



GUJARAT TECHNOLOGICAL UNIVERSITY

**VISHWAKARMA GOVERNMENT ENGINEERING COLLEGE
AHMEDABAD**

REPORT

ACCIDENT DETECTION AND RESCUE SYSTEM

Under subject of

Design Engineering – 2A (3150001) B.E. Semester – 5

Electronics & Communication Engineering

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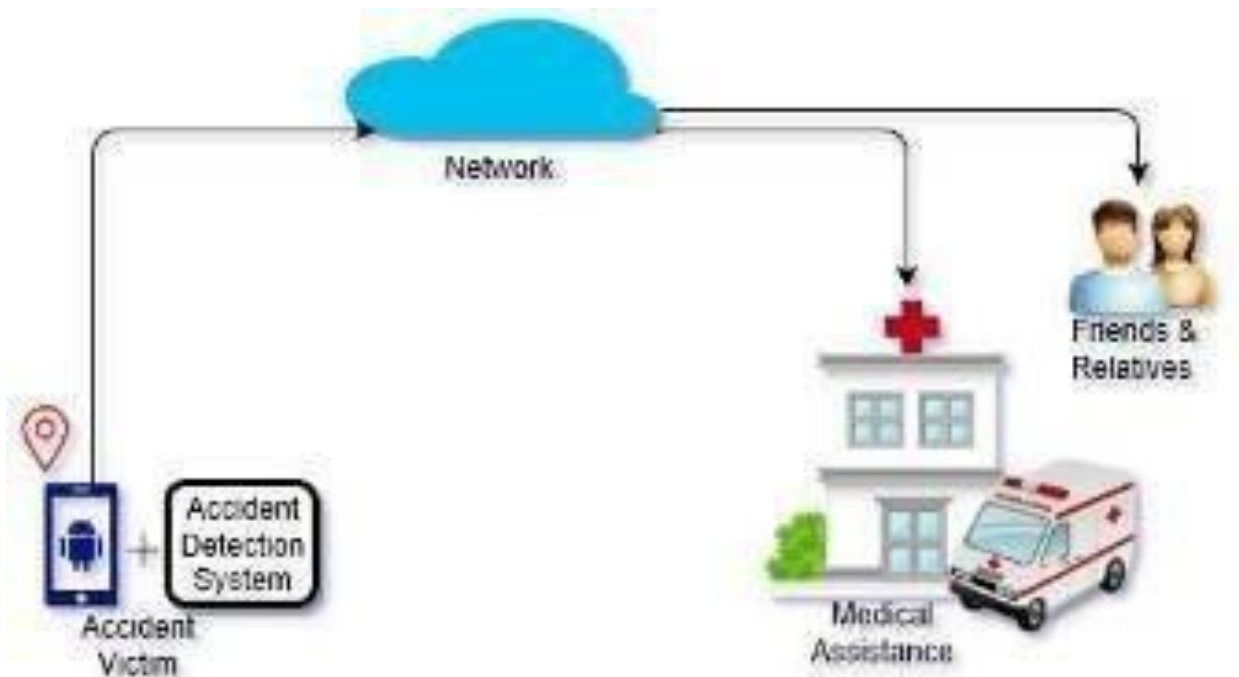
CONTENTS

INDEX

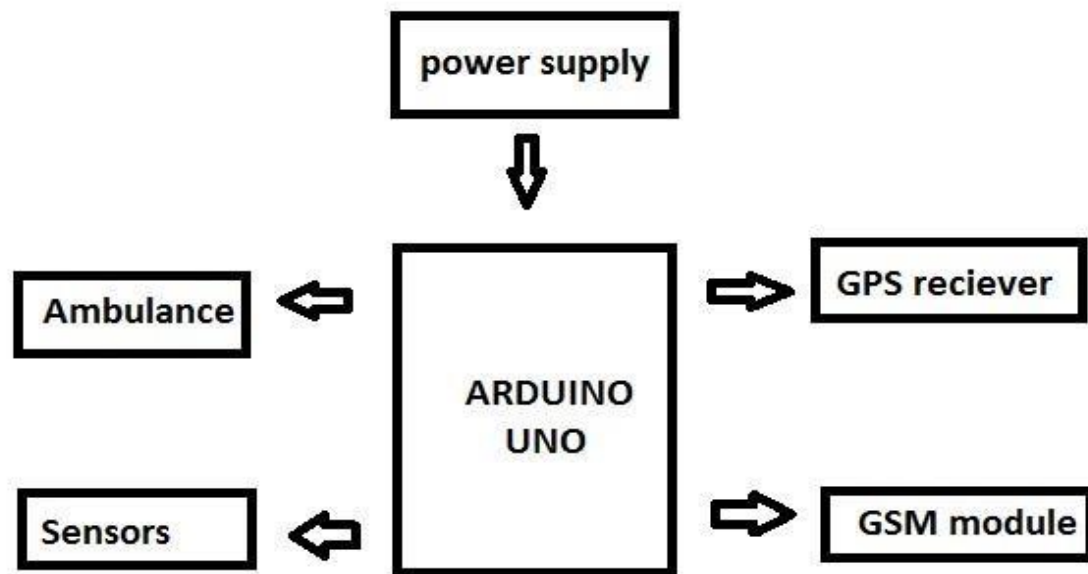
- INTRODUCTION
- WORKING
- COMPONENTS
- CIRCUIT DIAGRAM
- AEIOU CANVAS
- IDEATION CANVAS
- EMPATHY CANVAS
- PRODUCT DEVELOPMENT CANVAS
- MIND MAPPING CANVAS
- LEARNING NEEDS MATRIX CANVAS
- PROTOTYPE
- CONCLUSION

