VISVESVARAYA TECHNOLOGICAL UNIVERSITY

BELAGAVI-590018 KARNATAKA

A

PROJECT REPORT

ON

"IoT BASED INTELLIGENT HIGHWAY SYSTEM"

Submitted by:

ADINARAYANA	**2LG19CS002**
KAVYA S HORAPETI	**2LG19CS016**
PRATIBHA KOTEPPAGOUDA PATIL	**2LG19CS027**
BRUNDA PATIL	**2LG20CS402**

Under the Guidance of:

Prof. TEJASWINI ESHWAR ACHAR (M.E)

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

GOVERNMENT ENGINEERING COLLEGE

TALAKAL, KOPPAL-583238

2022-23

GOVERNMENT OF KARNATAKA
GOVERNMENT ENGINEERING COLLEGE
TALAKAL, KOPPAL-583238

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Certificate

This is to certified that the Project Work entitled **"IoT BASED INTELLIGENT HIGHWAY SYSTEM"** carried out by students of B.E 8th semester have successfully completed the project work for the partial fulfilment of the Bachelor Degree in Computer Science and Engineering as prescribed by the Visvesvaraya Technological University, Belagavi, during the year 2022-2023. The project report has been approved as it satisfies the academic requirements in respect of project work prescribed for the Bachelor of Engineering Degree.

Name of the Students	University Seat Number
ADINARAYANA	2LG19CS002
KAVYA S HORAPETI	2LG19CS016
PRATIBHA KOTEPPAGOUDA PATIL	2LG19CS027
BRUNDA PATIL	2LG20CS402

Signature of guide
Prof. Tejaswini Eshwar Achar

Signature of HOD
Prof. Veeresh

Signature of Principal
Dr. Rajashekar

Name of the Examiner	Sign and Date
1……	…….
2……	……..

ACKNOWLEDGEMENT

We consider it a privilege to express a few words of gratitude in depth and respect to all those, who guided and inspired for the successful completion of this project.

We would like to express our immense gratefulness to our beloved Project Guide **Asst Prof. TEJASWINI ESHWAR ACHAR,** Department of Computer Science and Engineering, for her guidance and support throughout our project work.

We would like to express our immense gratefulness to our beloved Head of Department **Prof. VEERESH,** Department of Computer Science and Engineering, for their support throughout our project work.

Our sincere thanks to our beloved principal, **Dr. RAJASHEKAR U,** Government Engineering College, Talakal, for kind co-operation during our entire course.

We are thankful to all the faculty members of Computer Science and Engineering for their valuable support and co-operation.

We are thankful to our Parents and Friends for their love, encouragement, affection and moral support showered on us during our entire course.

Cordially,

ADINARAYANA	2LG19CS002
KAVYA S HORAPETI	2LG19CS016
PRATIBHA KOTEPPAGOUDA PATIL	2LG19CS027
BRUNDA PATIL	2LG20CS402

ABSTRACT

One of the biggest motivators people have for conserving electricity in their homes is the accumulated savings in their energy bills at the end of the year. There are other reasons why conserving electricity is important beyond the impact on your wallet. Electricity can beobtained from solar or wind power, but most electricity used in homes comes from the burning of fossil fuels such as oil or coal. Advancement in transportation system has boosted speed of our lives. Meantime, road traffic accident is a major global health issue resulting huge loss of lives, properties and valuable time. It is considered as one of the reasons of highest rate of death nowadays. Accident creates catastrophic situation for victims, especially accident occurs in highways imposes great adverse impact on large numbers of victims. In this paper, we develop an intelligent accident detection, location tracking and notification system that detects an accident immediately when it takes place. Global Positioning System (GPS) device finds the exact location of accident. As the time being, many of these connections are changing as Finding the faulty street light automatically is become a vital milestone by using this technology. The primary goal of the project is to provide control and identification of the damaged street light automatically.

The lighting system which targets the energy and automatic operation on economical affordable for the streets and immediate information response about the street light fault.Road weather services are based on a weather information generated either for the large geographical areas or at the specific spots like city centers. However, regular and exact weather forecasts and services, tailored for the specific road stretches, would be more beneficial for the road users, thus also increasing a traffic fluency and a safety. To provide such services, one would need to have access to the latest observations originating from the mobile vehicles and the local road weather stations as well as the weather forecasts from experts. Crosswalk is a method for sharing the street amongst vehicle and individuals. In this paper, we propose another framework called Smart Crossing that is another sort of crosswalk utilizing sensors, illuminator and an IoT gadget to guard person on foot in while crossing. In this paper, we propose a crosswalk framework utilizing sensors to track passerby and feature them to make vehicle driver effortlessly keep away from any risky circumstances.

CONTENTS

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

Highway lights are switched on for whole night and during the day, they are switched off. But during the night time, highway lights are not necessary if there is no traffic. Saving of this energy is very important factor these days as energy resources are getting reduced day by day. Alternatives for natural resources are very less and our next generations may face lot of problems because of lack of these natural resources. Highway lighting provides a safe night time environment for all road users including pedestrians. Providing highway lighting is one of the most important and expensive responsibilities of a city. Lighting can account for 10–38% of the total energy bill in typical cities worldwide. Highway lighting is a particularly critical concern for public authorities in developing countries because of its strategic importance for economic and social stability. Inefficient lighting wastes significant financial resources every year, and poor lighting creates unsafe conditions. Energy efficienttechnologies and design mechanism can reduce cost of the highway lighting drastically. The main objective of the project is to reduce the power consumption and efficient utilization of renewable sources for the application of highway lightening. Hence, this project is aimed at design and implementation of an automatic system to reduce energy consumption of highway lighting system up to the maximum possible extent. The availability of vehicle is sensed by using an array of Infrared Sensors (IR), which senses the traffic movement. LDR is used to detect the presence of day light. In this system, the highway lights are switched ON/OFF automatically during the presence of the traffics only during the nights.

The evolution of the transportation system has made possible the rapid change in the civilization of human history. Transportation has great importance in our daily life and its development has made our communication much easier. But it can be also cause of loss of lives and properties. According to Association for Safe International Road Travel approximately 1.25 million people die in road accident every year while 3,287 deaths every day. Besides, 20-50 million people are injured and disabled. Road traffic accident is ranked as9th leading cause of loss of lives. Annually USD $518 billion has been damaged because of road traffic accident which costs from 1-2% of annual GDP of individual countries. The most obvious reason of a person's death during accidents is the unavailability of the first aid

provision due to the delay in accessing the exact information of the accident location. The trivial reasons of unavailability of prompt onsite medical assistance are late reporting of accident, incorrect geographic location and unreliable mobile application due to malfunctioning of smart phone. The typical scenario is eyewitnesses do not notify hospital and police while an accident takes place. Moreover, accidents occur on highways, vehicles passing the accident location generally ignore their responsibility to notify hospital and police.Hence, this problem needs immediate attention and intelligent accident detection and location tracking system should be developed which do not required human intervention. The paper begins by discussing the significance of a lightweight, standalone, intelligent accident detection system in the current scenario. A brief description of the existing approaches is presented in Section.

The methodology of the proposed system including system architecture is described in Section. Hardware set up is described in Section IV. The working flow diagramis shown in Section. The experimental results along with the device prototype are presented inSection. Finally, Section concludes the paper with future direction. An important and essential role is being played by the Internet of Things in every one's regular life. There is a clear increase in the changes being made among the traditional systems, & other general household components and traditional systems for making a better life. The major problem of the available system of electricity is the issue of connectivity because of the major connections is manually handled by several contractors. Manually, the settings of the timer are done. Additionally, the timer needs 12 hours' of power supply continuously, setting the timer may interrupt in the loss of power supply continuously. IOT is characterized through largely shared, original world smaller things, and the capability of processing and with the storage of restriction that contains the presentation, confidentiality, consistency, and safety. Pervasive devices are linked using IOT and many networks are convenient for delivering protected and effectual provisions for entire applications anywhere and anytime. The Internet of Technology is combined with IT (Information Technology) and OT (Operational Technology) in which the unstructured data generated by machines are studied for making improvements. IOT is combining of physical devices with sensors, electronics, and software using the internet, which allows the objects to fetch and interchange the data through the ecosystem. It is determined as IOT because all the components described here are utilized in making a better ecosystem.

Assets of the city's is street light which provides road safety and increases the security in city centers and houses too. There are many automation applications of IOT such as smart roads, smart parking, smart lighting, smart home, and many more. In the existing system that is the manual system of street lighting contains many issues like connectivity problems, maintenance problems, and the timing issue. These issues will be solved using the technology of IOT. This system depends on the smart and climatic flexibility of street lighting, management automatically [14]. Several issues are simplified by automation in the economy of the world and regular life. Currently, the system of streetlight flexibility is majorly challenged. Controlling the distant area location is a major dilemma. Human mistakes lead to wastage of energy and the system's low performance. Based on the survey it is determined that 30 percent of electricity is consumed by street lights in each city. Currently, the street lights are will be in ON state before the sunset and they get OFF after getting light in the atmosphere, sometimes the light will be in ON state whole day. As it is our responsibility to save energy, we need to take initiative in saving energy. Our project yields the best solutionfor electricity wastage. Automatic ON/OFF of the street light is an effective solution that will decrease the consumption of the lights of the streets up to 20 percent when the environment contains light.

Increased the traffic safety and reduced a pollution are the important issues in our modem society. The vehicular industry is nowadays facing new challenges provided by the modern market trends. Green technology, electrical/hydrogen vehicles, vehicular intelligence, online services and automatic vehicles are just a few examples. Engine economy is in general a challenge of its own, but for the rest of the topics, cooperative communication presented by ITS has an important role. The road weather information is one of the very perspective and straightforward applications in ITS. The road weather information brings not only added travel convenience, but also an essential improvement of the traffic safety. The production of the reliable road weather forecasts covering the full road network is a big challenge due to lack of the local area observations. Road weather stations are mainly located along the major roads and are typically far apart from each other a growing number of the available mobile observations are expected to be beneficial in solving the lack of the observations problem. Road weather services exploiting traffic data allow more accurate a real-time service generation directly to a different traffic and transport actors.

