A Short Technical Report towards A5017 – PR (P) Course

Vehicle Accident Prevention System for Mountain Roads

Submitted in the Partial Fulfillment of the

Requirements

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Submitted

By

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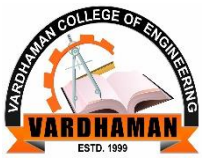

Department of Electronics and Communication Engineering

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

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Kashif Ahmed Farhaan - 19881A04E2

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CERTIFICATE

This is to certify that the short technical report work entitled **"Vehicle Accident Prevention System"** carried out by Mr. Kashif Ahmed Farhaan, Roll Number **19881A04E2** towards **A4020 – PR (P)** course and submitted to the Department of Electronics and Communication Engineering, in partial fulfillment of the requirements for the award of degree of **Bachelor of Technology** in **Electronics and Communication Engineering** during the year 2020-21.

Name & Signature of the Instructors

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Assistant professor

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Name & Signature of the HOD

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HOD, ECE

Abstract

Road traffic injuries are one of the leading causes of death. Road network of India, is about 56 lakh kms.A total of 4,64,910 road accidents have been reported the year 2017 claiming 1,47,000 souls. As many as 1,170 people died in road accidents in the three hill states of Himachal Pradesh, Jammu and Kashmir and Uttarakhand in the first five months of 2019. Moreover, this is not just a localized phenomenon, it's a global one. There are accidents in Chongqing, China that occur due to the poor engineering of the mountainous roads. A study for this has been published in the paper Estimation of crash severity on Mountainous Freeways in Chongqing. Hence, with the growing traffic and number of roads, it is important to realize the product that is the VAPSMR.

LIST OF FIGURES

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ABBREVATIONS

Abbreviation	Expansion
VAPSMR	**Vehicle Accident Prevention System for mountain roads**

OUTLINE

CHAPTER 1

INTRODUCTION

1.1 Motivation

The motivation for this project stems out of respect for all this lives that have been lost at such roads due to engineering errors. Having known a close friend who had to endure tremendous loss at a very young age due to poor engineering of one such road, I felt the need to implement this project for the sake of solving this engineering problem. Furthermore, a desire to deliver or contribute has had an immense effect on my motivations to create such a system.

1.2 Scope

- This project can be extended to every mountain road out there as it can not only help with vehicle detection, but also extend to detection of sharp turn on mountain roads at night time and during thick fog.
- Furthermore, this project can be implemented in traffic dense U turns, sharp corners, etc. Where it can save countless lives and collect impeccable data which our world has an ever-growing need of.
- The use of Arduino gives this project great possibilities for expansion and one such expansion has already been done by us. We have added a GSM module and a moisture sensor which can detect fog up to a certain extent.

1.3 Objectives

- The solution is to deliver a system that can alert the drivers on each side of the curve about the other's presence, which gives the drivers a head up so that they can decide to slow down and be careful.
- This system can solve the issue of overcrowding on the mountain roads and sharp turns as overcrowding is caused by lack of information about the oncoming traffic. This solution essentially solves traffic jams at U turns, S turns, etc.
- Deliver a solution that can work at night time unlike mirrors.

- Be a morally correct alternative to mirrors as they are old tech and depend on a lot of factors that may not be in their favor.
- Deliver a system with high possibilities of expansion at a relatively low price point.
- To notify authorities if there is high chance of accident.

1.4 Need for product Realization

Today, road traffic injuries are one of the leading causes of death, disabilities and hospitalization in the country. A total of 4,64,910 road accidents have been reported by States and Union Territories (UTs) in the calendar year 2017 claiming 1,47,913 lives. The figures get alarming when we move our study to the mountain roads. As many as 1,170 people died in road accidents in the three hill states of Himachal Pradesh, Jammu and Kashmir and Uttarakhand in the first five months of 2019. Moreover, this is not just a localized phenomenon, it's a global one. There are accidents in Chongqing, China that occur due to the poor engineering of the mountainous roads. A study for this has been published in the paper Estimation of crash severity on Mountainous Freeways in Chongqing. Hence, with the growing traffic and number of roads, it is important to realize the product that is the VAPSMR.