INTRODUCTION

The advancement in the field of automobiles is highly increasing day by day which leads to many accidents. People's life is under high risk and danger. This situation prevails, just because the injured person did not get efficient emergency medical treatment on time. In our country, many people lose their life because of accidents. Because of late or improper communication to medical team. We are in the process of solving this issue by proposing an efficient solution and to reduce the loss of lives as much as possible. In our project, our system helps us to detect accidents automatically in significantly minimum time and transfer the fundamental information to the emergency medical team within a few seconds covering the geographical coordinates of accident location, the time and the angle where the vehicle had met with an accident. This alert message is sent to the rescue team (ambulance) and the registered mobile number within short period. This real time application saves many valuable lives. The message is sent through the GSM module and the location of the incident. The basic idea is to localize the vehicle system by receiving the real time position of the vehicle through GPS and send the information through GSM module through SMS service.



BLOCK DIAGRAM



WORKING

To overcome the existing problem we will implement a new system in which there is automatic detection of the accident. An impact sensor is fitted in every vehicle and when an accident occurs, signals from the impact sensor are sent to the microcontroller. The signal is transferred from microcontroller to the central unit using IoT platform. The GPS module provides the latitude and longitude coordinates of victim vehicle which are sent to the control using IoT platform. The central unit sends the location coordinates to the nearest ambulance and is instructed to pick up the victim. The central unit will be placed in a police station or a hospital that receives the signals from vehicle unit. It sends an alert message to the ambulance that is nearer to the location of the accident. The ambulance is also equipped with a GPS receiver for tracking of the accident location. This helps ambulance to reach the location in time and save the victim

COMPONENTS

(1) ARDUINO UNO

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, 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.



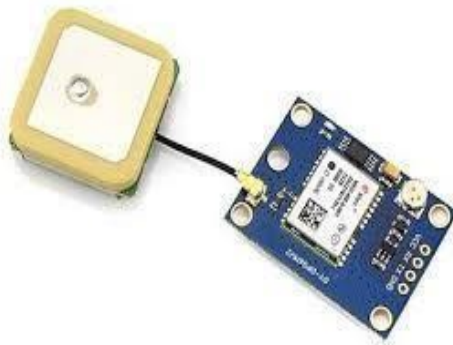
(2) GSM MODULE

Here a GSM mobile hand set is used. GSM networks are originally from the most popular standard for mobile phones in the world, GSM differs from its predecessors in that both signaling and speech channels are digital, and thus is considered a second generation (2G) mobile phone system. GSM is a cellular network, which means that mobile phones connect to it by searching for cells in the immediate vicinity.



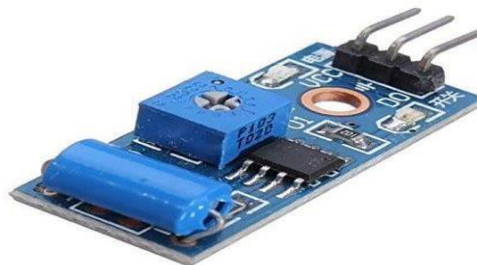
(3) GPS MODULE

The Global Positioning System (GPS) is a U.S. space-based global navigation satellite system. It provides reliable positioning, navigation, and timing services to worldwide users on a continuous basis in all weather, day and night, anywhere on or near the Earth. GPS is made up of three parts: between 24 and 32 satellites orbiting the Earth, four control and monitoring stations on earth, and the GPS receivers owned by users. GPS satellites broadcast signals from space that are used by GPS receivers to provide three dimensional location (latitude, longitude, and altitude) plus the time.