The more extensive piloting of the services in more controlled conditions and under the real-life traffic conditions. Exploiting both VANET and a cellular networking (3G/4G/5G) best features in a hybrid system offers the best communication approach and getting the best results. FMI is presently building the large-scale test environments for these purposes: the Sod5G project in a controlled vehicle winter testing area for both IEEE 802.11p VANET and 5G cellular networking, and the Arctic Intelligent Trucks project for an operational vehicle fleet testing within a normal highway traffic environment under challenging weather conditions with general 3G communication with hybrid IEEE 802.11p partially available. SG- Safe project introduces more demanding application scenarios for enhanced user experience and safety, obviously challenging the capacity and other advanced properties envisioned in 5G. Important communication safety features are analyzed in Cyber WI and Safe COPproject, the latter also introducing the cloud based data exchange for the vehicular networking components. In this paper we present our road weather system, which was developed as a part of the infrastructure aiming to provide testing and evaluation environments for the weather services. The system includes collecting the weather information and the data from thedifferent sources, modelling the forecast based on the collected data and delivering theprocessed weather information to the vehicles.

Since individuals and vehicle are sharing the road, crosswalk expands effectiveness of utilizing the road in exceedingly thought region. Be that as it may, as the populace expands, this brings more incessant accidents and more genuine wounds and subsequently, nationals are attempting to diminish these accidents by making advancements and legitimate approvals. Such activities pull down the aggregate number of lethal accidents yet sadly, number of pedestrian fatalities does not diminish for 10 years. To be particular, this casualty does not have a comparative trademark thinks about to others. An examination around 2014 in USA demonstrates fatalities in 78% happened in urban, 71% happened at non-crossing points and 72% happened oblivious. Through this examination, pedestrian fatalities are inferring vigorously populated territory makes more shot make a mischance and a mediocre acknowledgment makes less opportunity to distinguish a pedestrian or a vehicle.

CHAPTER 2

LITERATURE SURVEY

Automatic highway lighting systems are designed to enhance road safety by providing appropriate lighting for motorists during low-light conditions. These systems are programmedto automatically detect ambient light levels and adjust the brightness of the road lighting accordingly. Now-a-days, street lights consume large part of power. Because there is no automation in this field, there always require a human being to turn on/off the light according to the need of light. If the person that is employed for this work is absent then this would result in large amount of wastage of light energy. So, there is a need of an automatic system that would help in conservation of electrical energy. A system that automatically controls the on/off function of light according requirement is needed [1]. There are some cases in which street lights have pre-set time for turning on/off light and if due to some reason timer is not working in a proper way then it would take time to fix it because it has long procedure of complaining and then working on it to resolve the problem. The environment is also affectedif the light remains in working condition (on condition) for a long time[2].

LEDs (Light emitting diodes) are used that provide more luminance and less power consumption as compared to previous ones like halogen lamps, mercury lamps etc. The street lights operation is based on light sensor which makes them separate from other entities[3]. To on/off street lights controllers have a real time clocks IC (RTC) which is not that accurate and the error of time is plus or minus 5 seconds a day, so it involve resetting in a month[4][5]. There exist many systems that provides control and monitoring over lights such as radio channel control system and supply change system etc. However, these systems have some disadvantages like in radio channel control system creates the problem of pollution as it uses radio waves and it is not cost efficient. The other system has a disadvantage of cost of autotransformer and we need to put a microcontroller in each and every street to provide control over lights. To overcome these problems we have projected a system for controlling lighting of street with the help of GPS[6]. The development of a transportation system has been the generative power for human beings to have the highest civilization above creatures in the earth.

We utilize it to go to our work place, keep in touch with our friends and family, and deliver our goods [1]. Despite many efforts taken by different governmental and non-governmental organizations all around the world by various programs to aware against careless driving, yet accidents are taking place every now and then. However, many lives could have been saved if the emergency service could get the crash information in time. A study by Virtanen et al. shows that 4.6% of the fatalities in accidents could have been prevented only in Finland if the emergency services could be provided at the place of accident at the proper time [2].

The major problem of the available system of electricity is the issue of connectivity because of the major connections is manually handled by several contractors. Manually, the settings ofthe timer are done. Additionally, the timer needs 12 hours of power supply continuously, setting the timer may interrupt in the loss of power supply continuously [1]. IoT is characterized through largely shared, original world smaller things, and the capability of processing and with the storage of restriction that contains the presentation, confidentiality, consistency, and safety [2].

This system depends on the smart and climatic flexibility of street lighting, management automatically [3]. Several issues are simplified by automation in the economy of the world and regular life [4]. Based on the survey conducted by S. K. Cho et.al. [5], it is determined that 30 percent of electricity is consumed by street lights in each city. Currently, the street lights are will be in ON state before the sunset and they get OFF after getting light in the atmosphere, sometimes the light will be in ON state whole day. As it is our responsibility to save energy, we need to take initiative in saving energy. Our project yields the best solution for electricity wastage. Automatic ON/OFF of the street light is an effective solution that will decrease the consumption of the lights of the streets up to 20 percent when the environment contains light.

In this paper we present a vehicle dispatching system prototype based on weather and road condition which have better security, real-time performance, manageability. This prototype can gather real time weather condition, weather forecast and road real-time condition from internet, and then the logistics server can make a better and safer path selection which will avoid the dangerous or time-consuming weather to improving safety after consider the

weather and road condition. This prototype also can receive message from vehicle terminals through wireless communication and analyze discrepancies between actual data and planned data, furthermore, it can be used to revise the planned data [1]. According to [2] tracking of vehicles is needed in order to provide the link between the information systems and the physical reality. This prototype allow tracking vehicles while they are travelling between the transshipment points and can provide the necessary information required to achieve real-time computer-based decision support. However, only few decision support tools can be found thatuse real-time information which is gathered from internet and sent by the vehicle terminals. So far no universal solution exists that will make path selection by considering weather and road condition. Vehicle managing and dispatching system prototype use GPS technology [3.4.5], Wireless Communication technology [6, 7, 8], GIS technology.

Pedestrian fatalities appear to be influenced by assorted reasons. In any case, incredibly, a fewhighlights that may look like to influence, for example, plastered driver or youthful driver, was not the significant issues in accidents. It will probably impact by the thickness and number of the populace and light. To decrease the quantity of pedestrian fatalities, there are a few methodologies, which lead driver to back off, take care of this issue. In the first place approach is to authorize the acknowledgment of crosswalk region utilizing light transmitting asphalt marker, in this manner vehicle driver can be effectively educated where the genuine crosswalk is on the road [2 - 4].

For all that, this neither keeps any sudden responses from pedestrians nor drivers to see pedestrian effortlessly. Second approach is lighting up the crosswalk territory that the driver sees a pedestrian from long separation. This is extremely satisfactory against a sudden development of pedestrian. Unexpectedly, this expends excessively vitality to maintain every single dim hour for inadequate pedestrians also the shoreline of vitality isn't shabby if illuminators are introduced more to bring down the shot of mishap [5]. For all that, if the mishap happens, there is just believing the vehicle driver to call crisis unless the pedestrian has its awareness.

CHAPTER 3

SYSTEM DESIGN AND ANALYSIS

3.1 EXISTING SYSTEM

IoT (Internet of Things) is a rapidly growing field, and there are numerous existing systems available to support it. These systems provide a range of services and tools for connecting, managing, and analyzing data from IoT devices. These systems provide the necessary infrastructure and tools to connect IoT devices, collect and store data from them, and analyze the data to derive insights and inform decision-making The existing systems for IoT typically include cloud-based platforms, communication protocols, device management systems, data storage and processing systems, and analytics tools. These systems help to address the challenges of managing large-scale and complex IoT deployments and facilitate the creationof new IoT applications across various industries.

The existing systems consist of manual controls which need constant monitoring and maintenance. Considering the wastage of energy due to manual control many systems have been introduced. These systems are designed in such a manner that they could reduce their intensity and save as much energy as possible. Systems like these use LEDs (Light Emitting Diode) instead of HID (High Intensity Discharge) lamps due to dimming feature. There is a time slot allotted during which the intensity of the system keeps reducing and turns the lights OFF at morning. The time slot starts when it is specified. Reduction of intensity starts gradually at midnight when it is not much dark and there is not much traffic and is switched OFF at 6 in the morning. Some use IR (Infrared Ray) sensors to detect vehicles. Existing systems do overcome the drawbacks of HID based systems, but do not save enough energy as they are time based also in seasons like monsoon the environment remains dark compared to regular days. Winters bring the fog and if the lights are dim it could result into a great accidentor disaster. Therefore, still some improvements in systems like these are needed. Time slot- based systems consider the time slot as an advantage, but it actually is a drawback as it could not work in all conditions.

The enormous research has been done to detect an accident and notify the emergency medicalservices. In the speed of the vehicle has monitored with the help of GPS receiver and detected accident by comparing the previous and current speed of vehicles. This system sent the location of accident to an Alert Service Center. However, the distance between accident location and Alert Service Center might affect the time required to rescue or to send help. In the authors proposed a system that notified emergency contact, police or ambulance services while an accident has detected. The system programmed a smart phone for decision support based on Mamdani Fuzzy Logic to detect accident and stored records in the data center for future use. The data regarding accidents were collected using Accelerometer, Gyroscope and four force sensors attached at each side of the vehicle. However, the system hardware with excessive sensors was not compact enough. Though the system sent a text message to the emergency contact or public safety, the response time depends on the distance between the location of the accident and the public safety service center. The authors employed a shock sensor to detect accident and sent geographic location, additional information of passengers such as full name, blood type, phone number, email, medical history, date of birth, and reference phone number to the headquarters of the Public Safety Organizations. The main limitation of the system is all the passengers and vehicles need to be pre-registered with their information which is not practical for the current scenario of Bangladesh. Besides, the success of the system relied upon the distance between the headquarters of the Public Safety Organizations and accident location. In [6] a map matched system has been proposed to locate the vehicle using data collected by GPS. The system detected accident by comparing the previous and current speed of the vehicle. While an accident detected it sent the location to an Alert Service Center.

IoT-based Automatic Damaged Street Light Fault Detection Management System. The choiceof platform will depend on the specific requirements of the project, including factors such as scalability, security, and cost. During most of the night, Intelligent street lighting systems utilizing GSM, street light systems of conventional in regions with less incidence of passersbyare online without any cause. The result of this is the bulk of power is wasted unnecessarily. Street lighting systems became reality because of the vast accessibility of flexible technology of lighting such as the wireless connection of the internet, light-emitting diode lamp, well-

grounded functionality, power conservation, and quick reacting. This main theme of this studyis to describe that the Intelligent Street lighting ISL system was the initial to achieve the command for the public systems of lighting in a flexible way.

