

Road Safety- Multiple Hazards Detection Application

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Abstract – In today’s world where technology is rapidly advancing with increasing population to fulfil basic human needs, the need of safety is increasing too. While we talk about safety the most dangerous situations encountered are accidents. Accidents occur often, but majority of them happen due to vehicular transportation. Many cases such as drink and drive, break failure, engine cease, obstacles encounter cause accidents. So there is a need for a multipurpose device/application which will help in detecting majority and most important factors among these causes. By combining various sensors with the internet making a host through programming, and making it available on smartphones through an application we can achieve a better lookout for avoiding these accidents. The idea of this project is to reduce such unstoppable accidents by using a common device which not only helps to detect the danger beforehand but also helps in knowing the safety measures. Be it a hilly area where rocks keep falling or a fallen tree, or a drunk driver, be it the abnormal heating of the engine, this project targets the basic common problems and provides a single solution for the same. The idea of this project is to detect such problems and provide the necessary safety measures.

Index Terms – accidents, engine cease, drink and drive, obstacles, landslides, safety, sensors, internet, application

1. INTRODUCTION

Accidents are inevitable but it can be prevented, with this outlook, a device is needed for multipurpose usage, which will not only detect various dangerous situations beforehand but also help with safety measures. Many other techniques of detection have been devised which includes machine learning, convolutional neural network, nearest neighbour algorithms, but as we know the complexity of such techniques reduces its usage and hence is not much popular among the mass. Secondly, this application is multipurpose, it will not only detect obstacles but also check for various other factors such as engine heat, alcohol presence, driver’s lousiness, speed limit. So we can prevent accidents beforehand by correcting these through direct engine lock, automatic speed reduction of vehicle; in case of emergency speed dialling and messaging are also provided along with safety measures.

Obstacles to be detected based on the distance between them and vehicle using ultrasonic sensors, where distance to be calculated in terms of speed and time using radioactivity. The

distance thus calculated through programming will be sent over to the gsm module which will connect it to the device, and on detection the alert alarm along with message will be sent to the user. This technique involves IOT and hence is programmed accordingly with the Arduino and Android as user interface at the client side. This even involves programming in such a way as to reduce speed when obstacle is encountered. Alcohol presence will be detected using the MQ-3 ethanol sensor connected to the internet and thus the alarm buzzes on detection, and the engine is locked preventing the drunk driver from driving. Engine heat is detected using set of resistors and thermistor, if the temperature goes beyond the critical temperature, alert is sent to avoid ceasing of engine. Maps are provided along with gps tracker which will help you get to your destination with full safety. All of these embodied into a single unit of application to make it available for all types of user. Making the use of this easy and economical for everyone and hence can be used on a large scale. In future, the plan is to incorporate weather monitoring system along with various other modules into this same entity for all purpose usage.

2. RELATED WORK

Many techniques have been devised for obstacle detection, vehicle tracker, some of them as devised from the previous papers are:

- 2.1. Detection and Discrimination of obstacle to vehicle environment under convolutional network [1] – which uses the optical method and neural network convolution to detect obstacles, they used an improved algorithm but using optical method made it complex under complex lightning system, without any optimizing features.
- 2.2. Obstacle Detection for Intelligent Transportation and k nearest neighbour[2]- this algorithm provided a good approach towards obstacle detection, since use of stereovision is done, lightning complexity is also removed but it is not available to all types of users and not economic.
- 2.3. Obstacle detection for self-driving car in Pakistan’s perspective[3]- used LIDAR, MHT algorithm but failed for dynamically changing objects.

2.4. Obstacle and track detection method using sensors, gsm/gps[4]- secured remote controlling of vehicles, low cost but used only for front barrier detection, track not arranged properly.

After surveying these papers and numbering the drawbacks the basic requirement is to make a less complex system supporting proper economic conditions and working under various situations

3. PORPOSED MODELLING

There are many mobile applications made for the purpose of obstacle detection. but maximum of them have something in missing, for example some don't have provision for safety measures, others don't have a GPS tracking system, need of device camera, which further reduces battery. Need of Wi-Fi or intercellular network, when connection lost any mis happening can happen. Detection of vehicles only. Since it requires user's attention while looking at the device only many accidents occur. No provision for safety measures. No provision for weather conditions, if you are travelling to a hilly area and there it's raining, or its foggy it's too dangerous. Data not transferred or collected for future safety purpose. Different application for different purpose which makes it difficult to detect simultaneously. In the proposed system we try to inculcate all those minute factors which can lead to even 0.01% of mis happenings. In this application the user will have everything hand free. The overall advantages of this application are GPS and Climatic condition tracker, Small, Cost effective, All-in-one application (with trackers, barrier detection, safety measures, sharing and speed dialling), It can also help in controlling the speed of your vehicle, Provision for safety measures, Highly useful in rainy, foggy climatic conditions, Hands free device, portable and economic, Detection of drink and driving, engine heating. The mobile application is thus further programmed in a way to not only receive and verify these inputs but also show the output in form of alert messages/alarm with safety measures to be taken; in case of emergency you can speed dial too; it will even have provision for climatic conditions, gps tracker; at the start of your journey you can even send your START and END location to your loved ones. You can install this device at back of the steering wheel, or near the handle for 2 wheelers since it's small it does not occupy much space.