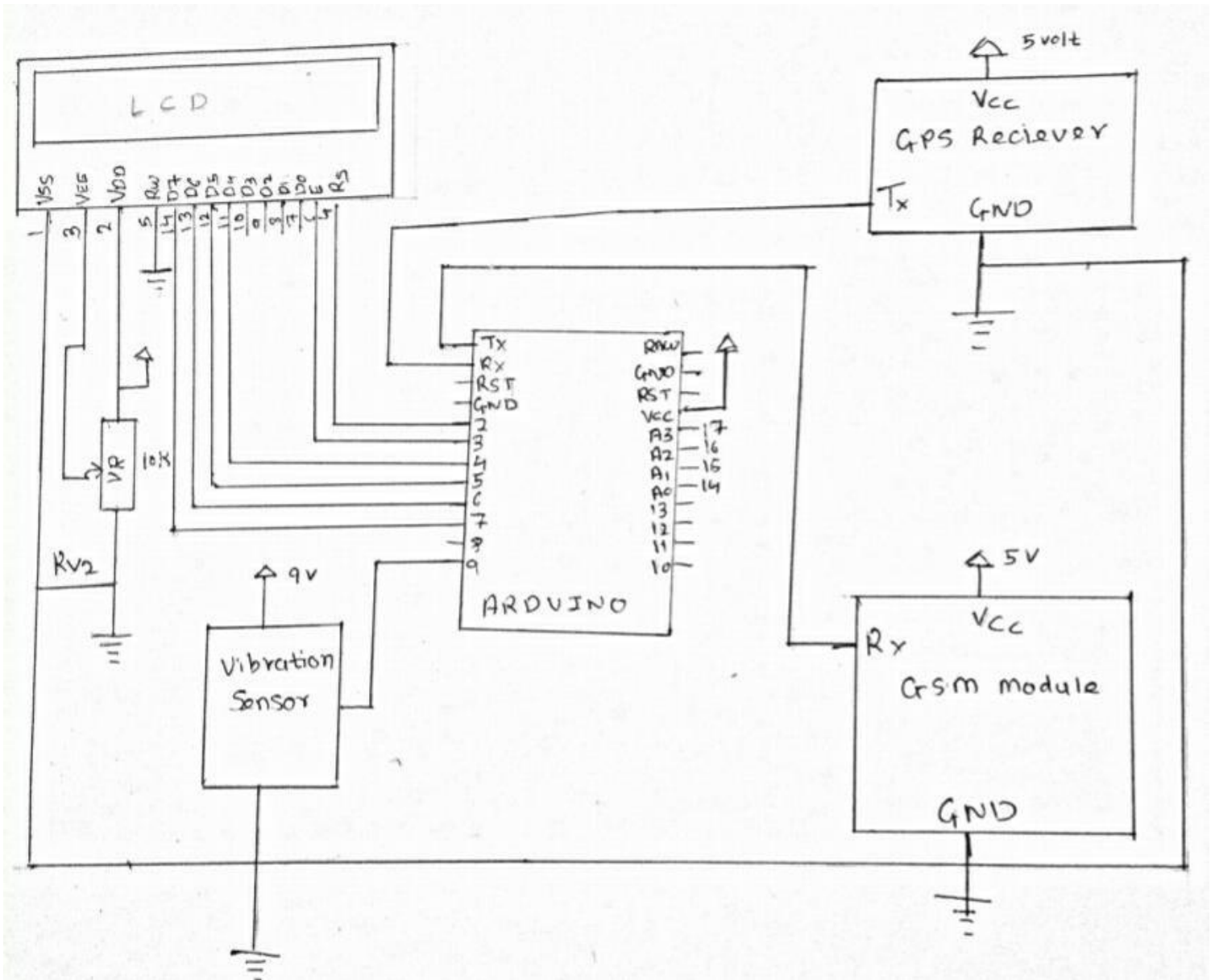


(4) VIBRATION SENSOR

Vibration sensor is also called piezoelectric sensor. These sensors are flexible for measuring various processes. These sensors are used to measure piezoelectric effects while measuring changes within acceleration, pressure, temperature, force and strain by changing in an electric charge.



CIRCUIT DIAGRAM



AEIOU CANVAS

AEIOU stands for 5 elements to be coded Activity, Environment, Interaction, Object and User.

AEIOU is an investigative tool to help interpret observations gathered by ethnographic practices in the field. It is an Observation tool. Its two primary functions are to code data, and to develop building blocks of models that will ultimately address the objectives and issues of a client.

ACTIVITIES

Our model provides quick medical assistance to the person met with an accident.

ENVIRONMENT

It can be useful in highways, Hilly are as uncertain traffic signals and road trips.

OBJECTS

Objects used are Arduino-UNO, Atmega 328p microcontroller, SIM 900 GSM module, Neo 6M GPS module, vibration sensor and software.

INTERACTION

Interaction is done after accident has occurred through GPS &GSM module.

USER

- Drivers
- Road safety agency
- Ambulance service
- Fire brigade service
- Police

AEIOU Summary :

Group ID: 259083

Date: 13/10/2020 Version: 1

Domain Name: ACCIDENT DETECTION & RESCUE SYSTEM

Environment:

HIGHWAYS

ROAD TRIPS

HILLY AREAS

UNCERTAIN
TRAFFIC SIGNALS

MIDNIGHT
TRANSPORTATION

CROSS ROADS

HEAVY VEHICLE
TRANSPORTATION

MEDICAL
EMERGENCY

Interactions :

NEARBY
HOSPITALS

ACCIDENT
PLACE

AMBULANCE
SERVICES

GPS MODULE

FIRE
BRIGADE

GSM MODULE

Objects :

SIM 8001900 GSM

ATMEGA 328P
MICRO CONTROLLER

NEO 6-M GPS MODULE

BATTERY

ARDUINO - UNO

SOFTWARE

VIBRATION
DETECTION SENSOR

MOBILE

Activities :

SURVEY OF
PROBLEMS

COLLECTION OF
INFORMATION

DISCUSSION

COMPONENTS
COLLECTION

CODING

REVIEWS

PLANNING

ANALYSIS

OBSERVATIONS

Users :

TWO WHEELERS

TOURISM VEHICLES

AMBULANCE SERVICE

FOUR WHEELERS

TRANSPORTERS

HOSPITALS

TRUCK DRIVERS

ROAD SAFETY
AGENCIES

FIRE BRIGADES

IDEATION CANVAS

Within the Ideation phase, we select a test case where we have more have emotional attachment and solutions for the problem faced by the people in the selected test case are considered further.

PEOPLE

- Drivers
- Road safety agency
- Hospital staff
- Police

SITUATION

It can be used in situation such as

- Heavy vehicles and major accidents
- Midnight cross road accident

CONTEXT

To save life after road accident

POSSIBLE SOLUTIONS

- Resist accident
- It provides quick medical treatment
- Less loss of life after accident
- The system provides accurate location to the ambulance to save victim.