In today's world many pollution monitoring systems are designed by considering different environmental parameter A Wireless Sensor Network [6] consists of many inexpensive wireless sensors, which are capable of collecting, storing, processing environmental information, and communicating with neighboring nodes. In the past, sensors are connected by wire lines. The access method of WSN gateway node is convenient because data can be received from a WSN via the gateway at any time and any place. The gateway acts as the network coordinator in charge of node authentication, message buffering where you can collect, process, analyze, and present your measurement data. Wireless sensor network management model consists of end device, router, gateway node and management monitoringcenter.

End device is responsible for collecting wireless sensor network data, and sending them to parent node, then data are sent to gateway node from parent node directly or by router. After receiving data from wireless sensor network, gateway node extracts data after analyzing and packaging them into Ethernet format data, sends them to the server. A server is an instance of a computer program that accepts and responds to requests made by another program; known as a client. Less formally, any device that runs server software could be considered a server aswell. Servers are used to manage network resources. The services or information in the servers are provided through the Internet that are connected through LAN and made available for users via smart phones, web browser or other web browser devices to make the system more intelligent, adaptable and efficient

Pedestrian fatalities appear to be influenced by various reasons. Be that as it may, incredibly, afew highlights that may look like to influence, for example, inebriated driver or youthful driver, was not the real issues in accidents. It will probably impact by the thickness and number of the populace and light. To decrease the quantity of pedestrian fatalities, there are a few methodologies, which lead driver to back off, take care of this issue. Disadvantages: 1.We are unable to control the accidents. 2. There are no proper techniques in the existing systems.

3.2 PROPOSED SYSTEM

Internet of Things (IoT) systems are becoming increasingly popular and can be used in various industries and applications, such as smart homes, healthcare, transportation, and agriculture, among others. IoT systems can be complex, and it's important to carefully plan and test each component to ensure that the system is reliable and secure. A proposed system is a plan or design for a new or improved system that is being presented for consideration or implementation. The meaning of a proposed system can be understood by examining the context in which it is being proposed and the goals that it is intended to achieve.

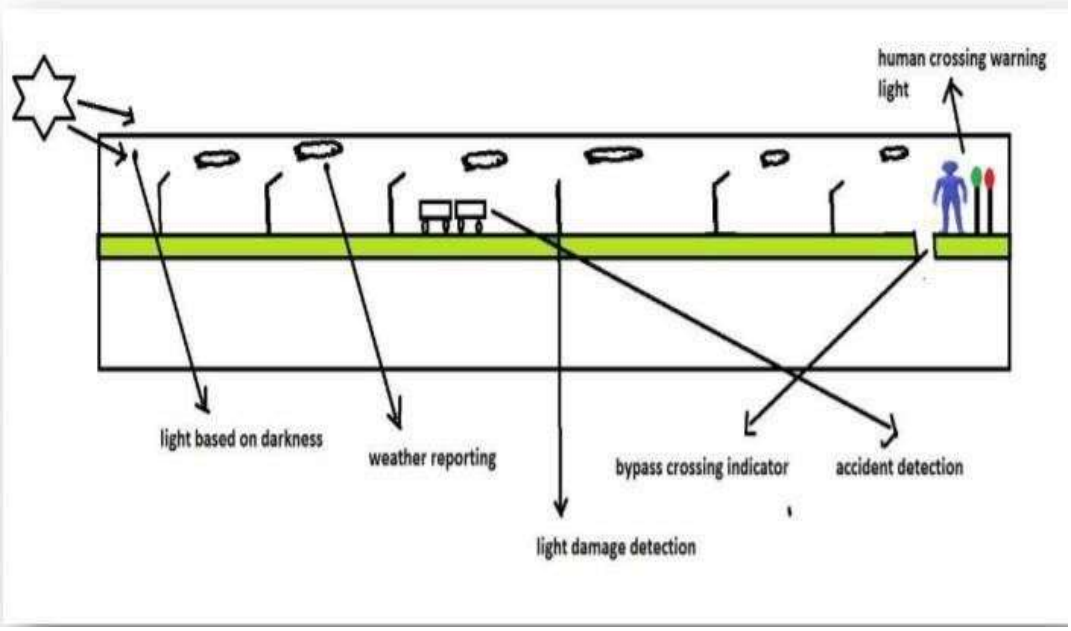


Figure 3.1: proposed system model

The above figure shows our project proposed system model and this is the blue print of our project. In our project we mainly doing five models those are Automatic highway light, Accident detection, faulty light detection, weather forecasting for drivers. In further future we developing these with another model that is smart crossing of the highway. Thisproposed is about control and identification of the damaged highway lights automatically accident detection, location tracking and notification system that detects an accident immediately developing a service to help driving in the different weather conditions,allowing increase the traffic safety by delivering near real-time road weather, Human Crossing warning light, by pass crossing indicator for safety.

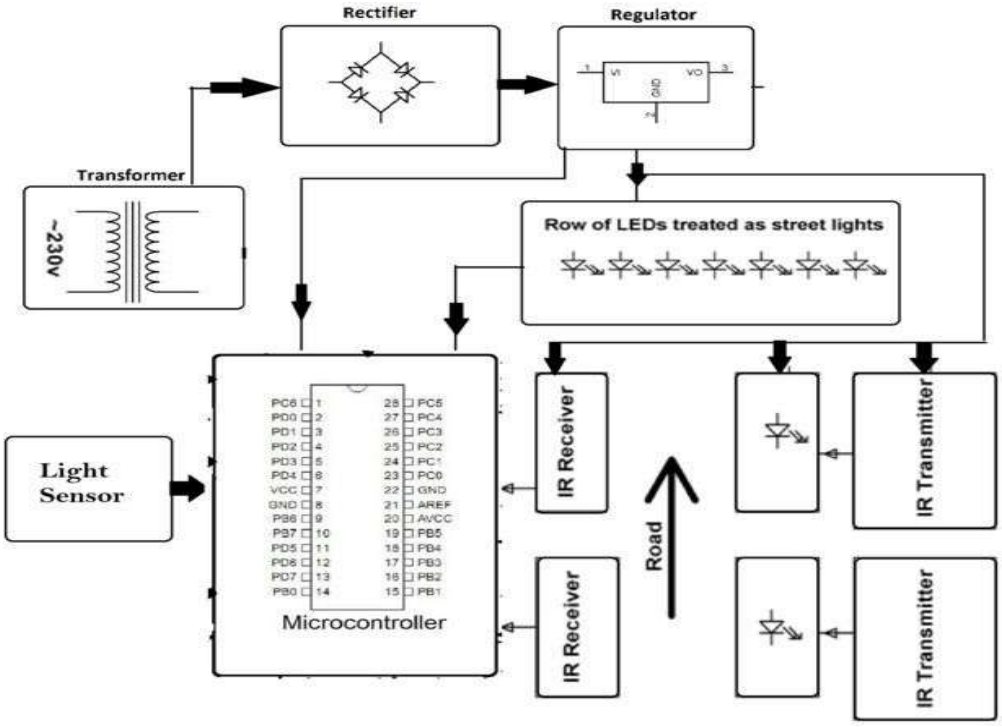


Figure 3.2: Block Diagram of automatic light

The highway model consists of 7 LEDs as highway lights and 8 pairs of photodiodes-IR diodes used as sensors, variable resistors and transistors which acts as switch as explained above. The IR diodes are placed on one side of the road and photodiodes are placed on the other side of the road, directly facing the IR diodes. Consider the case when there is no vehicle on the highway. In this case, the IR radiation emitted from the IR diode directly falls on the photodiode which is exactly opposite to it. This causes the photodiode to fall in conduction state. This implies that photodiode conducts and current passes through it. The current passes through the photodiode and goes through the variable resistor and the base-emitter region of the transistor. This in turn connects the collector of the transistor to the emitter. From the circuit diagram we can see that emitter is connected to ground which implies that the collector also goes to the ground. The collector region of the transistor is connected to the port 1 (input port) which in turn goes to ground i.e., logic ZERO. So, to summarize we can say that, when there is no vehicle on the highway, then all the inputs to the microcontroller port 1 is ZERO.In the first mode of operation, initially when the vehicle is not sensed, all the streetlights will be in dim state. This is achieved by use of pulse width modulation technique through the program stored in the microcontroller. Whena vehicle is not present on the highway, then the streetlights are made to glow for about 1ms and then for 100ms they are switched off.

Thus, we have a PWM wave of 99% duty cycle for those seven LEDs. 2. In the second mode of operation, when the vehicle is not present, all the streetlights will be in dark state. When a vehicle is sensed then the window of streetlights is illuminated in front of the vehicle.

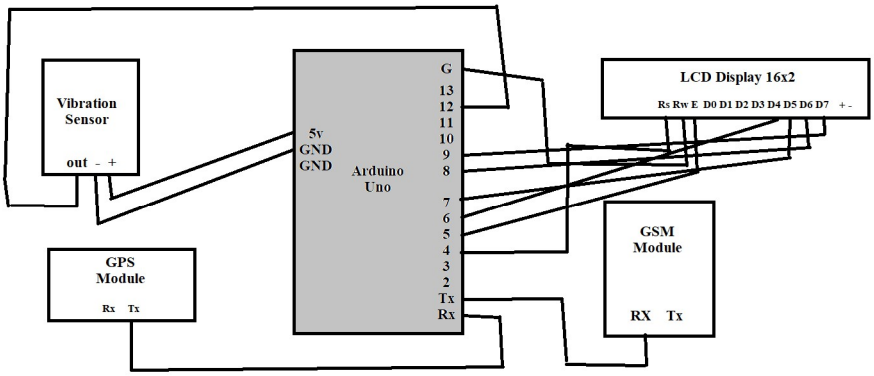


Figure 3.3: Block Diagram of accident detection

Here we are attempting to make an IOT based vehicle accident location and warning system utilizing Arduino board and some different segments for example GSM, GPS, and push buttons. The proposed system comprises of equipment and programming segments. The efficient accident location detects the accident location and notify the system which comprises of two stages that is detection stage and notification stage, the detection stage will detect the accident and notification stage will notify the data to the system. Arduino Nano is used as controlling unit, communicating between modules for better information transformation at time. Accelerometer can be used for detecting the collision direction from tri-lateral axis movements. Gyroscope can be used for rollover collisions after a threshold of roll and pitch values, the weight and center of gravity of vehicle plays an important role in rollover. The device also confirms from vibration sensors which detects the collision after a threshold voltage increase. Then a buzzer is provided to abort the false detection of accident to the passenger Within of limited time of buzzer signal the GPS module. These co-ordinates nearby hospitals are alerted for emergency rescue call topassenger. The hospital approves the accident by verifying the accident at specified location and confirms the accident. The saved personal members of family are informed regarding the accident through GSM module.