1.5 Product Realization Process

- The prototype created for Engineering Design Thinking was carefully analyzed.
- Some research was done to improve the product and the pitching that might follow.
- Better alternatives for the sensors used were explored for when project may be realized at a commercial level.
- The prototype was deemed a success and the new GSM module was attached for adding the response feature for emergency situations.

CHAPTER 2

PRODUCT REALIZATION PLANNING

2.1 Flow Chart

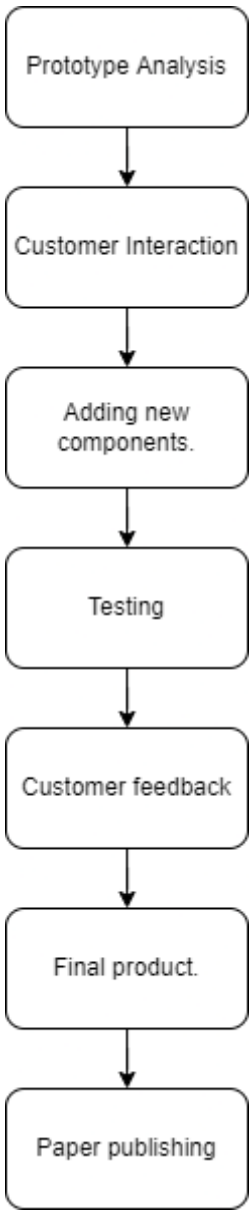


Fig 2.1.1 – Product realization flow chart

2.2 Steps involved for Product Realization

- **Prototype Analysis**: The previous prototype for the VAPSMR was a working model capable of working as the solution we proposed to our problem. By analysis of the prototype, we were able to look into how to improve upon our system.
- **Customer Interaction:** The interaction with the customer gave us a clear picture of what else we can add into the system to make it more effective for the road.
- **Adding new components:** Based on the suggestion from the customer, we added a GSM module and moisture sensor to better serve the purpose of saving lives.
- **Testing:** A very common theme in our project was testing. This ensured our product met at-least the bare minimum to function properly.
- **Customer Feedback:** After implementing the changes the product is shown to the customer to check whether the product reaches their requirements.
- **Final product:** The final product came as a two-part system which performed both prevention of accident and forecast of accident
- **Paper Publication:** The work done in creating this project can be reflected in the paper that details the journey made in creating this project and serving the purpose of saving lives.

2.3 Gantt Chart

Task	WEEK1	WEEK2	WEEK3	WEEK4	WEEK5	WEEK6	WEEK7	WEEK8
Product Analysis								
Costumer communication and product refining.								
Designing the project and regular feedback.								
Testing phase								
Paper								

Table – 2.3.1 – Gnatt chart.

CHAPTER 3

Community partner-Related Processes

3.1 Details of Community partner

- **Name**: Anurag Kottam Prateesh
- **Occupation**: Driver
- **Place**: Hakimpet
- **Mobile number:** +91 6928580916

3.2 A field survey form

Problem to be Solved: Accidents at mountainous roads.

Need Statement: In todays world of vast on road networks, roads connecting different continents, etc. It is important to have systems that ensure road safety. Specially roads which are hostile and difficult to traverse need systems that ensure its commuters safety.

Specifications Desired from the Product:

- To increase road awareness while driving.
- To build system that reduces or removes the possibility of accidents during high fog.

Expected Cost of the Product: 2500

Questions Asked:

- Would you rely on this product?
- How was your experience with this product?
- Does this product put your mind at ease?
- What else would you like to see from this product?
- Any similar products you're aware of?
- Are there any differences in specifications with the existing product?
- Do you consider this affordable?