4. RESULTS AND DISCUSSIONS

The components that will be used in this system comprises of hardware and software components. The software component used in this project is Android Studio for programming in java, to link all the hardware components to android- the user interface. For GPS tracker android will be programmed in a way to directly receive all map information from google maps. The hardware component used are sensors-MQ3 ethanol sensor to detect alcohol presence, ultrasonic sensor for obstacle

distance measurement; Arduino board for connection, connecting wires, breadboard, thermistors, transistors, resistors for temperature measurement of engine heat, buzzer for alert, LCD for output display check, LED for night measurements.

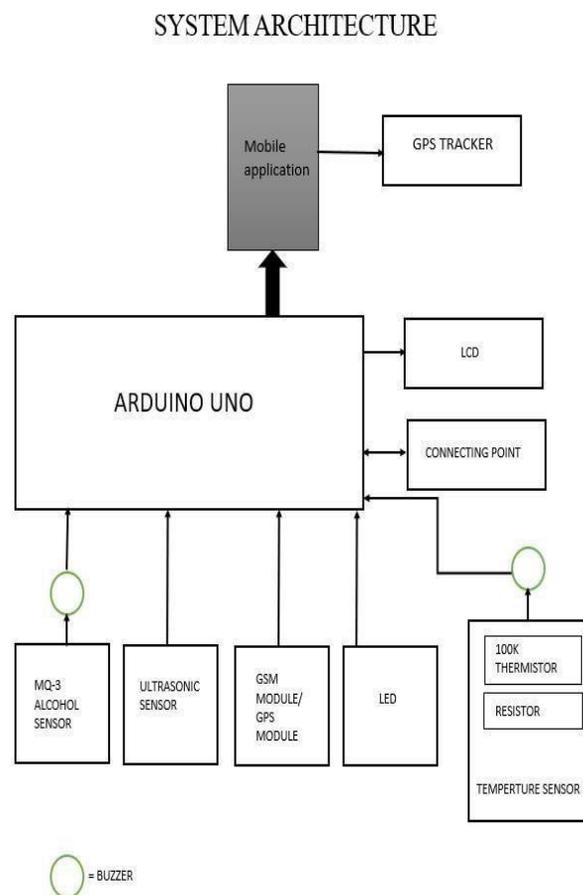


FIGURE 4.1. SYSTEM ARCHITECTURE

ENGINE HEAT:

Engine heat is detected using set of resistors and thermistor, if the temperature goes beyond the critical temperature, alert is sent to avoid ceasing of engine. The resistors will provide the necessary friction to the current flow, from a continuous current supply for every 10s the engine heat will be checked, in case of engine temperature exceeding the recommended temperature or the critical temperature alert will be sent

Hardware:

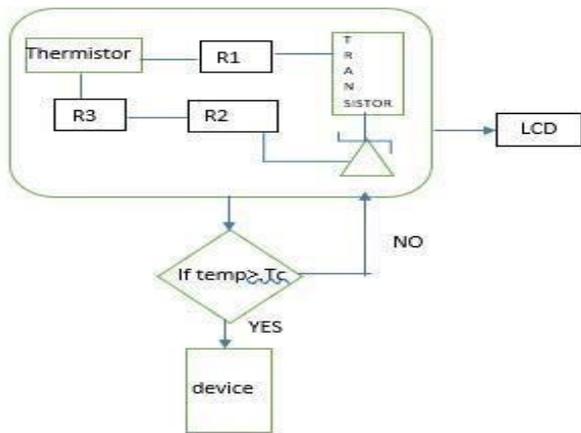
- Thermistor
- Transistor
- Resistor
- Zener diode

ALGORITHM:

STEP 1: Combining the hardware components together.
 STEP 2: Connection of circuit to LCD to give an output. STEP 3: Connection of circuit to LCD to device for reading output.

STEP4: Programming in Android Studio to receive information through hardware components.

STEP 5: Set a temperature constraint above which if the temperature reaches, it beeps and sends alert along with buzzer.



Tc = Critical temperature

FIGURE 5.1. ENGINE HEAT DETECTION FLOW DIAGRAM

ALCOHOL SENSOR

Alcohol presence will be detected using the MQ-3 ethanol sensor connected to the internet and thus the alarm buzzes on detection, and the engine is locked preventing the drunk driver from driving.[6]

Hardware:

- MQ-3 Alcohol Ethanol Sensor
- Arduino UNO
- 10 Ohm Resistor
- Microtivity lm206 6*6*6mm tact switches

ALGORITHM:

STEP 1: Combining the hardware components together.
 STEP 2: Connection of circuit to Arduino. STEP 3: Connection between Arduino and Android Studio for reading input. STEP 4: Programming in Android Studio to receive information through hardware components. STEP 5: If alcohol

presence is detected, command sent to lock engine and send alert as a message along with buzzer.