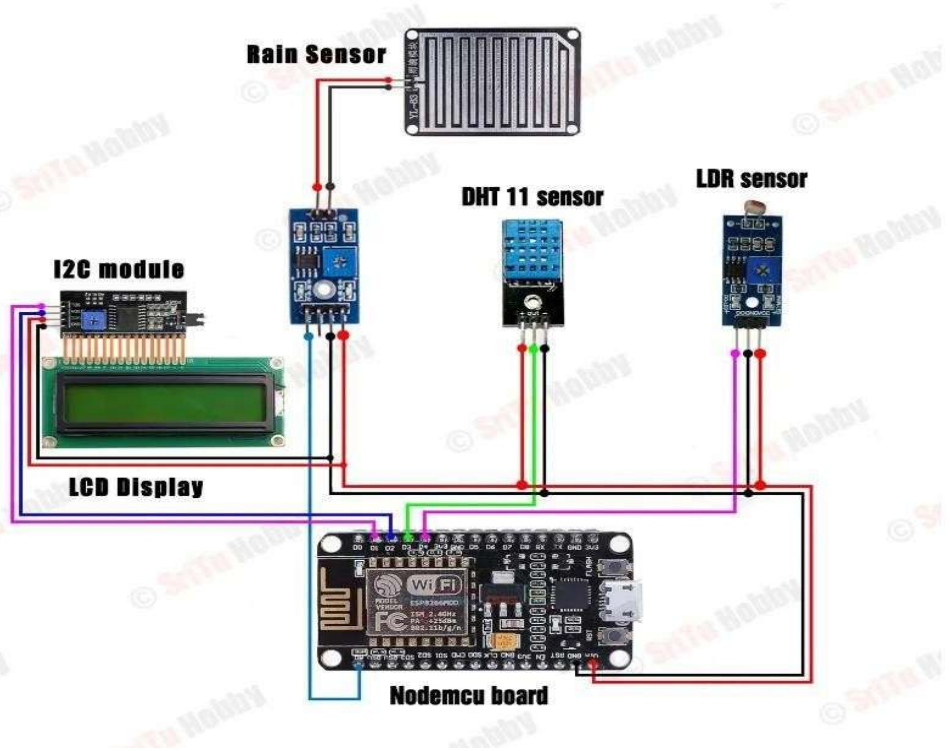


Figure 3.4: Block diagram of weather monitoring system

The above diagram represents the Block diagram of the proposed model of weatherforecast system. Microcontroller has three independent inputs such as power source from the battery, intensity of light in the environment and weather pattern for the next two days. These inputs have driven the system to be implemented in the most optimized method. Components such as IR sensor and microcontroller Node MCU are used to implement wireless transmission of data over a sample of five lights. However, these components have to be replaced with the components said in below table. A weather monitoring system is a system that is designed to collect and analyze weather data in real-time. This system typically consists of a network of weather sensors that are placed at different locations to collect data on various weather parameters such as temperature, humidity, air pressure, wind speed, and precipitation. The collected data is then transmitted to a central location where it is analysed and processed to create weather forecasts and reports. These reports can be used by various industries such as agriculture, aviation, and transportation to make informed decisions about their operations. Weather monitoring system using the Node-mcu and Blynk app. Also, this model is mainly based on three sensors. That is the rain sensor, DHT11 sensor, and LDR sensor. Through this, we can see factors such as

rainfall, temperature, humidity, and amount of light. Also, the specialty is that we can monitor all this over the internet. So, it is clear that this model is a creation of IoT technology. Also, we can do this model at a low cost and use it for farms and greenhouses.

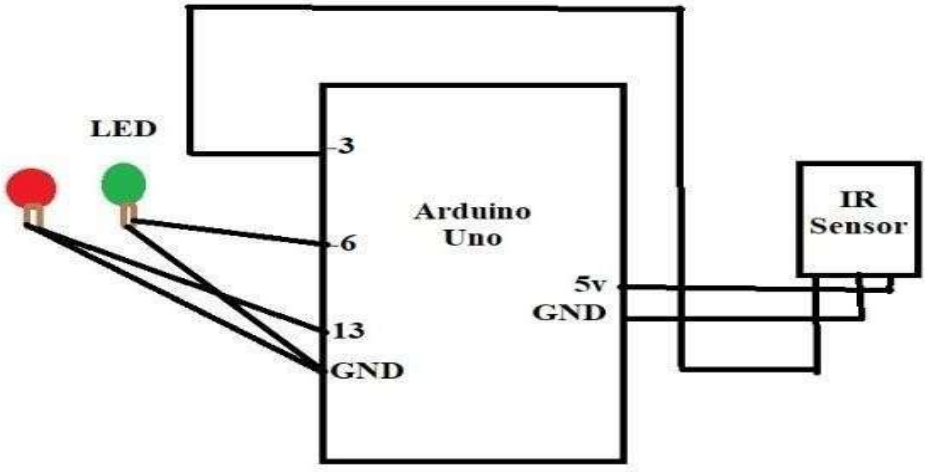


Figure 3.5: Block diagram of human crossing warning lights system

In above figure we propose another sort of crossing framework that can give pedestrian security and in addition drivers to see pedestrians prior to stay away from any unsafe circumstance. Utilizing illuminator gives three times longer separation of seeing the pedestrian that acquires enough time to back off the speed of vehicle. On the off chance that if there should be an occurrence of mischance happens, smart crossing gives robotized condition answering to the control focus about the circumstance records and react promptly whether the driver get frenzy or flee. This may spare numerous lives, which brings more opportunities to get into the brilliant hour. Smart crossing additionally spares colossal vitality in running the illuminator. Numerous other illuminators spend a ton of vitality to light up the crosswalk whether the pedestrian exists or not. In the interim, smart crossing turns on the illuminator when the pedestrian exists.

CHAPTER 4

REQUIREMENTS SPECIFICATIONS

4.1 SOFTWARE REQUIREMENTS

- Programming language : C/C++
- IDE : Arduino IDE

4.2 HARDWARE REQUIREMENTS

Figure 4.1: Arduino Uno

The Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs a 16 MI12 quartz. crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller. "Uno" means one in Italian and was chosen to mark the release of Arduino Software. The Uno board and version 1.0 of Arduino Software were the reference version of Arduino now evolved to newer releases. This board is the first in a series of USB Arduino boards. The Arduino Uno board is programmed using the Arduino Integrated Development Environment (IDE), which is a simple and easy-to-use programming interface. The IDE is used to write and upload code tothe board, and it includes a range of built-in libraries and examples that make it easy to get started with programming

.

Figure 4.2: LED light

LED stands for Light Emitting Diode. It is a semiconductor device that emits light when an electric current is passed through it. LEDs are energy-efficient, long-lasting, and come in a wide range of color and brightness levels, making them popular for a wide range of applications such as lighting, displays, and indicators' work by using a combination of materials such as gallium, arsenic, and phosphorus to create a junction between two semiconductor materials. When a voltage is applied across the junction, electrons and holes recombine, releasing energy in the form of light. The colour of the light emitted depends on the type of materials used and the amount of energy released.

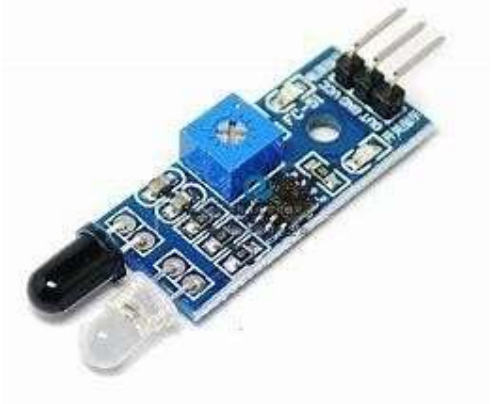


Figure 4.3:IR sensor

An IR sensor, or infrared sensor, is a device that detects and measures infrared radiation. Infrared radiation is a type of electromagnetic radiation that is invisible to the human eye but can be felt as heat. IR sensors are commonly used in a wide range of applications, including remote control devices, motion detectors, temperature sensors, and proximity sensors. An IR sensor typically consists of an infrared source, a detector, and associated electronics.

Figure 4.4: Jumper wires

Jumper wires are typically made from stranded wire with a male or female connector on each end. The connectors can be inserted into the holes on a breadboard or other electronic component to create a temporary connection. Jumper wires come in a variety of lengths, colors, and gauges, making it easy to create complex circuits and keep track of connections. Overall, jumper wires are a simple but essential tool in electronics prototyping and experimentation. They allow for quick and easy connections between components, making it possible to test and iterate on circuit designs without the need for complex or permanent connections.

Figure 4.5: LDR

LDR stands for Light Dependent Resistor, also known as a photoresistor. It is a type of electronic component that changes its resistance in response to changes in the ambient light level. LDRs are made of semiconductor materials such as cadmium sulfide, and are commonly used in a wide range of applications, such as cameras, light meters, and automatic street lights.

Figure 4.6: Resistor 10 ohms

A resistor with a value of 10 ohms is an electronic component that has a resistance of 10 ohms. Resistance is a measure of how much a component resists the flow of electric current. A 10-ohm resistor will allow the flow of electric current to pass through it, but willresist the flow of current, resulting in a voltage drop across the resistor. Resistors are used in electronic circuits to limit current flow, reduce voltage, and adjust signal levels. They come in a variety of values and sizes, and can be made from a variety of materials, such as carbon, metal film, and wire wound.

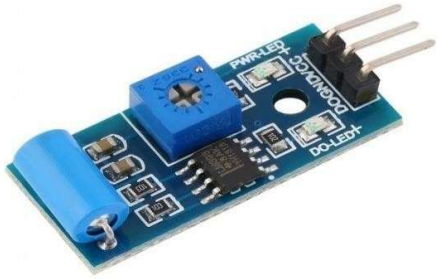


Figure 4.7: Vibration sensor

A vibration sensor is an electronic device that is used to measure or detect vibration, acceleration, or shock. Vibration sensors are used in a variety of applications, including condition monitoring, predictive maintenance, machine health monitoring, and structural health monitoring. There are several types of vibration sensors, including piezoelectric sensors, capacitive sensors, and accelerometers. Piezoelectric sensors use the principle of the piezoelectric effect, where an electric charge is generated in response to mechanical stress or deformation.