The Ideanut : Ideation Canvas

Project : ACCIDENT DETECTION
& RESCUE SYSTEM

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People

TWO-WHEELERS

FOUR-WHEELER

THREE-WHEELERS

AMBULANCE SERVICE
DRIVER

TRUCK DRIVERS

TOURISTS

TRANSPORTERS

ROAD SAFETY
AGENCIES

DOCTORS

FIREMEN

Activities

SURVEY OF
PROBLEMS

COLLECTION OF
INFORMATION

WHATSAPP CALLING
FOR DISCUSSION

COMPONENTS
COLLECTION

REVIEWS

PLANNING

CODING

ANALYSIS

OBSERVATION



Situation / Context / Location

HEAVY VEHICLE
ACCIDENTS

HIGHWAYS

MIDNIGHT ACCIDENTS

TO SAVE LIFE
AFTER ROAD ACCIDENT

CROSS ROADS

MAJOR ACCIDENTS

TO PROVIDE QUICK
MEDICAL TREATMENT

HIGHLY AREAS

ACCIDENTS IN
REMOTE AREAS

UNCERTAIN
TRAFFIC SIGNALS



Props / Possible Solutions

QUICK MEDICAL
TREATMENT

LESS LOSS OF
LIFE AFTER ACCIDENT

AUTOMATIC
ACCIDENT DETECTION

PROVIDES ACCURATE
LOCATION OF ACCIDENT

EMPATHY CANVAS

Used to develop a deep, shared understanding and **empathy** for other people, an **Empathy Map** is a tool that helps describe aspects of a user's experience, needs and pain points. This template allows you to quickly understand your users' experience and mindset

HAPPY STORY

A family was traveling from Ahmedabad to Baroda in their car. Unfortunately on their way they met with a worst accident on the highway. Fortunately they had the '**Accident Detection and Rescue System**' installed in their car. Because of which arrived and was able to save them.

SAD STORY

Two friends on their bike were going through a remote area where met with an accident. Both of them were seriously injured. Their bike had the '**Accident Detection and Rescue System**' installed due to remote area the location of the system was not accurate because of which the medical team was not able to get there on time and one of them lost his life.

Design For

ACCIDENT DETECTION
& RESCUE SYSTEM

Date

13/10/2020

Design By

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Version 1

USER

TWO / FOUR
WHEELER DRIVERS

ROAD SAFETY
AGENCIES

AMBULANCE SERVICE

FIRE EMERGENCY
SERVICE

STAKEHOLDERS

ENGINEERS

COMPANIES

GOVERNMENT

CORPORATION

ACTIVITIES

SURVEY OF
PROBLEMS

COMPONENTS
COLLECTION

PLANNING

COLLECTION OF
INFORMATION

CODING

ANALYSIS

WATSAPP CALLING
FOR DISCUSSION

REVIEWS

OBSERVATION

STORY BOARDING

HAPPY - A Family was travelling from Ahmedabad to Baroda in their car. Unfortunately in their way they met with a worst accident on Baroda Highway. Fortunately they got Accident detection and Rescue System installed in their car, because of which the medical team arrived on time and was able to save them.

HAPPY - A Truck loaded with goods turned over because the road being very slippery. The driver was heavily injured. The truck had the Accident detection and rescue system installed because of which Ambulance arrived on time and the driver was taken to the Hospital for treatment.

SAD - Two friends on their bike were going through remote area, where they had an accident. Both of them were seriously injured. But due to area being remote the location of Accident detection and Rescue System was not accurate, because of which the medical team was able to get on time and one of them lost his life.

SAD - A Group of people were travelling to Saputara Hilly terrain during midnight hours. As the road being very uneven the Bus driver lost his control and accident occurred. Luckily the bus had Accident Detection and Rescue System installed, but due to poor signal the message did not reach to the medical center on time, due to which the passenger did not have treatment on time and they could not save the driver.

PRODUCT DEVELOPMENT CANVAS

Product development canvas can give you insights to these problems when creating a product, factors such as Purpose, people, product experience, product functions, product features, and components.

PRODUCT FUNCTIONS

- Automatic detects accidents through vibration sensor.
- Automatic sends message to registered mobile number using GSM module.
- Accurate location detection using GPS.

FEATURES

- Less Battery consumption.
- Affordable cost
- Easy to use and install

REJECT

- Use and through battery
- Poor sensor quality
- Large size of system
- Slow response speed

REDESIGN

- Use rechargeable battery
- Compact size - Good sensor quality - Quick response.

Product Development Canvas

? Purpose

What is the purpose of this concept you're developing?
Does it solve a problem, or it enhances a certain experiences?

Is it serving a need or it is trying to create a new need or tap an untapped need?

MORE SAFETY

TO SAVE LIFE
AFTER ACCIDENT

QUICK MEDICAL HELP

REDUCE LOSS OF
LIFE AFTER ACCIDENT

People

Who is the key customer segment who will use this product /service or the end product of the concept you're pushing?

Write here about them, describe them a little.

DRIVERS

POLICE

AMBULANCE SERVICE

FIRE MEN

ROAD SAFETY AGENCY

Product Experience

Define what your customer should feel like when he uses your product / service ? emotions, feelings would define his experience ? feeling of Comfort Convenience, or feeling of buying more with less (cost conscious) or feeling of greater security, safety etc.

EASY TO INSTALL

AFFORDABLE COST

GOOD BATTERY LIFE

QUICK RESPONSE

Product Functions

Functions are a products answer to user problems / need. They do something that user wants. They are often verbs in nature. Every function is powered by many features. Multitasking is a function. Browser tabs is a feature that powers the multitasking feature. A function can have one or more features powering it. Functions are very generic in nature, features are often more specific. Functions can be similar to product experience. Safety (product function) provides a feeling of safety (product experience)

AUTOMATIC
DETECTS ACCIDENT

24/7 WORKING

AUTOMATIC SENDS
MESSAGE TO NEARBY
MEDICAL CENTER

REDUCES LOSS OF
LIFE AFTER ACCIDENT.

Product Features

Product feature are specific. One of more features will power a function. Antilock Brakes, Airbags are feature that power the safety function. Browser tabs, Apple's home button to multitask between apps are features powering the multitasking function. Each feature will have many components/sub components powering it. Sometimes a very popular component becomes a feature in itself. Like car stereo is a major components and a feature at the same time powering the in car entertainment function powering entertainment as a product experience.