3.3 Questioner with Community Partners responses

- Would you rely on this product?
  A: I would. Considering how there is nothing installed on such roads, this system, however new and undercooked it is at the moment, is far better than nothing.
- How was your experience with this product?
  A: I found it very useful and easy to use. The cost of the product surprises me specially considering how much functionality is packed inside this system.
- Does this product put your mind at ease?
  A: Yes it does.
- What else would you like to see from this product?
  A: Perhaps a system that can track a collision and notify the hospitals.
- Any similar products you're aware of?
  A: I know there is a system that slows down the car when it detects an object in front of it.
- Are there any differences in specifications with the existing product?
  A: This one seem much cheaper, less complex and much more practical.
- Do you consider this affordable?
  A: I do.

3.4 List the Community Partner Specifications

- Good sensors are paramount to this effort.
- No false output as that can throw the driver off.
- Costs of production should be low.
- Should be sustainable for the long term.

CHAPTER 4

Design and Development of Product

4.1 Design of Product

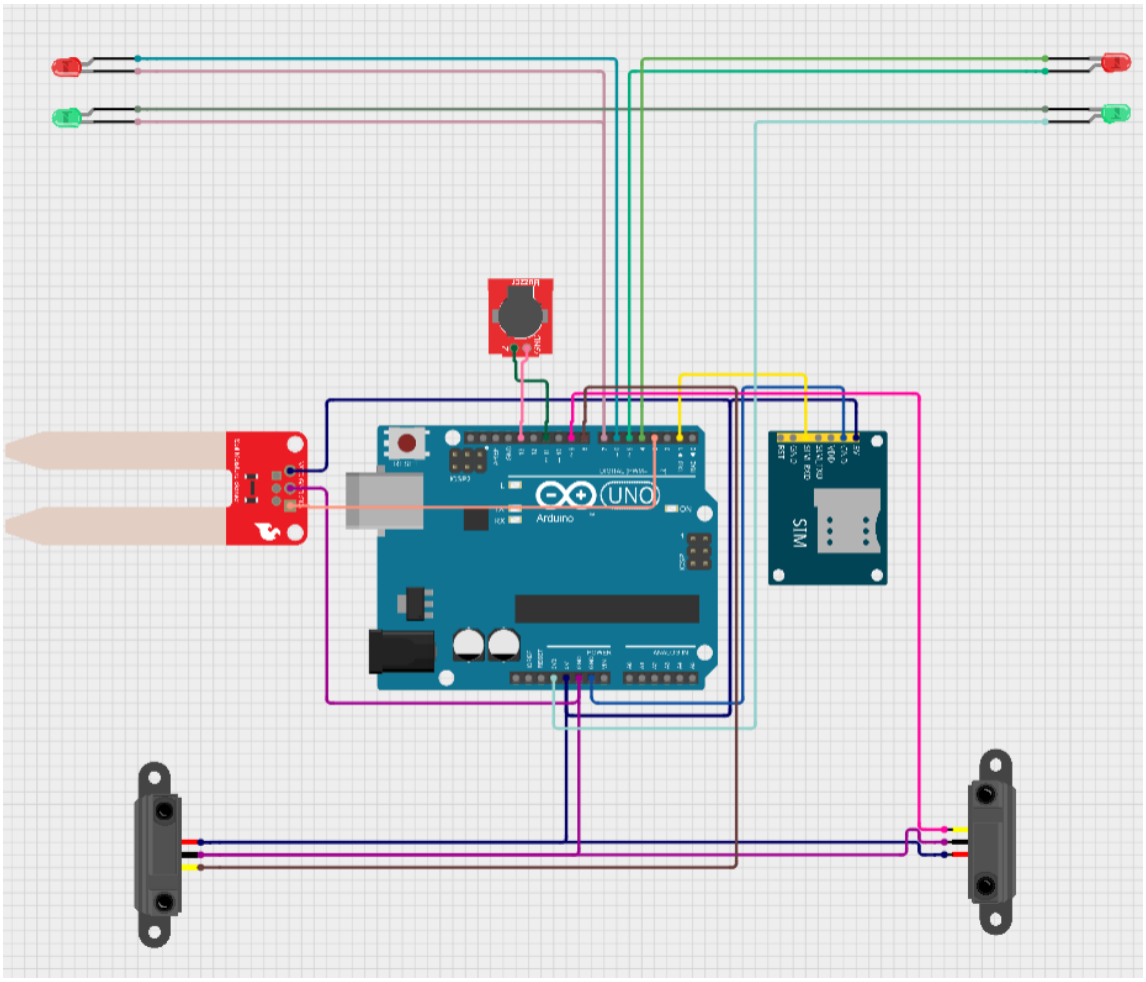


Fig – 4.1.1 – Proposed Design

Hardware used:

I. **Arduino UNO: 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 MHz ceramic resonator (CSTCE16M0V53-R0), a

USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.. You can tinker with your Uno without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

II. **IR sensors:** 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 measures only infrared radiation, rather than emitting it that is called as a passive **IR sensor**.

III. **Buzzer:** An Arduino buzzer is also called a piezo buzzer. It is basically **a tiny speaker that you can connect directly to an Arduino**. You can make it sound a tone at a frequency you set. The buzzer produces sound based on reverse of the piezoelectric effect.

IV. **Red and Green LEDs:** A light-emitting diode is a semiconductor light source that emits light when current flows through it. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons.

V. **GSM module:** A GSM modem or GSM module is **a hardware device that uses GSM mobile telephone technology to provide a data link to a remote network**. From the view of the mobile phone network, they are essentially identical to an ordinary mobile phone, including the need for a SIM to identify themselves to the network.

VI. **Moisture Sensor:** Soil moisture sensors **measure the water content in the soil** and can be used to estimate the amount of stored water in the soil horizon. Soil moisture sensors do not measure water in the soil directly. Instead, they measure changes in some other soil property that is related to water content in a predictable way. This is used in conjunction with fog or rain in order to sense the weather conditions and use the GSM module to convey the weather condition to the authorities involved.

Configuring of Peripherals

I. IR sensors

i. GND and Vcc of IR sensor on the right connected to GND and Vcc of IR sensor on the left.

ii. GND and Vcc of IR sensor on the left connected to GND and 5V supply on Arduino Uno.

iii. Out pin or IR sensor(L) and IR sensor(R) connected to pin 8 and pin 7 of Arduino respectively.

II. LEDs

i. Red and Green LEDs, on the right, connected to 3.3V, pin 4, 5 and 9.

ii. Red and Green LEDs, short circuited with right LED set for power supply and connected to pins 6 and 7.

III. GSM module

i. GSM module and Arduino UNO power supply short circuited.

ii. GSM module Rx connected to Arduino pin 1.

iii. GSM module GND connected to Arduino UNO GND.

IV. Moisture sensor

i. Moisture Sensor GND and Vcc short circuited to GND and 5V of Arduino respectively.

ii. Moisture sensor out connected to pin 2.

4.2 Purchasing information

- Arduino UNO – 550/-
- IR sensors – 150 /-
- LEDs-100/-
- GSM module-900/-
- Moisture Sensor-150/-
- Connecting wires -100/-.

4.3 Development Process

Proposed Design

The system we propose, uses widely available electronic parts to build an obstacle detection system that can detect traffic on either side of the U or S shaped roads, and alert the drivers of each other's presence. We call this system the **Vehicle Accident Prevention System for Mountain Roads and Sharp turns**.

This system utilizes vehicles as obstacles. First, when a vehicle passes in front of an IR sensor, the sensor detects and sends signals to the Arduino, which acts as an interface between the many components being utilized in our project. Then the Arduino turns the red light ON on the opposite side of the sensor.

Furthermore, we've expanded the system to have additional functionality that helps it detect bad weather conditions that may affect the visibility, grip on roads, etc.