Figure 4.8: GSM

GSM stands for Global System for Mobile Communications. It is a standard for digital cellular communication used in mobile devices such as smartphones and tablets. The GSM standard was developed in the 1980s and is now widely used globally. GSM operates using radio frequencies in the 900 MHz and 1800 MHz bands. It uses digital encoding and modulation techniques to transmit and receive data, voice, and text messages

Figure 4.9: GPS

GPS stands for Global Positioning System. It is a satellite-based navigation system that provides location and time information in all weather conditions and anywhere on or near the Earth. The GPS system is maintained by the United States government and is freely accessible to anyone with a GPS receiver. The GPS system provides accurate location information within a few metersor less, depending on the quality of the receiver and the number of visible satellites.

.

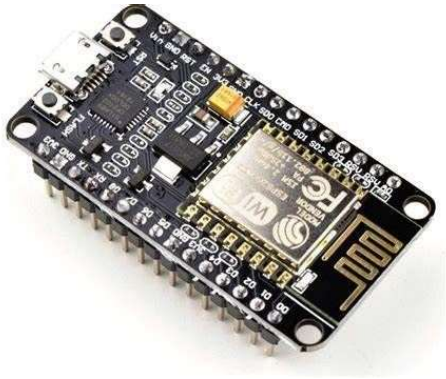


Figure 4.10: NodeMCU

NodeMCU ESP8266 is an open-source development board based on the ESP8266 microcontroller. It is designed for IoT (Internet of Things) applications and provides a complete solution for building wireless IoT applications. The NodeMCU board features a Wi-Fi module, GPIO pins, and a USB interface, making it easy to program and communicate with other devices. The ESP8266 microcontroller is a low-cost Wi-Fi chip that supports TCP/IP communication protocols. It has a built-in 32-bit processor and supports Lua scripting, making it easy to program and customize

.

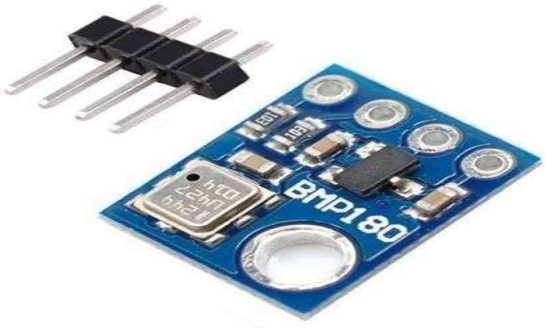


Figure 4.11:BMP 180 sensor

The BMP180 sensor is a digital barometric pressure sensor that also measures temperature. It is designed to be used in a wide range of applications, including weather monitoring, altitude tracking, and GPS navigation. The BMP180 sensor is manufactured by Bosch Sensortec and is commonly used in hobbyist and DIY projects. The BMP180 sensor uses a piezoresistive sensor to measure pressure and a thermistor to measure temperature. The sensor communicates with a microcontroller using the I2C interface and provides pressure and temperature readings in digital format.

Figure 4.12: DHT11 sensor

The DHT11 sensor is a digital temperature and humidity sensor that is commonly used in DIY and hobbyist projects. It is an inexpensive sensor that is easy to use and provides reliable readings of temperature and humidity. The DHT11 sensor uses a capacitive humidity sensor and a thermistor to measure humidity and temperature, respectively. It communicates with a microcontroller using a single-wire interface and providestemperature and humidity readings in digital format.

Figure 4.13: Rain sensor

A rain sensor is an electronic device used to detect the presence of rain or other precipitation. It is commonly used in weather monitoring systems, irrigation systems, and automotive applications. Rain sensors are typically used in conjunction with other sensors, such as temperature and humidity sensors, to provide more accurate readings of precipitation. They can also be integrated into electronic circuits and connected to microcontrollers or other devices for data logging or real-time monitoring.

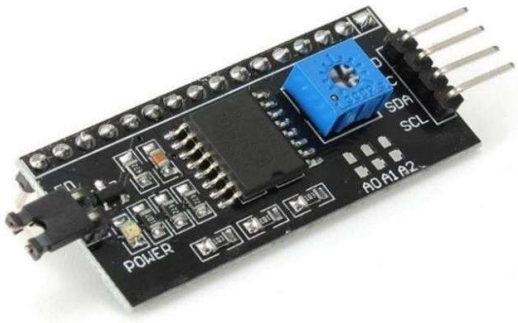


Figure 4.14: I2C Module

The I2C module (Inter-Integrated Circuit module) is a communication protocol used to communicate between microcontrollers, sensors, and other electronic devices. It is commonly used in embedded systems and is designed to be simple, efficient, and reliable. The I2C protocol supports multiple data transfer modes, including byte, word, and block transfers. It also supports both master and slave modes of operation, allowing for flexibility in system design.

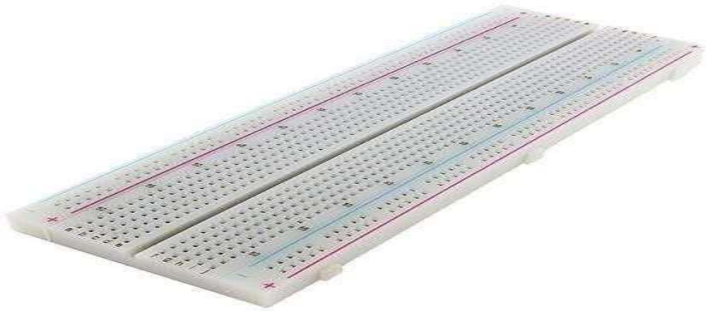


Figure 4.15: Bread board

A breadboard, also known as a prototyping board or solderless breadboard, is a device used for prototyping electronic circuits. It allows electronic components to be easily connected without the need for soldering. A breadboard consists of a plastic board with rows of interconnected sockets, usually in a grid pattern. These sockets are connected internally in a specific pattern, usually with a power bus and ground bus running along the length of the board. This allows electronic components to be easily plugged in and connected to each other, without the need for soldering or other permanent connections.

CHAPTER 5

SYSTEM IMPLEMENTATION

System implementation refers to the process of putting a new system or technology into operation. It involves planning, designing, developing, testing, deploying, and maintaining the system. Here are some steps involved in the system implementation process Planning involves identifying the goals and objectives of the new system, defining the scope of the project, and creating a project plan that outlines the timeline, budget, and resources required for implementation. The second step is designing the system. This involves creating a detailed design of the system architecture, including hardware, software, and network components. The design should be based on the requirements identified in the planning stage. The third step is developing the system. This involves building and testing the hardware and software components of the system, as well as integrating them into a working system. The fourth step is testing the system. This involves verifying that the system meets the requirements identified in the planning stage and that it is free of errorsor defects. Testing can be done in various stages, including unit testing, integration testing, and system testing. Deployment: The fifth step is deploying the system. This involves installing the hardware and software components in the production environment and making the system available to end-users. Maintenance: The final step is maintenance. This involves monitoring the system to ensure that it continues to operate effectively and efficiently. Maintenance can include fixing bugs or defects, upgrading hardware or software components, and making changes to the system to meet changing requirements.

C++ Programming Language

C++ is a general-purpose programming language and is widely used nowadays for competitive programming. It has imperative, object-oriented and generic programming features. C++ runs on lots of platforms like Windows, Linux, Unix, Mac etc. C++ was designed with systems programming and embedded, resource-constrained software and large systems in mind, with performance, efficiency, and flexibility of use as its design highlights. The C++ language has two main components: a direct mapping of hardware features provided primarily by the C subset, and zero-overhead abstractions based on those mappings. Stroustrup describes C++ as a light-weight abstraction programming language designed for building and using efficient and elegant abstraction.

5.1 Source Code

Automatic street Light

```
int ldrPin = A0;
int led = 7;
int threshold = 1020;
void setup()
{
  Serial.begin(9600);
  pinMode (led, OUTPUT);
}
void loop()
{
  int data = analogRead(ldrPin);
  Serial.println("");
  Serial.print("Light Sensor ");
  Serial.print("Value = ");
  Serial.print(data);
  if(data <= threshold)
  {
    digitalWrite(led, HIGH);
  }
  else
  {
    digitalWrite(led, LOW);
  }
}
```

Accident Detection

```
#include <LiquidCrystal.h>
#include <TinyGPS.h>
LiquidCrystal lcd(4, 5, 6, 7, 8, 9);
const int relay_Pin = 2;
const int ir_Sensor = 10;
const int vibration_Sensor = 12;
TinyGPS gps;
long lat,lon;
/*bool ir_status = LOW;*/
bool vibration_Status = LOW;
void setup() {
  pinMode(relay_Pin, OUTPUT);
  /pinMode(ir_Sensor, INPUT);/
  pinMode(vibration_Sensor, INPUT);
```

```
  Serial.begin(9600);
  lcd.begin(16, 2);
  lcd.print("ACCIDENT DETECTION");
  lcd.setCursor(3,2);
  lcd.print("SYSTEM");
}
void loop() {
  /*ir_status = digitalRead(ir_Sensor);
  delay(100);
  if(ir_status == HIGH)*/
  {
        while(1)
        {
          vibration_Status = digitalRead(vibration_Sensor);
          delay(100);
          if(vibration_Status == HIGH)
          {
           lcd.clear();
           lcd.print("Accident Detected");
           lcd.setCursor(3,2);
           lcd.print("Sending Msg");
           delay(500);
           Serial.println("AT+CMGF=1");//Sets the GSM Module in TextMode
           delay(100); // Delay of 1000 milli seconds or 1 second
           Serial.println("AT+CMGS=\"+919606150913\"\r");Replace xwith mobile

           delay(100);
           Serial.println("Accident Detected ");//The SMS text you want to send
           Serial.println("please check location");//The SMS text you want to

           while(1)
           {
            gps_read();
           }
          }
          else
          {
          }
        }
       else
      {
        lcd.clear();
        lcd.print("Alcohol ");
        lcd.setCursor(3,2);
        lcd.print("Detected");
        delay(500);
        digitalWrite(relay_Pin, LOW);
```

```
        delay(200);
        digitalWrite(buzzer_Pin, HIGH);
        delay(200);
       }
  }
    void gps_read()
{
 byte a;
  if(Serial.available())
  {
    a=Serial.read();

   //Serial.write(a);

    while(gps.encode(a))   // encode gps data
    {
      gps.get_position(&lat,&lon); // get latitude and longitude

      Serial.println("Position: ");
      Serial.print("lat:");
      Serial.println((lat*0.000001),8);
      Serial.print("log:");
      Serial.println((lon*0.000001),8);
    }
  }
}
```

