicle owners on how to use the system effectively and safely.

CHAPTER 7

APPLICATIONS AND SCOPE

7.1 Applications

This project has applications in many fields due its necessity. We have selected a few of them and they are given below:

- It can be used in any kind of vehicle.
- Useful to people who travel longer distances.
- Useful to people who are driving late at night.
- It will detect if the driver has falls a sleep.

7.2 Advantages

There are certainly many advantages of our project and some of the major ones have been given below:

- Able to check driver drowsiness can be prevented using eye blink sensors.
- This project is easy to use.
- Cost effective.
- User-friendly.
- Automatic and requires less human interaction.
- The whole system consumes very little energy.

7.3 Future Scope

Some of our project future scopes of works are listed below:

- ❖ In future development this project can be develop by more sensor.
- ❖ In future we will add a huge battery source.
- ❖ We can add this system in toolbox area for control speed.
- ❖ We can make in future wireless Eye blink sensor.

7.4 Conclusion

In conclusion, the Integrated Security System for Vehicle and Passenger System project aims to enhance road safety by detecting and alerting drivers about potential dangers associated with alcohol consumption and driver drowsiness. By integrating components such as the Eye blink monitoring system, Arduino Pro Mini, relay, battery, and gear motor, the system can effectively monitor driver drowsiness, and provide timely warnings and alerts to the driver. Additionally, by monitoring the driver's eye blink patterns, the system can identify signs of drowsiness or fatigue. In such cases, an alert or warning mechanism is activated, reminding the driver to take a break or rest.

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