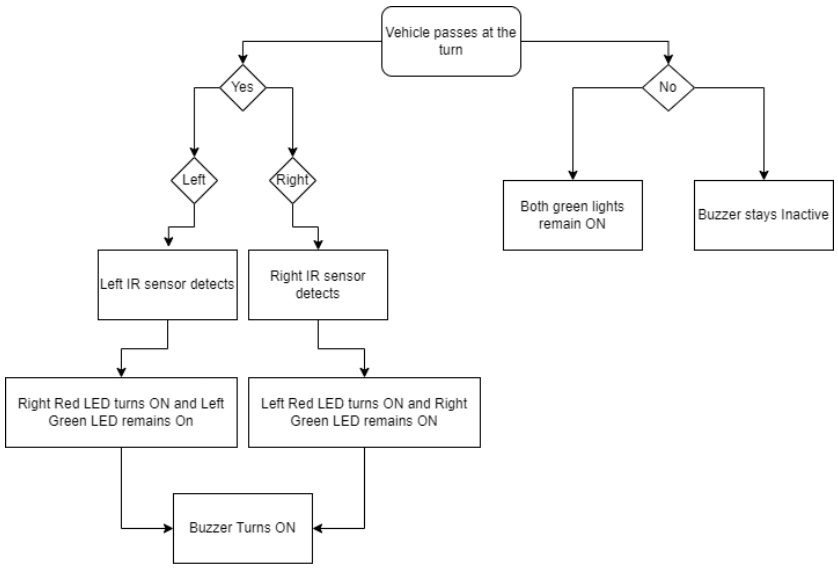


Fig – 4.3.1 – Accident Prevention

The main functionality of our project is shown above. We detect a vehicle on one side of the curve and notify the other side of its presence. There's also a buzzer that stays ON for a certain period of time to let anyone, who has closer to the curve, know that there is a vehicle on the other side.

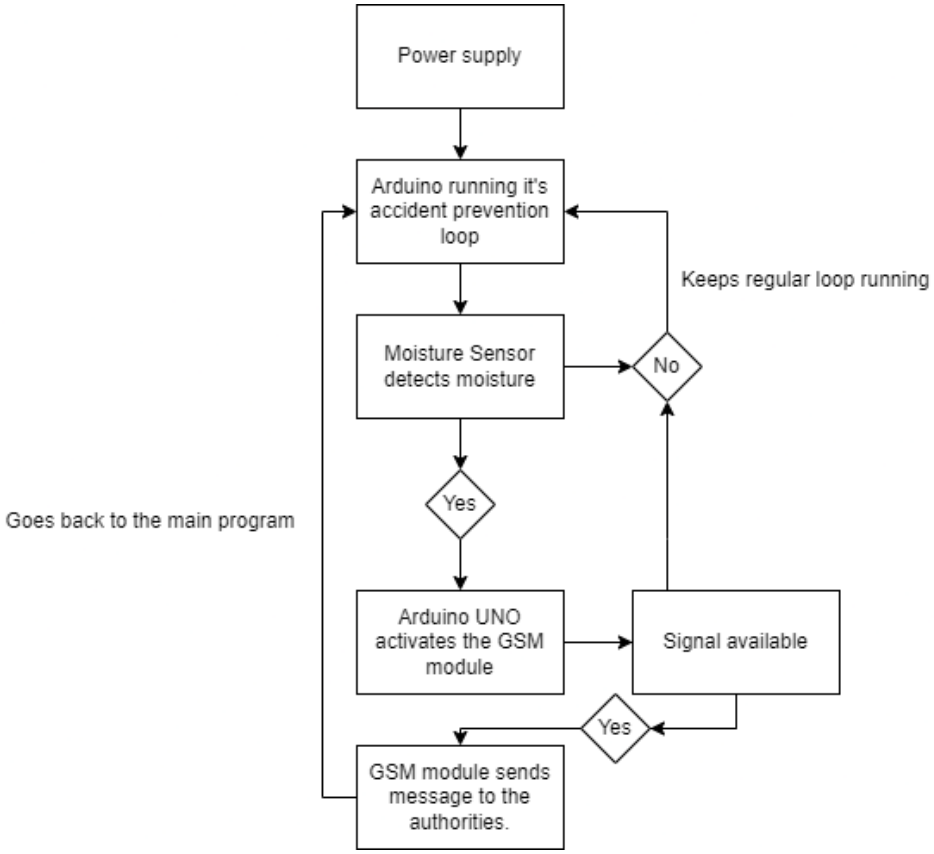


Fig – 4.3.2 – Fog detection

This is the secondary functionality of our project. The moisture sensor senses the amount of moisture in the soil and notifies the authorities about the risks involved in taking the route of interest. This is done in an effort to reduce casualties and maximize coherent response in case of one.