LESS BATTERY
CONSUMPTION

AUTOMATIC
DETECTS ACCIDENTS

AUTOMATIC SENDS
EMERGENCY MESSAGE.

AFFORDABLE COST

Components

Components build up the features. For a airbag it will comprise a list of component like bags, triggers etc. that go into making it. For a tabbed browser it will comprise of various chunks of code that will make the tabs work. In cases where the feature is a major component, you could list here the auxiliary components that are required to make the major component work. You can also list new adjustments and innovations you're planning here at the component level.

SIM 900/800 GSM

NEO 6M
GPS MODULE

ARDUINO-UNO

ATMEGA 328P
MICROCONTROLLER

VIBRATION
DETECTION SENSOR

BATTERY

SOFTWARE

MOBILE

LED'S, WIRES

Customer Revalidation

Once you're finished with your feature set, test with the customer / user if the features, functions are useful. Speak to the customer / user.

EASY TO USE

SIZE ISSUES

GOOD FOR SAFETY

BATTERY PROBLEMS

AFFORDABLE COST

POOR SENSOR QUALITY

Reject, Redesign, Retain

Post customer validation, reject, those function or feature that the customers didn't find useful. Redesign those that were partially useful and retain those that met the bar. Iterate with this until all functions / features are accepted.

REJECT

REDESIGN

USE & THROW BATTERY

RECHARGEABLE BATTERY

LARGE SIZE

COMPACT SIZE

POOR SENSOR QUALITY

GOOD SENSOR QUALITY

SLOW
RESPONSE SPEED

QUICK RESPONSE

MIND MAPPING CANVAS

Mind maps are diagrams used to visually organize information hierarchically. Mind maps are created around a single concept or image at the center of a blank page or canvas. Major ideas directly branch from this central point with further ideas and detail branching off from those levels. Mind maps are purposefully colorful and work well when combined with imagery to represent ideas, concepts or information. The non-linear but hierarchical approach of mind maps makes them an excellent way to organize your ideas, plan an essay, make notes for a lecture.

ADVANTAGES

- Accurate location for ambulance.
- Provides quick medical treatment.

DISADVANTAGES

- Poor signals resists the working of system.
- In hilly areas or remote areas location is not accurate.

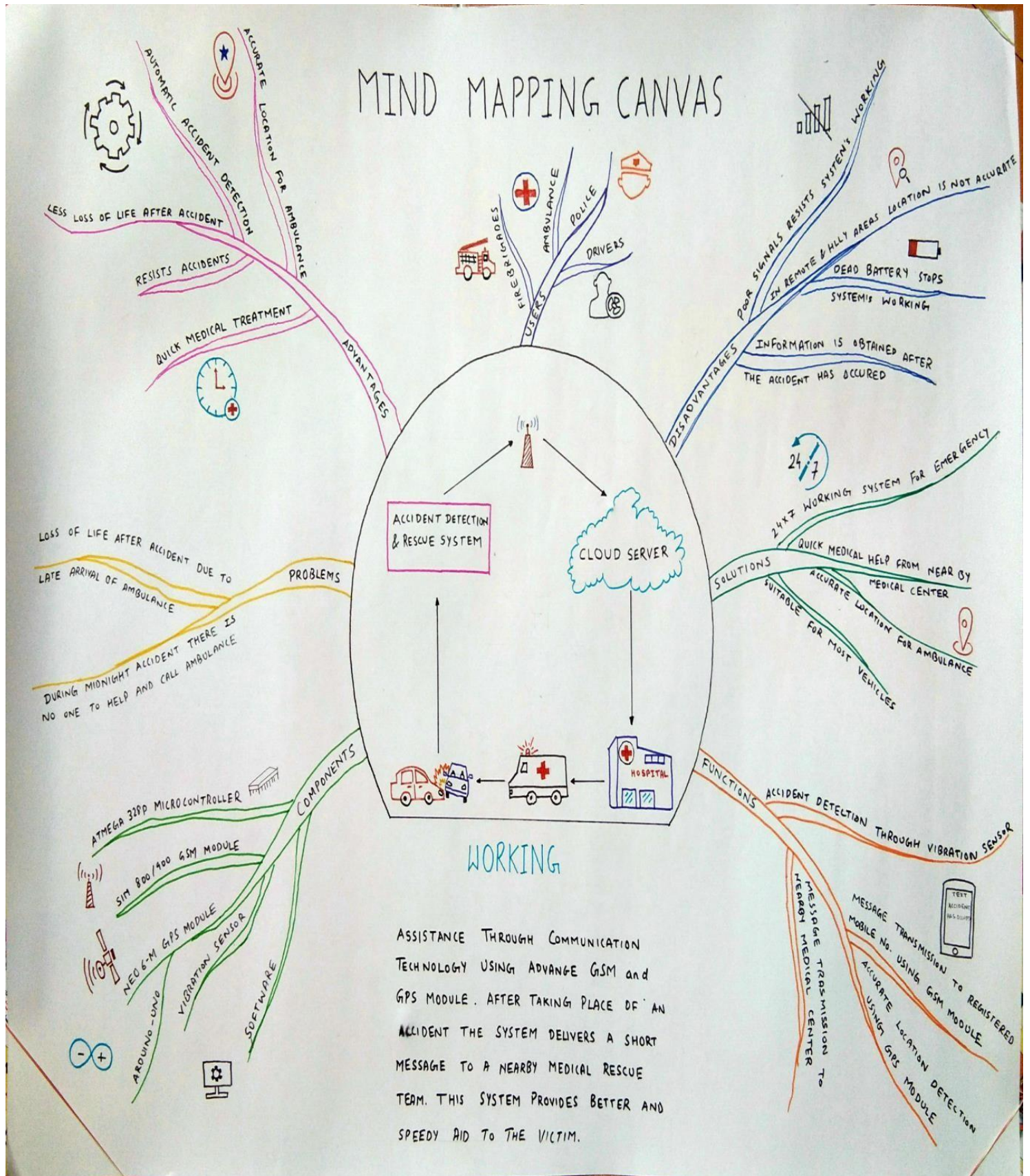
PROBLEMS

- Losses of life after accident due to late arrival of ambulance.
- During midnight accidents there is no one to help or call ambulance.