Weather Monitoring system

```
#include <LiquidCrystal_I2C.h>
#define BLYNK_PRINT Serial
#include <ESP8266WiFi.h>
#include <BlynkSimpleEsp8266.h>
#include <DHT.h>
#include <SFE_BMP180.h>

//Initialize the LCD display
LiquidCrystal_I2C lcd(0x27, 16, 2);

// Create an object for the BMP180 sensor
SFE_BMP180 bmp;

char auth[] = "SHJLKWdMnFbXgJY95IM4o9tDK9CC5URz"; //Enter your Auth token
char ssid[] = "Redmi 11T 5G"; //Enter your WIFI name
char pass[] = "12345678";  //Enter your WIFI password

DHT dht(D3, DHT11); //(DHT sensor pin,sensor type)
BlynkTimer timer;
```

```
//Define Rain and LDR pins
#define rain A0
#define light D0

//Create three variables for pressure
double T, P;
char status;

void setup() {
  Serial.begin(9600);
  bmp.begin();
  lcd.init();
  lcd.backlight();
  pinMode(light, INPUT);

  Blynk.begin(auth, ssid, pass, "blynk.cloud", 80);
  dht.begin();

  lcd.setCursor(0, 0);
  lcd.print("Weather Monitor");
  lcd.setCursor(4, 1);
  lcd.print("System");
  delay(4000);
  lcd.clear();

  //Call the functions
  timer.setInterval(100L, DHT11sensor);
  timer.setInterval(100L, rainSensor);
  timer.setInterval(100L, pressure);
  timer.setInterval(100L, LDRsensor);
}

//Get the DHT11 sensor values
void DHT11sensor() {
  float h = dht.readHumidity();
  float t = dht.readTemperature();

  if (isnan(h) || isnan(t)) {
    Serial.println("Failed to read from DHT sensor!");
    return;
  }
  Blynk.virtualWrite(V0, t);
  Blynk.virtualWrite(V1, h);

  lcd.setCursor(0, 0);
  lcd.print("T:");
  lcd.print(t);
```

```
  lcd.setCursor(8, 0);
  lcd.print("H:");
  lcd.print(h);
}

//Get the rain sensor values
void rainSensor() {
  int value = analogRead(rain);
  value = map(value, 0, 1024, 0, 100);
  Blynk.virtualWrite(V2, value);

  lcd.setCursor(0, 1);
  lcd.print("R:");
  lcd.print(value);
  lcd.print(" ");
}

//Get the pressure values
void pressure() {
  status = bmp.startTemperature();
  if (status != 0) {
    delay(status);
    status = bmp.getTemperature(T);

    status = bmp.startPressure(3); // 0 to 3
    if (status != 0) {
      delay(status);
      status = bmp.getPressure(P, T);
      if (status != 0) {
      }
    }
  }

  Blynk.virtualWrite(V3, P);
  lcd.setCursor(8, 1);
  lcd.print("P:");
  lcd.print(P);
}

//Get the LDR sensor values
void LDRsensor() {
  bool value = digitalRead(light);
  if (value == 0) {
    WidgetLED LED(V4);
    LED.on();
  } else {
    WidgetLED LED(V4);
    LED.off();
```

```
  }
}

void loop() {
  Blynk.run(); //Run the Blynk library
  timer.run();  //Run the Blynk timer
}
```

Human crossing system

```
int led1 = 13;

int led2 = 6;

int ir_Sensor = 3;

void setup()

{

  pinMode(13,OUTPUT);

  pinMode(6,OUTPUT);

  pinMode(3,INPUT);

  Serial.begin(9600);

}

void loop()

{

  if (digitalRead(3)== LOW)

  {

    digitalWrite(13,HIGH);

    digitalWrite(6,LOW);

    delay(10000);

  }else

  { digitalWrite(13,LOW);

    delay(1);

    digitalWrite(6,HIGH);

  }

  }
```

CHAPTER 6

ADVANTAGES AND DISADVANTAGES

6.1 ADVANTAGES

Automatic highway lighting systems offer several advantages

- Energy Efficiency: One of the main advantages of automatic highway lighting systemsis their energy efficiency. These systems use sensors or timers to turn on the lights only when they are needed, reducing energy consumption and saving costs.

- Improved Safety: Automatic highway lighting systems can improve safety on highways by ensuring that the road is properly lit at all times, regardless of weather or visibility conditions. This can reduce the risk of accidents due to poor visibility.

- Easy Maintenance: Automatic highway lighting systems can be remotely monitored andcontrolled, making maintenance easier and more efficient. This can reduce the need for manual inspections and repairs, saving time and money.

- Environmental Benefits: The energy efficiency of automatic highway lighting systems also has environmental benefits, as it reduces the amount of energy required to light the highways, resulting in a reduction in greenhouse gas emissions.

Advantages of an accident detection, location tracking, and notification system

- Faster response times: With an accident detection system in place, emergency services can be notified quickly, potentially leading to faster response times and increased chances of survival for those involved in accidents.

- Location tracking: An accident detection system can pinpoint the location of the accident, making it easier for emergency services to locate and respond to the scene.

- Reduced human error: The system can detect accidents automatically, reducing the likelihood of human error in reporting an incident or locating the scene of the accident.

- Improved road safety: The presence of an accident detection system can deter reckless driving and promote safer behavior on the roads.

- Cost-effective: The cost of implementing an accident detection system can be offset by the potential cost savings from reduced emergency response times and increased road safety.

Advantages of street light fault detection system

- Energy savings: An automatic street light fault detection system can detect faulty street lights, which consume a lot of energy, and immediately switch them off. This leads to energy savings and a reduction in the cost of electricity bills.

- Reduced maintenance costs: The system enables early detection of faulty street lights, which can be repaired or replaced before they cause any further damage. This reduces the maintenance costs of street lights, as repairs can be done in a timely manner.

- Improved safety: A faulty street light can create a dangerous situation for pedestrians and motorists, especially in poorly lit areas. The system can quickly detect and alert the authorities to faulty street lights, which can then be repaired to improve safety.

- Automatic detection: The system automatically detects faulty street lights without human intervention, reducing the need for regular manual inspections.

Advantages of a road weather information and forecast system for vehicles include

- Increased efficiency: Drivers can adjust their routes and driving behavior based on road weather information, reducing travel time and increasing efficiency.

- Improved safety: Road weather information and forecasts can help drivers make informed decisions about their driving conditions, reducing the risk of accidents and increasing safety.

- Increased efficiency: Drivers can adjust their routes and driving behavior based on road weather information, reducing travel time and increasing efficiency.

- Environmental benefits: More efficient driving can lead to reduced fuel consumption and emissions, contributing to a cleaner environment.

- Improved planning: Road weather information and forecasts can help transportation planners make better decisions about road maintenance and management.

Advantages of a smart crossing for pedestrians using IoT

- Improved safety: IoT sensors can detect pedestrians and adjust the traffic signals accordingly, reducing the risk of accidents.

- Increased efficiency: The system can optimize traffic flow, reducing wait times for pedestrians and vehicles and increasing efficiency.

- Accessible: The system can be designed to be accessible for individuals with disabilities, such as auditory signals and tactile feedback.

- Reduced environmental impact: The system can optimize traffic flow, reducing fuel consumption and emissions.

6.2 DISADVANTAGES

Disadvantages of an automatic highway lighting system

- Cost: The installation and maintenance of an automatic highway lighting system can be expensive, especially if it involves retrofitting existing infrastructure.

- Maintenance: Automatic highway lighting systems require regular maintenance and periodic replacement of bulbs, sensors, and other components. This can be time-consuming and expensive.

- False activations: Automatic highway lighting systems can be triggered by false activations such as passing animals, wind-blown debris, and changes in ambient lightingconditions. This can cause unnecessary power consumption and maintenance.

- Limited customization: Automatic highway lighting systems operate based on pre-programmed settings and may not take into account the unique lighting needs of individual areas or time periods. This can result in either under or over illumination, leading to safety issues.

- Environmental impact: Automatic highway lighting systems can contribute to light pollution, which has negative impacts on wildlife, human health, and astronomical observations.

Disadvantages of an accident detection, location tracking, and notification system

- False alarms: The system may generate false alarms in situations where no accident has occurred, which can be a waste of emergency resources.

- Privacy concerns: Location tracking can raise privacy concerns for some individuals who may not want their whereabouts to be tracked and recorded.

- Technical issues: The system may experience technical issues or malfunctions, which can lead to delays or inaccurate reporting of accidents.

- Maintenance: The system may require regular maintenance to ensure it is functioning properly, which can be time-consuming and costly.

- Reliance on technology: The system is reliant on technology, and any disruptions or failures in the system can lead to delays in emergency response times and potential safety concerns.

Disadvantages of street light fault detection system

- Cost: The installation and maintenance of an automatic street light fault detection system can be expensive, making it difficult for some municipalities to implement.

- False positives: The system may sometimes identify a street light as faulty when it is not, leading to unnecessary repairs or replacements.

- Technical issues: The system relies on technology, and any technical issues can cause it to malfunction. This can lead to incorrect identification of faulty street lights or failure to identify them at all.

- Lack of customization: Some automatic street light fault detection systems are not customizable, which means that they may not be suitable for all types of street lights or environment.

Disadvantages of a road weather information and forecast system for vehicles

- Technical issues: The system may experience technical issues or malfunctions, leadingto inaccurate or incomplete information being provided to drivers.
- Cost: The system can be expensive to implement and maintain, potentially resulting inhigher costs for drivers or taxpayers.
- Limited coverage: The system may not be available in all areas, limiting its usefulnessfor some drivers.
- Privacy concerns: The collection and use of data about driving behavior and roadconditions may raise privacy concerns for some individuals.

Disadvantages of a smart crossing for pedestrians using IoT

- Technical issues: The system may experience technical issues or malfunctions, leadingto delays or inaccurate traffic signals.
- Cost: The system can be expensive to implement and maintain, potentially resulting inhigher costs for municipalities and taxpayers.
- Privacy concerns: The collection and use of data about pedestrian behavior and trafficpatterns may raise privacy concerns for some individuals.
- Limited coverage: The system may not be available in all areas, limiting its usefulnessfor some pedestrians.
- Reliance on technology: The system is reliant on technology, and any disruptions orfailures in the system can lead to delays in providing information to pedestrians.