Working

The code is dumped into the Arduino UNO with the phone number of the authority involved with taking care of the route.

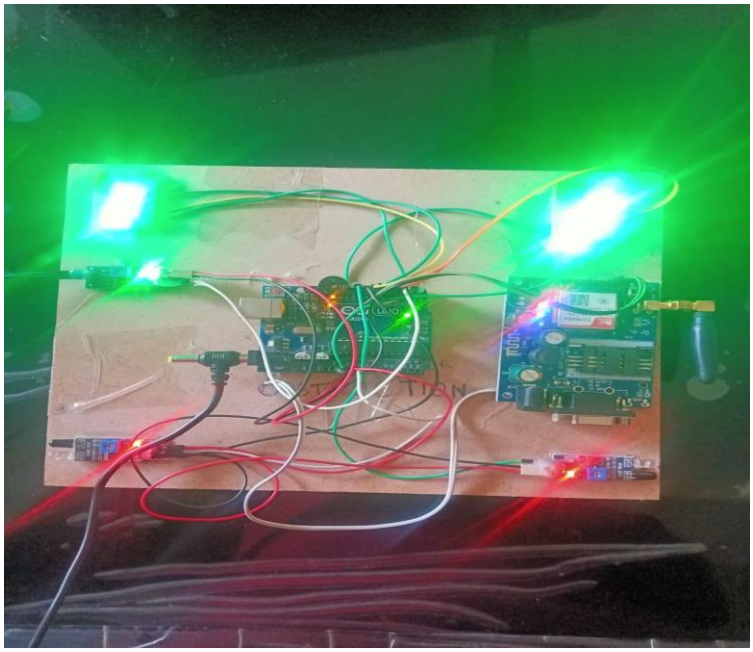
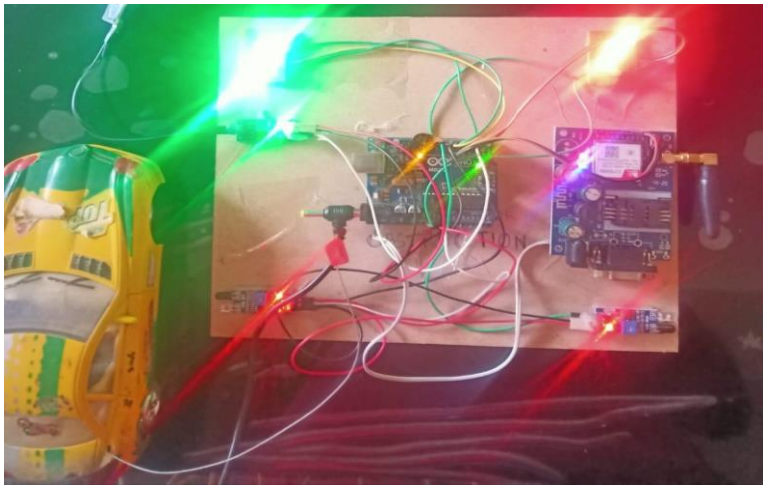


Fig 4.3.3 - No vehicles on either side of the obstruction.

In the figure **Fig 4.3.3**, there are no vehicle on the either side of the system which here acts as the obstruction between the 2 roads.



. **Fig 4.3.4 –** Vehicle on the left side of the system.

In the figure **Fig 4.3.4**, there are is one vehicle on the left side of the system which turns on the Red LED ON on the right side of the system which happens to be on aligned with the road on the right side of the obstruction.