SOLUTIONS

- 24*7 working system.
- Suitable for most of vehicle.
- Quick medical help from nearby medical center.

MIND MAPPING CANVAS



Learning Needs Matrix Canvas

Learning needs matrix will help students to identify the learning requirements that are much needed in industry or in their career at early stage along with prioritization of specific learning.

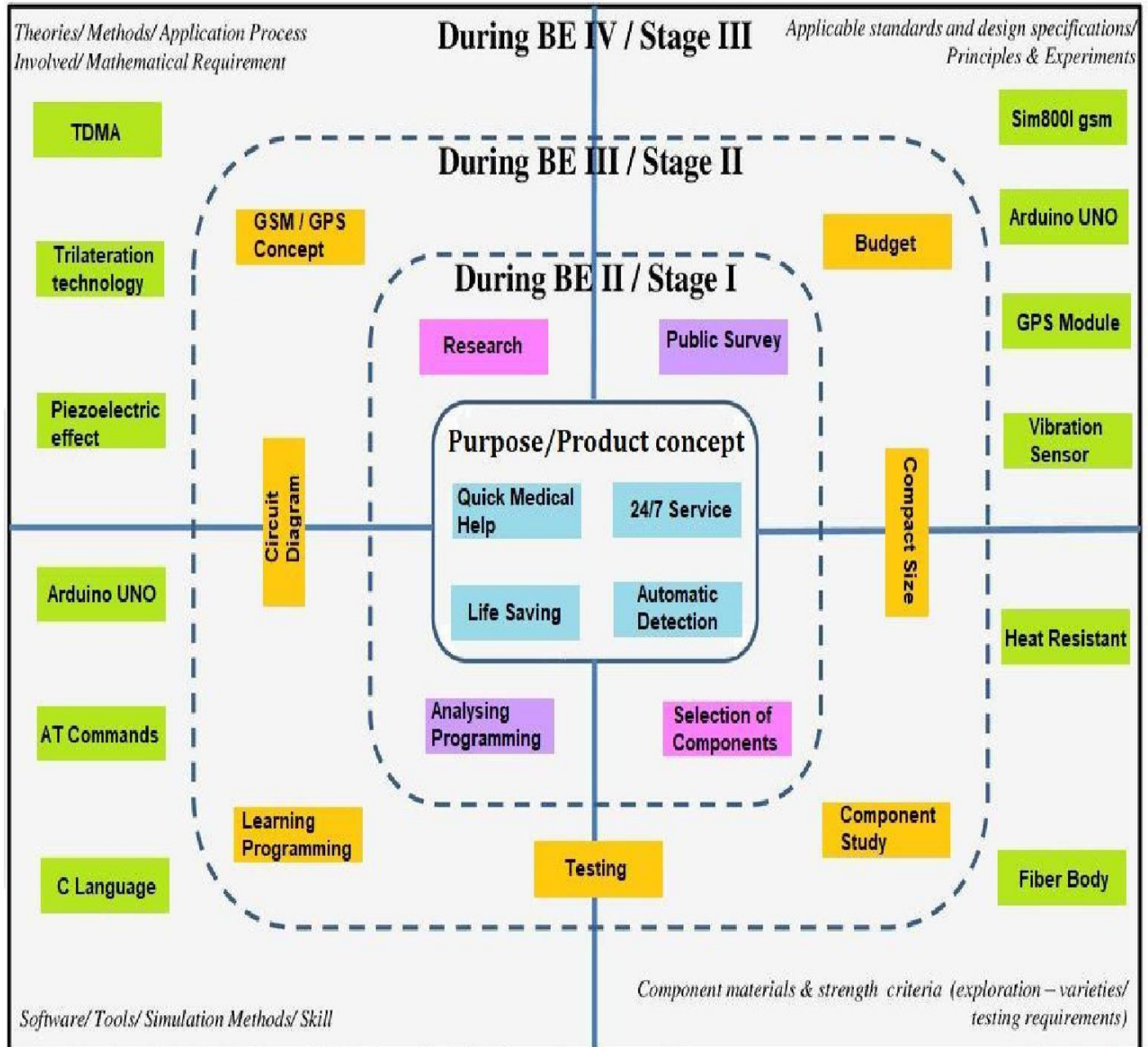
Identification will be focused with listing out syllabus based and out of syllabus learning and skill development.

LNМ is not necessarily related to their ongoing or future projects, but the learning needs may be generalized as per industrial requirements of skillsets.