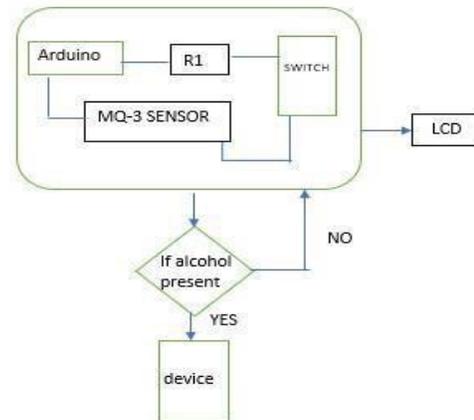


FIGURE 5.2. ALCOHOL DETECTION FLOW DIAGRAM

MAPS:

ALGORITHM:

STEP 1: GSM Module connected to Arduino
 STEP 2: Arduino further connected to GPS
 STEP 3: Your vehicle visible on map
 STEP 4: Entering start and end location on Google map and follow route

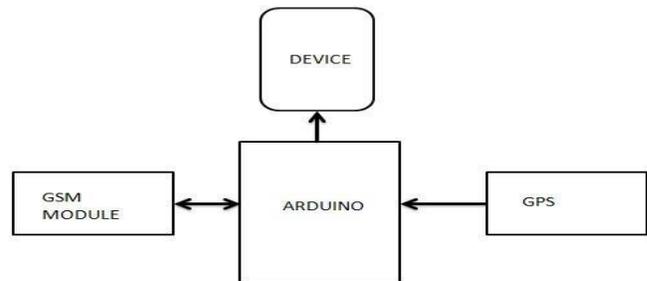


FIGURE 5.3. MAP FLOW DIAGRAM

OBSTACLE/VEHICLE DETECTOR:

Use of ultrasonic sensors will detect and find the distance between the obstacle and your vehicle. Since ultrasonic sensors travel in form of sound waves it can detect even tiny obstacles like, rock, bricks etc; The Arduino UNO board connected to these sensors and your cellular device will receive the input and will thus be programmed in such a way that it will send it through the GSM module to the intranet and thus no need of having a cellular network; for example, barriers like bumpers and tree or rocks the alert alarm will be shown which can help you in slowing down your vehicle
 Hardware:

- Ultrasonic Sensor
- Arduino UNO
- Gsm/gps Module

ALGORITHM:

STEP 1: Combining the hardware components together.

STEP 2: Connection of circuit to Arduino.

STEP 3: The moment the sensors sense some obstacle, alert message is sent along with distance.

STEP 4: Programming in Android Studio to receive information through hardware components.

STEP 5: Conditions applied for emergency situation for speed dial and messaging.

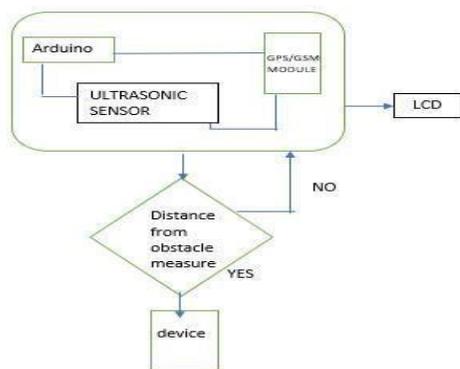


FIGURE 5.4. Obstacle/vehicle detection flow diagram

The software application will embody all these modules into a single entity and user can choose between maps/tracker while the alcohol presence and engine heat will be involuntarily monitored, the user need not monitor these; alerts will be sent in form of messages, beeps through buzzer, in case of emergency there I speed dialling which the user can alter based on convenience.

5. CONCLUSION

The idea projected in this paper speaks of the various reasons of accidents and its prevention. If put into practice many lives can be saved and it will be a great help for the society since its not expensive or complex and can be used through simple user interface- an application accessible through any mobile device. The future scope of this project is to implement weather monitoring system along with these modules, and a database system for storing and tracking the vehicle information so that the user remembers and can have everything on hand with its license and Aadhar card as a secured database which can help in getting more information about the user in case of accidents. The most important part of this project is it is simple and easy to use.

REFERENCES

[1] Detection and Discrimination of obstacle to vehicle environment under convolutional network- {978-1-5386-1243- 9/18/\$31.00_c 2018 IEEE} Author- Penghua Li1,2, Yi Mi1, Chunyan He1, Yuanyuan Li1
[2] G. O. Obstacle Detection for Intelligent Transportation and K- nearest neighbour {1558-1748 © 2018 IEEE}. Author- Abdelkader Dairi, Fouzi Harrou , Member, IEEE, Ying Sun , and Mohamed Senouci vol. 3, J. Peters, Ed. New York: McGraw-Hill, 1964, pp. 15–64.