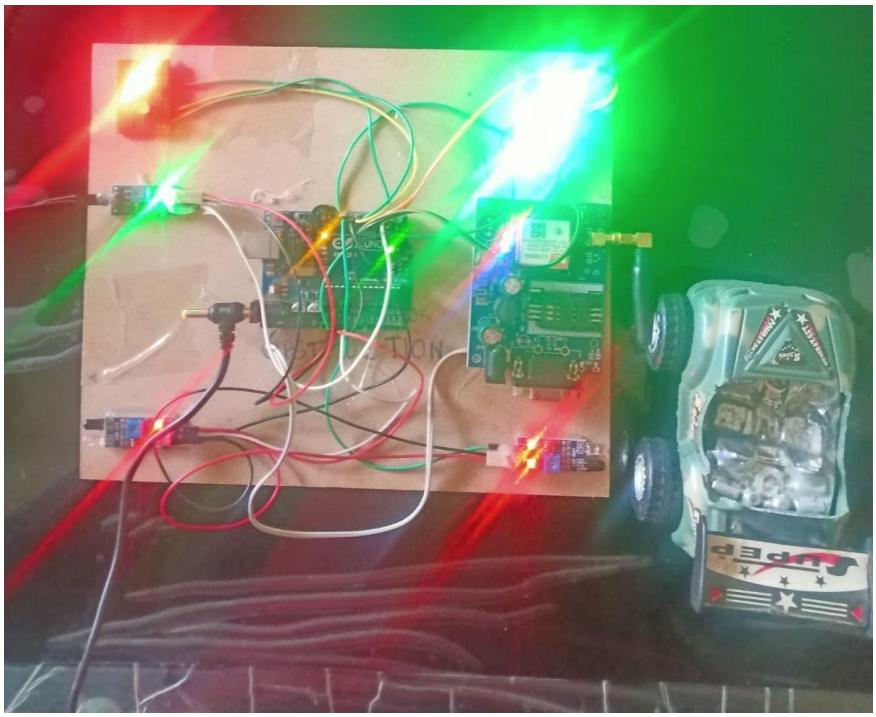


Fig 4.3.5 – Vehicle on the right side of system.

In the figure **Fig 4.3.5**, there are is one vehicle on the right side of the system which turns on the Red LED ON on the left side of the system which happens to be on aligned with the road on the left side of the obstruction.

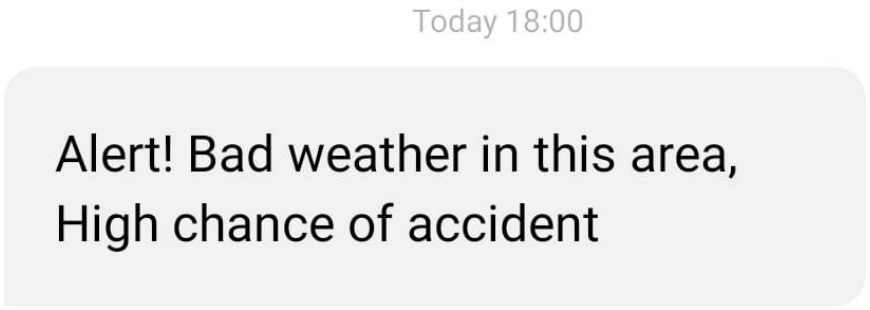


Fig 4.3.6 – System sends a warning to the authorities about the conditions of the road.

If the system detects any moisture in the system, it sends the text message in **Fig 4.3.6** to the authorities about the weather. This can be immensely helpful as it can tell the likeliness of accident beforehand.