Learnings Need Matrix

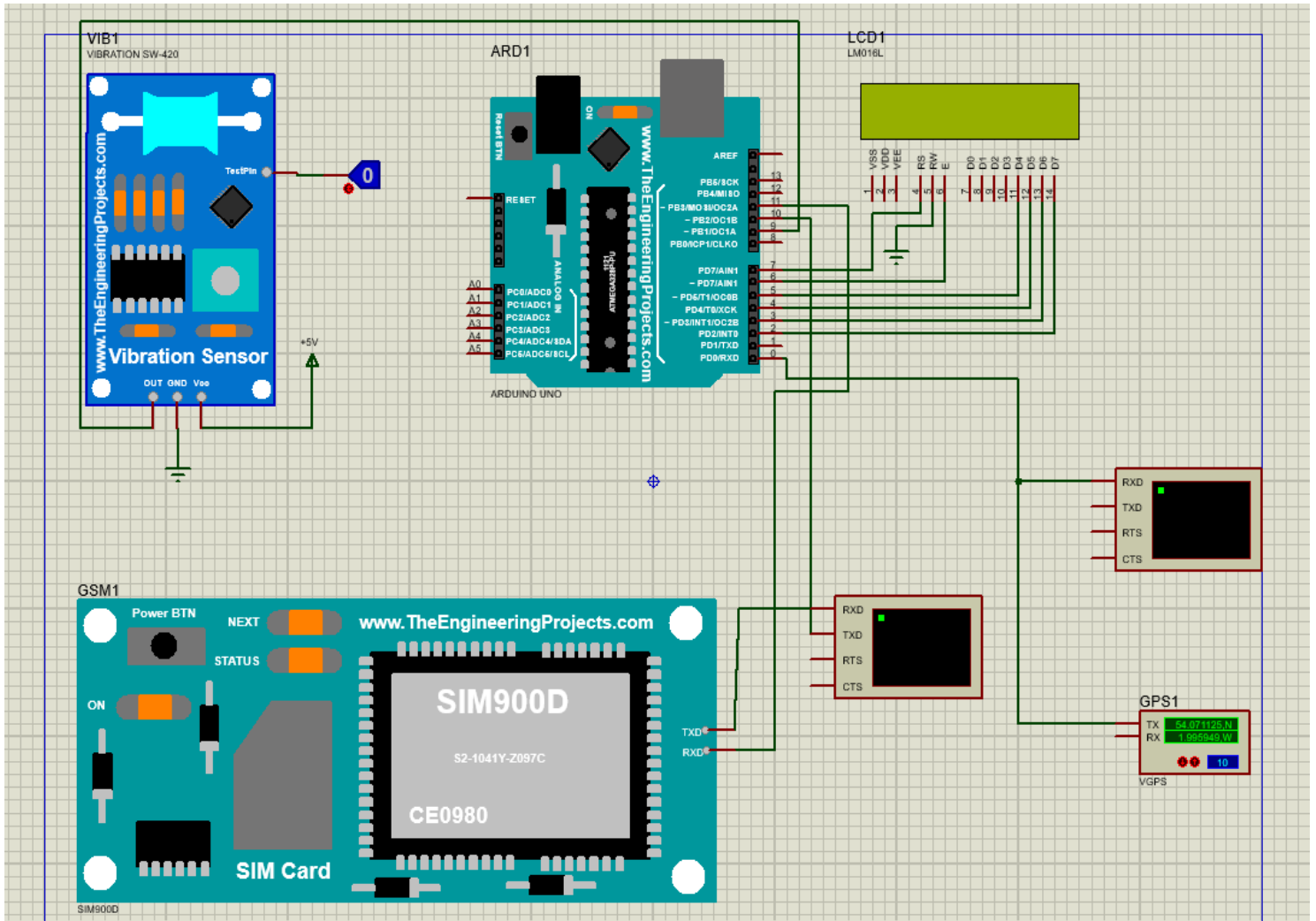
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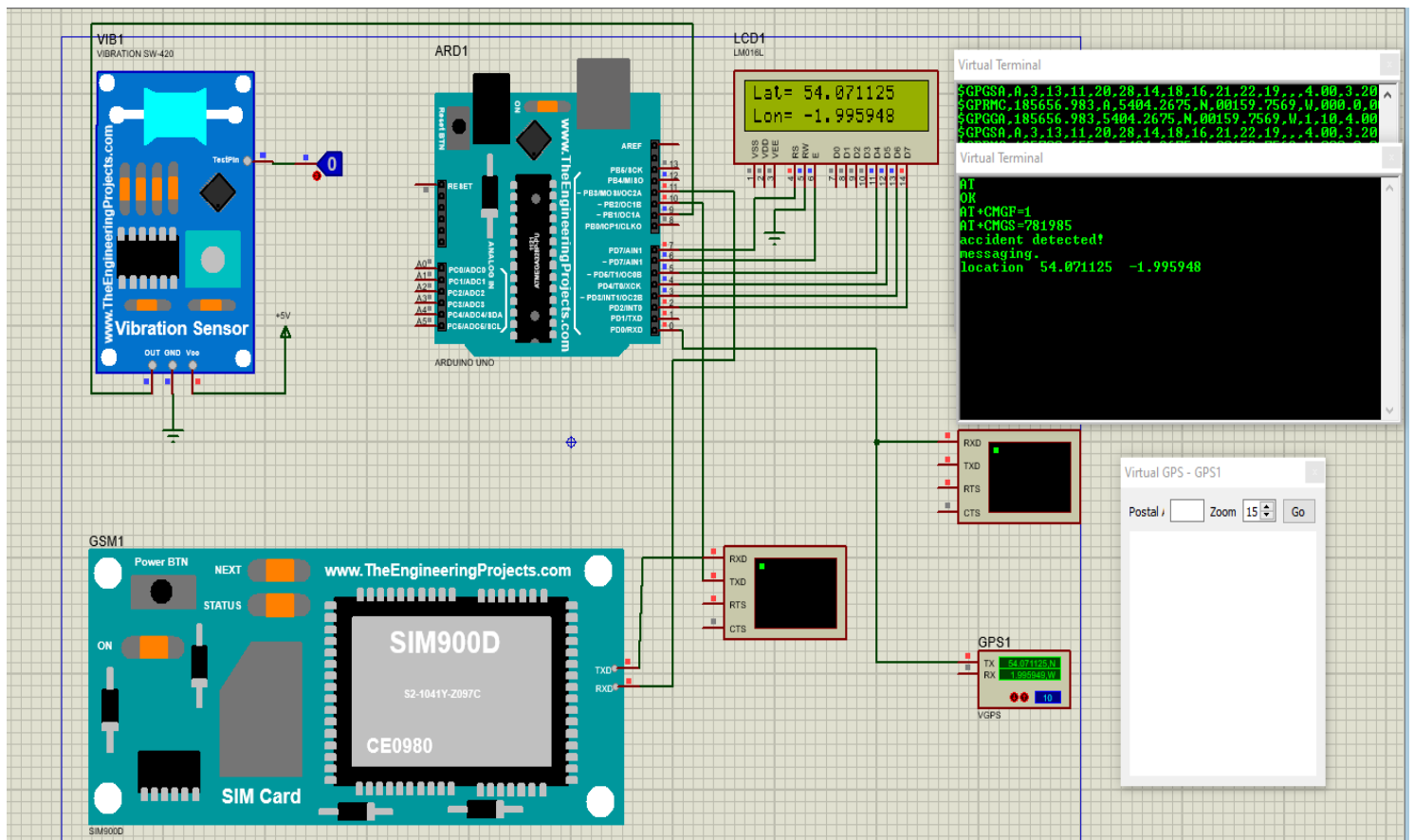
Date: 23/4/2021