CHAPTER 7

APPLICATIONS

Applications of automatic highway lighting system

- Energy savings: An automatic highway lighting system can help save energy by turning off lights during daylight hours or when the road is not in use. This can result in significant energy savings, reducing the carbon footprint of the lighting system.

- Increased safety: A well-designed automatic highway lighting system can improvesafety on the road by providing adequate illumination to drivers and pedestrians. The system can detect the presence of vehicles or pedestrians and adjust the lighting accordingly to provide optimal visibility.

- Cost savings: An automatic highway lighting system can reduce costs associated with maintenance and repair of the lighting system. With automatic fault detection and reporting, maintenance crews can quickly locate and repair faults, reducing downtime and maintenance costs.

- Smart city integration: An automatic highway lighting system can be integrated into a smart city infrastructure, allowing for data collection and analysis to optimize traffic flow, reduce congestion, and improve the overall efficiency of the road network.

Applications of an accident detection, location tracking, and notification system

- Improved emergency response: An accident detection system can immediately notify emergency services about the accident, providing them with the location of the incident and other critical information. This can help emergency responders reach the site of the accident quickly, potentially saving lives and reducing the severity of injuries.

- Increased safety: An accident detection system can provide real-time monitoring of driving behavior, detecting and alerting drivers about potential hazards such as lane

departure, collision risk, or driver fatigue. By providing drivers with real-time feedbackand alerts, the system can help reduce the risk of accidents.

- Insurance benefits: An accident detection system can provide insurance companies with valuable data on driving behavior and accident statistics. This can help insurers better understand risk factors and develop policies that are more tailored to the needs of individual drivers.

- Personal safety: An accident detection system can be used to provide peace of mind to family members and loved ones by providing real-time location tracking and notification in the event of an accident. This can help family members locate and assist loved ones in the event of an emergency.

Applications of street light fault detection system

- Efficient maintenance: An IoT-based street light fault detection system can help identifydamaged street lights quickly and accurately, enabling efficient maintenance and repair. By providing real-time updates on the status of street lights, the system can reduce downtime and improve the reliability of the lighting system.

- Energy savings: An IoT-based street light management system can help reduce energy consumption by automatically turning off or dimming lights when they are not needed. By using motion sensors or ambient light sensors, the system can adjust lighting levels based on the presence of pedestrians or vehicles, reducing energy waste and lowering operating costs.

- Improved safety: A well-designed street light management system can improve safety by ensuring that street lights are functioning properly and providing adequate illumination. By detecting damaged or malfunctioning street lights, the system can prevent accidents and improve the overall safety of the road network.

- Cost savings: By reducing energy consumption and improving maintenance efficiency, an IoT-based street light management system can help reduce operating costs associatedwith street lighting systems. This can result in significant cost savings for municipalitiesand other organizations responsible for managing public lighting systems.

Applications of a road weather information and forecast system for vehicles

- Efficient route planning: A road weather information system can help drivers plan their routes more efficiently by providing up-to-date information about road closures, detours, and other weather-related disruptions. This can help reduce travel time and improve the overall efficiency of the road network.

- Enhanced driver experience: A road weather information system can enhance the driver experience by providing real-time updates on weather conditions and other road hazards. By helping drivers avoid traffic delays and other disruptions, the system can help reduce stress and improve overall satisfaction with the driving experience.

- Fleet management: A road weather information system can be used by fleet managers tomonitor the safety and efficiency of their vehicles. By collecting data on driving behavior and road conditions, the system can help identify areas for improvement, such as reducing fuel consumption, optimizing routes, and improving driver safety.

- Emergency services: A road weather information system can provide emergency services with critical information about weather conditions and road hazards, enabling them to respond more quickly and effectively to accidents and other emergencies. This can help save lives and reduce the severity of injuries.

Applications of a smart crossing for pedestrians using IoT

- Improved safety: A smart crossing system can help improve pedestrian safety by providing real-time information about traffic patterns and pedestrian volumes. By using

sensors to detect pedestrians and traffic, the system can adjust traffic signals andpedestrian crossings to ensure safe passage for pedestrians.

- Enhanced accessibility: A smart crossing system can help improve accessibility for pedestrians with disabilities by providing real-time information about traffic patterns and pedestrian volumes. By using sensors to detect pedestrians and traffic, the system can adjust traffic signals and pedestrian crossings to ensure safe passage for all pedestrians, including those with mobility impairments.

- Reduced congestion: A smart crossing system can help reduce congestion by optimizingtraffic flow and pedestrian crossings. By using real-time data to adjust traffic signals and pedestrian crossings, the system can reduce wait times for pedestrians and improve overall traffic flow.

- Energy savings: A smart crossing system can help reduce energy consumption by using real-time data to optimize traffic signals and pedestrian crossings. By adjusting traffic signals and pedestrian crossings based on actual traffic and pedestrian volumes, the system can reduce energy waste and lower operating costs.

CHAPTER 8

RESULTS

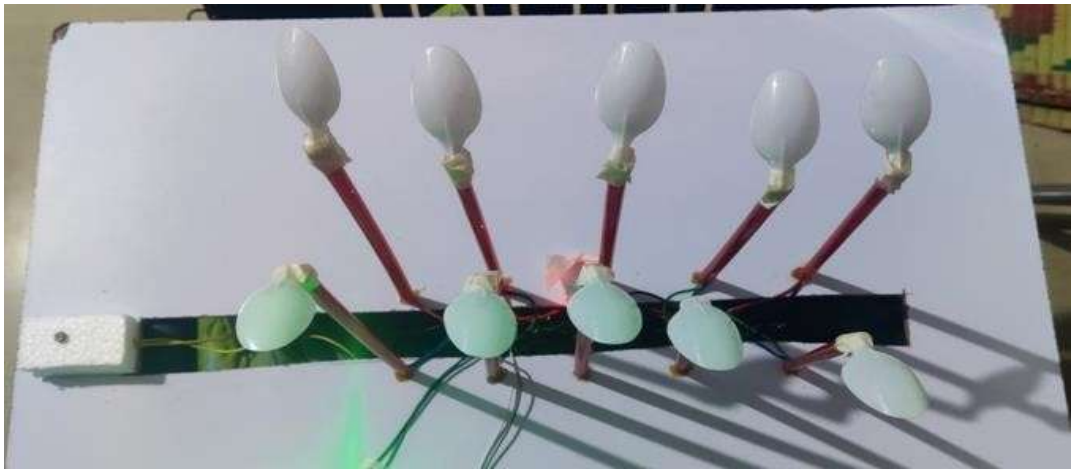


Figure 8.1 Highway street lights during day time

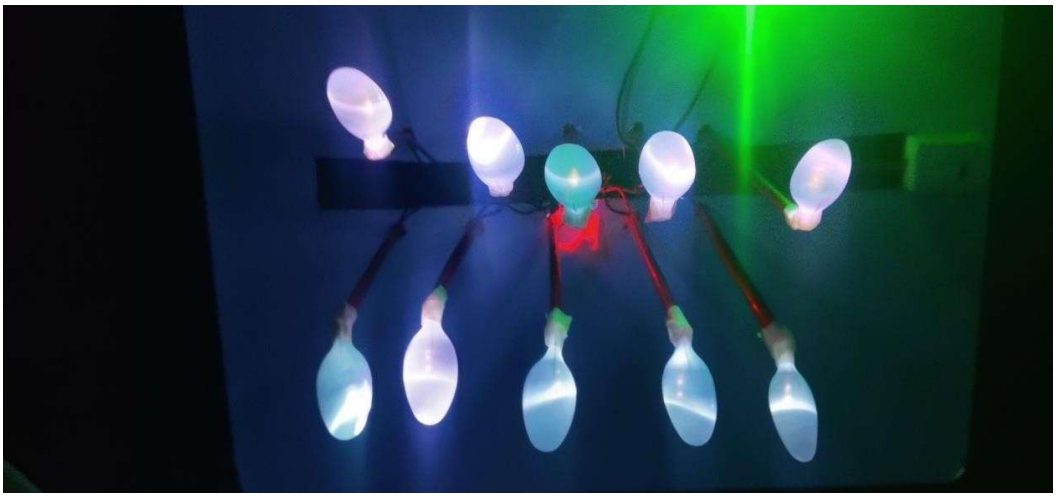


Figure 8.2: Highway street lights during night time

In the above figures when there is a need of light it automatically switches ON. When darkness risesto a certain level then sensor circuit gets activated and switches ON and when there is other sourceof light daytime, the street light gets OFF. The sensitiveness of the street light can also be adjusted.