4.4 Final Product

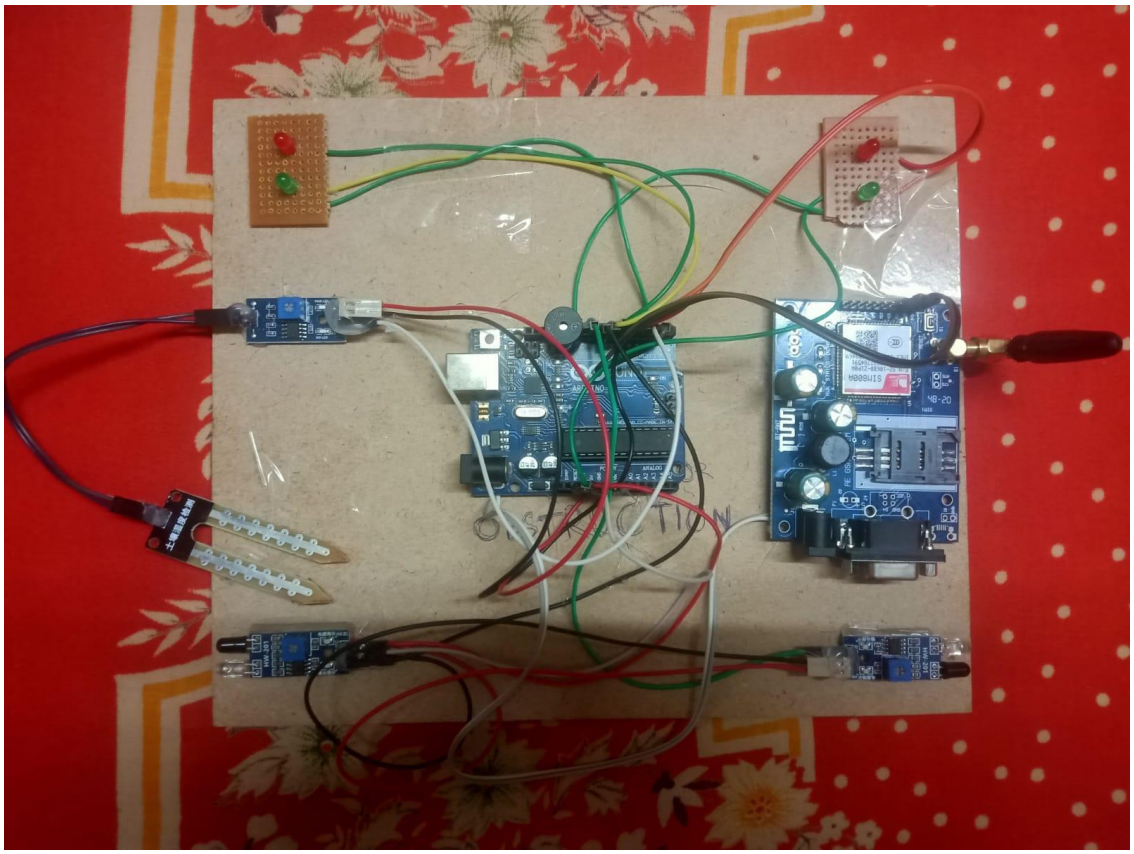


Fig 4.4.1 – Picture of product.

CHAPTER 5

Post Product Realization Activities

5.1 Delivery details

Delivery Date: 22-04-22

Place: Kukatpally

Means of delivery: Handed it over to the receiver at their place, in person.

5.2 Feedback on delivered product

Mr. Sateesh had a wonderful time with the project. He showed the product to his friends and family and demonstrated its ease of use. Furthermore, Mr. Sateesh and his friends who were in the similar trade, were impressed by how a project like this could change the way traffic flowed across the mountain.

The users of this project tested it out in proper conditions and had good comments about its efficiency.

CHAPTER 6

Business Model/Paper/Patent information

The paper for this project has already been written. It is yet to be published. The paper includes all the important methods, outputs, block diagram required to recreate this project. The paper will be updated regularly until it is accepted.

CHAPTER 7

CONCLUSIONS

About 2300 years ago, when Alexander the Great campaigned from Macedonia, to Asia minor, to Egypt and finally down to regions which are considered modern day Punjab. He became the man who conquered the known world of the time. Out of his Empire rose the Roman Empire. The greatest military force to ever exist, before the world got guns. The Romans, to keep their own territories in control, to enhance trade, and to continue on with their debauchery, built over 86,000 KMs of roads. They were built for ease of transport on foot or horse-back. But now, we use cars, bikes and other vehicle which go much faster than anything ever seen before in human history. This means, accidents caused by these inventions are far worse than anything ever seen in human history. In order to avoid these tragedies, we need ever-growing, impeccable and robust systems that don't fail. Our project offers one such system. Our proposition is one of the more pragmatic, and certainly, a more modern approach to a problem that needs solving.

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