Version: 01

PROTOTYPE





CODE

```
#include <TinyGPS.h>
#include <LiquidCrystal.h>
#include <SoftwareSerial.h>

SoftwareSerial mySerial(10, 11); //SIM800L Tx & Rx is connected to Arduino #10 & #11
const String PHONE = "781985";
int vs = 9;
LiquidCrystal lcd(7, 6, 5, 4, 3, 2);
TinyGPS gps; //Creates a new instance of the TinyGPS object

void setup()
{

    //Begin serial communication with Arduino and Arduino IDE (Serial Monitor)
    pinMode(vs, INPUT);

    //Begin serial communication with Arduino and SIM800L
    Serial.begin(9600);
    mySerial.begin(9600);
    lcd.begin(16, 2);
    lcd.setCursor(3,0);
    lcd.print("Project by");
    lcd.setCursor(2,1);
    lcd.print("Navanshu");
    delay(1000);
    lcd.clear();
}

void loop()
{
    bool newData = false;
    unsigned long chars;
    unsigned short sentences, failed;
    int vibration = digitalRead(vs);

    // For one second we parse GPS data and report some key values
    for (unsigned long start = millis(); millis() - start < 1000;)
    {
        while (Serial.available())
        {
            char c = Serial.read();
            //Serial.print(c);
```

```

        if (gps.encode(c))
            newData = true;
    }
}

if(vibration == HIGH) {
    if (newData)    //If newData is true
    {
        float flat, flon;
        unsigned long age;
        gps.f_get_position(&flat, &flon, &age);

        int lat=(flat == TinyGPS::GPS_INVALID_F_ANGLE ? 0.0 : flat, 6);
        int lon=(flon == TinyGPS::GPS_INVALID_F_ANGLE ? 0.0 : flon, 6);
        lcd.clear();

        lcd.setCursor(0,0);
        lcd.print("Accident ");

        lcd.setCursor(0,1);
        lcd.print("Detected ");

        delay(1000);
        lcd.clear();

        lcd.setCursor(0,0);
        lcd.print("Getting ");

        lcd.setCursor(0,1);
        lcd.print("Location ");

        delay(1000);
        lcd.clear();

        delay(1000);
        mySerial.println("AT"); //Once the handshake test is successful, it will back to OK
        updateSerial();
        mySerial.println("AT+CMGF=1"); // Configuring TEXT mode
        updateSerial();
        mySerial.println("AT+CMGS="+PHONE);//change ZZ with country code and xxxxxxxxxxxx with phone number to sms
        updateSerial();
        mySerial.println("accident detected!");
        mySerial.println("messaging.");
        mySerial.print("location" );//text content
    }
}

```

```

mySerial.print(" ");
mySerial.print( flat == TinyGPS::GPS_INVALID_F_ANGLE ? 0.0 : flat, 6);
mySerial.print(" ");
mySerial.print( flon == TinyGPS::GPS_INVALID_F_ANGLE ? 0.0 : flon, 6);
updateSerial();
mySerial.write(26);
lcd.setCursor(0,0);
lcd.print("Lat= ");
lcd.print(flat == TinyGPS::GPS_INVALID_F_ANGLE ? 0.0 : flat, 6);
lcd.setCursor(0,1);
lcd.print("Lon= ");
lcd.print(flon == TinyGPS::GPS_INVALID_F_ANGLE ? 0.0 : flon, 6);

}
}

Serial.println(failed);
if (chars == 0)
  Serial.println("** No characters received from GPS: check wiring **");
}

void updateSerial()
{
  delay(500);
  while (mySerial.available())
  {
    mySerial.write(mySerial.read()); //Forward what Serial received to Software Serial Port
  }
  delay(500);
  while(mySerial.available())
  {
    mySerial.write(mySerial.read()); //Forward what Software Serial received to Serial Port
  }
}

```


CONCLUSION

The proposed system deals with the accident alerting and detection. Arduino is the heart of the system which helps in transferring the message to different devices in the system. Vibration sensor will be activated when the accident occurs and the information is transferred to the registered number through GSM module. Using GPS the location can be sent through tracking system to cover the geographical coordinates over the area. The accident can be detected by a vibration sensor which is used as major module in the system.