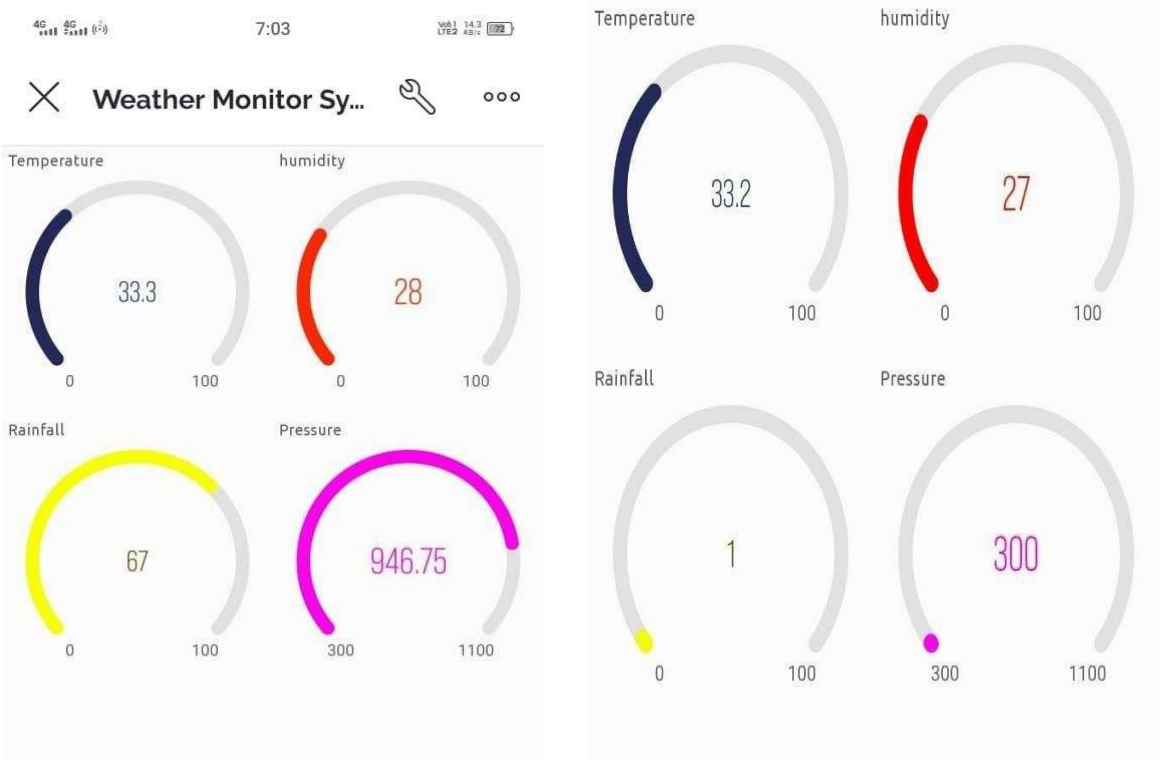


Figure 8.3: Weather monitoring system

A weather monitoring system is a system that is designed to collect and analyze weather data in real-time. This system typically consists of a network of weather sensors that are placed at different locations to collect data on various weather parameters such as temperature, humidity, air pressure, wind speed, and precipitation. The collected data is then transmitted to a central location where it is analysed and processed to create weather forecasts and reports. These reports can be used by various industries such as agriculture, aviation, and transportation to make informed decisions about their operations. Weather monitoring system using the Nodemcu and Blynk app. Also, this model is mainly based on three sensors. That is the rain sensor, DHT11 sensor, and LDR sensor. Through this, we can see factors such as rainfall, temperature, humidity, and amount of light. Also, the speciality is that we can monitor all this over the internet. So, it is clear that this model is a creation of IoT technology. Also, we can do this model at a lowcost and use it for farms and greenhouses.

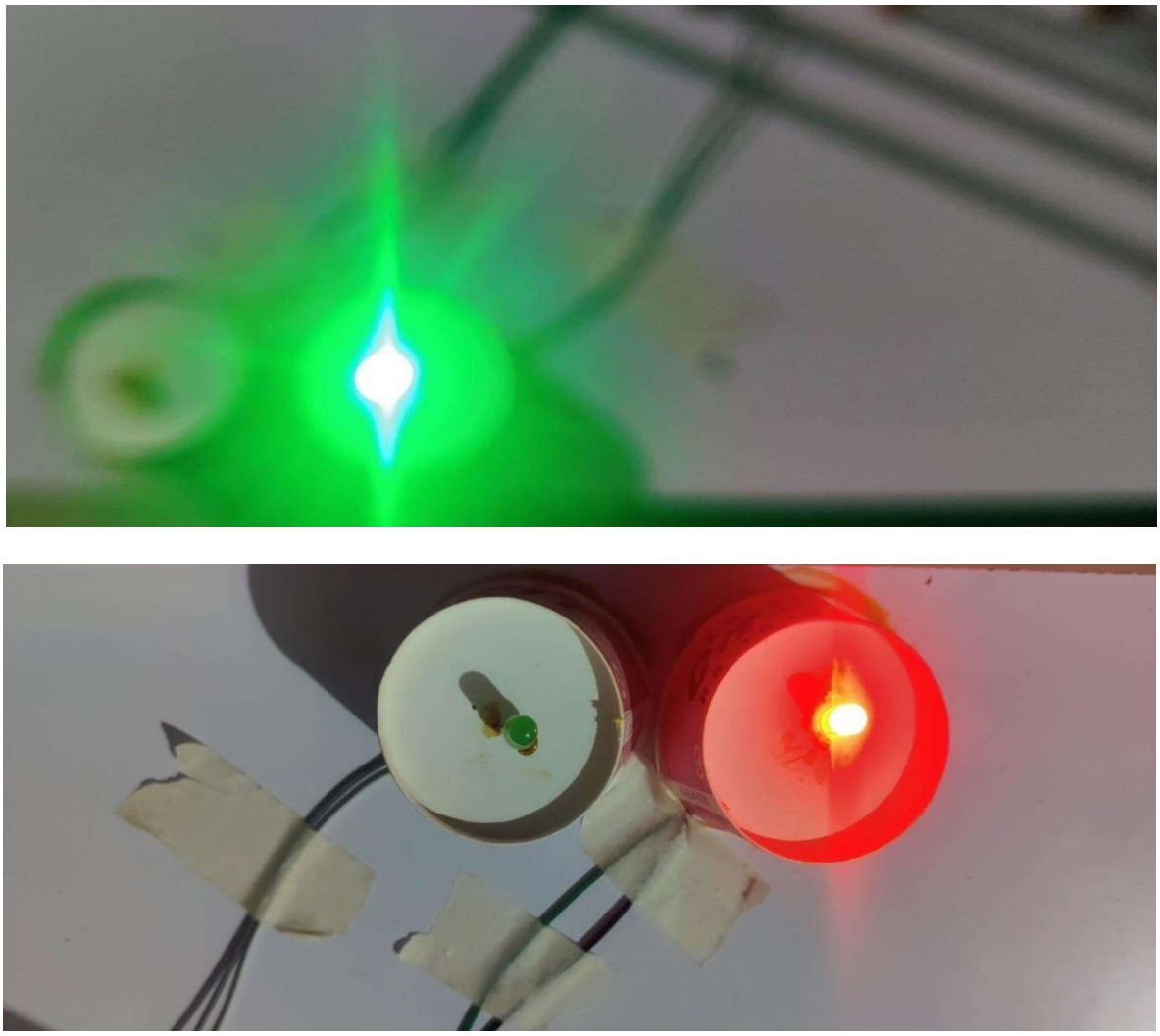
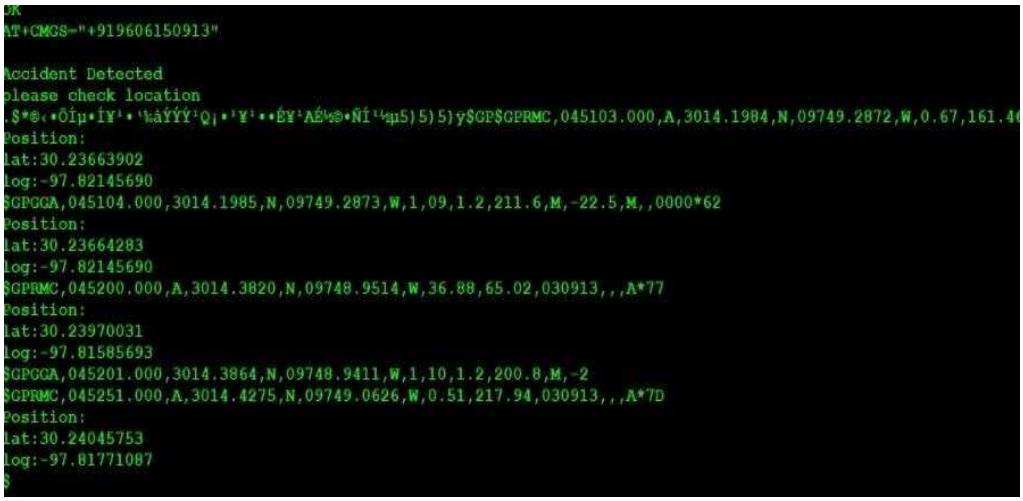


Figure 8.4: Human crossing warning lights

A human crossing warning light with red and green signals is commonly used at pedestrian crossings and is known as a pedestrian traffic signal. The red light indicates that pedestrians should not cross the road, while the green light indicates that pedestrians can cross the road safely. When the red light is illuminated, it is important for pedestrians to wait until the green light appears before crossing the road. It is also important to look both ways before crossing to ensure that it is safe to doso. When the green light is illuminated, pedestrians can cross the road but should still be cautious and aware of their surroundings. They should also make sure to cross the road within the designated pedestrian crossing area and not obstruct the flow of vehicular traffic.



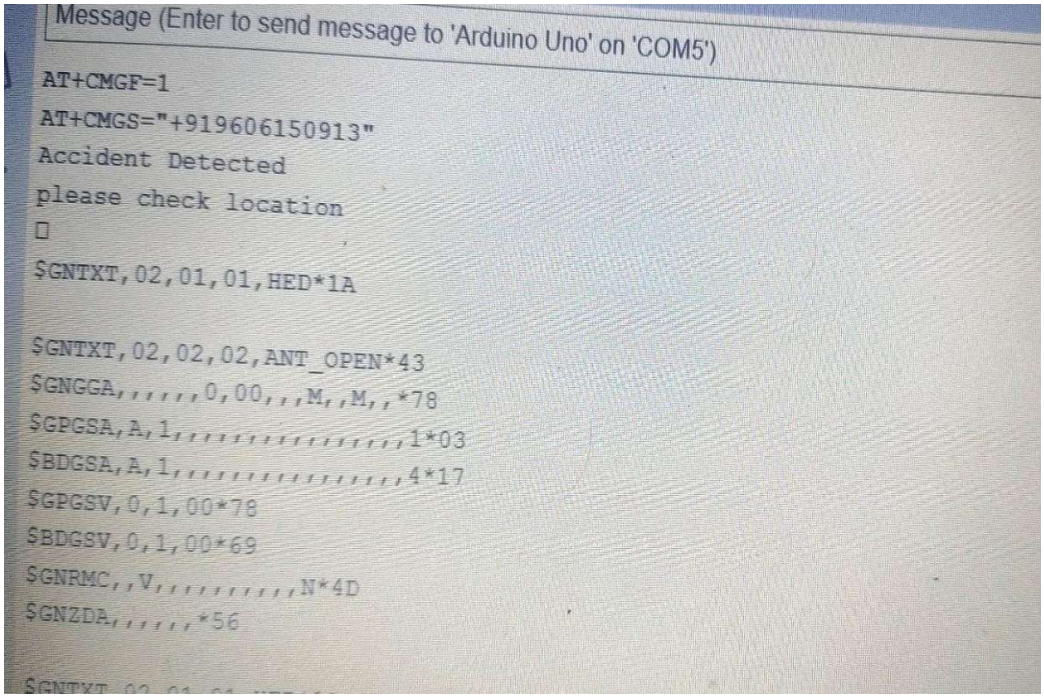


Figure 8.5: Accident detection system

In the above figure the system comprises of equipment and programming segments. The efficient accident location detects the accident location and notify the system which comprises of two stages that is detection stage and notification stage, the detection stage will detect the accident and notification stage will notify the data to the system.