Automatic Vehicle Monitoring System

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----------ABSTRACT----------

This document aids in the real-time chase of a car and aims to reduce the risk of mortality caused by a delay in the arrival of assistance by informing concerned individuals about the vehicle's misfortune. Our lives are now easier thanks to the technology and infrastructure's rapid progress. The development of technology has also increased traffic dangers and the frequency of road accidents, which results in significant loss of life and property due to inadequate emergency resources. According to a government assessment, drowsy driving and intoxicated driving account for 22 and 33 percent of accidents in India, respectively. If aid can be obtained as soon as possible, the number of lives lost can be reduced. This study suggests a system that can determine whether a driver is drowsy or not, and if it does, it would send a signal to the cloud and play an alert to wake him up. Additionally, a led alert will start if the engine temperature rises above a specified threshold. Also, in the event of an accident, the GPS coordinates will be captured, sent to a cloud platform, and an email will be sent to the designated person informing them of the accident and including a Google Maps link showing the accident spot.

Keywords - **Accident, Vehicle, Safety, Monitoring, Detection, IoT, OpenCV, GPS Module**

I. INTRODUCTION

Road accidents are the worst thing that happens to any car user and this happens usually. The main problem here is that we humans can't learn from our mistakes. Even for any human encountered with any accident, it is not guaranteed that that individual will not repeat the same mistake again and again.

And, as the number of autos grows, resolving issues such as automotive accidents and risks becomes increasingly challenging. Accidents have exceeded estimates in many places, posing a threat to public safety and resulting in human loss. The main human behavior the cause of the accidents are over speeding, drunken driving, distractions to the drivers, red light jumping, and avoiding safety gear like belts and helmets and also the main clause is about wrong side driving and lane cutting now, Internet of things is everywhere and its significance and impact is rapidly growing in every sector and it is helping in all the domains whether it is agriculture, technical, scientific or automobile. So using the technology of the Internet of things, This paper puts forth an Automatic Vehicle Monitoring System.The role of AVMS is to prevent deaths and injuries by reducing the number of car accident casualties due to the serious impact of those that cannot be avoided.

The driver is assisted by this mechanism during the driving procedure. when designed with a safe and appropriate Human-Machine Interface, it increases the safety of the car and more generally the road safety.

Hence, we have designed advanced security and monitoring system which has some features like if the engine gets overheated then it will alert the user and if the car has collided with some obstacle or car got with some accident, then the GPS module will directly send the coordinates over the mail to a particular person to whom it regards to.

II. RELATED WORK

According to the literature analysis, a lot of work has gone into detecting an accident and alerting emergency medical personnel. Accidents cause catastrophic situations for victims, and accidents on roads, in particular, have a major negative influence on a big number of people. They create an intelligent accident detection, tracking, and alerting system that recognizes an accident as soon as it occurs. The accelerometer identifies the collision based

on a change in the vehicle's preset orientation value and delivers the exact location of the accident is determined using a Global Positioning System (GPS) device.[4]

A notification message is sent via the Global System for Mobile (GSM) module to the nearest police control room and hospital, along with a link to the location on Google Maps, so that they may go to the website, figure out the quickest route to the accident scene, and take action to speed up the rescue procedure[1].

There is another method when a car is involved in a collision, an impact sensor, a piezoelectric sensor transducer, and a micro-electro-mechanical system (mems) receive the signal and communicate it to the Arduino (Atmega328P). The signal is immediately sent to the GPS module, which provides the precise value of the geographical coordinates, which includes longitude, latitude, and altitude. The microcontroller then uses the GSM module to send an alarm message to others who are close to him or her. In the event of a theft, our invention enables the owner to obtain his vehicle's location in terms of Latitude and Longitude, as well as a link to Google Maps, by sending a text message to the system's SIM.[10]

Some significant offenses, such as driving while inebriated, failing to obey traffic signs, and speeding, may result in harsh consequences. Authors seek the Advanced Driver Assistance System to avoid scenarios like this. ADAS can improve driving safety and comfort. Driving circumstances are electronically handled, and the driver's judgments are eased. This technology may potentially provide several benefits to the elderly. The human-machine interaction in ADAS is meant to increase road safety somewhat human error-related accidents can also be reduced.[2]

Drowsy driving and drunk driving, respectively, account for 23 and 32 % of all accidents in India, according to a government estimate. The number of lives lost can be lowered if assistance is sought as soon as feasible. This article enables the pursuit of a vehicle in actuality and by informing interested parties about the vehicle's collision, hopes to reduce the risk of deaths brought on by interruptions in the arrival of help.. To build a system that can inform concerned folks about the tragedy, GPS, GSM, and Arduino Uno, that acts as the controller, is connected to accelerometer modules.[5]
On-board sensors are used by current advanced driver assistance systems (ADAS) to detect targets within a specific range, they are unable to fulfill collision warning criteria at high speeds and over long distances; moreover, they are unable to provide collision warnings at complicated junctions and conflicts that may arise while the driver's view is impeded.
Within the context of the Cooperative Vehicle Infrastructure System, the research created and implemented information interaction and target fusion between automobiles and roadside devices (CVIS). The CVIS technology's simplicity of information interaction is used to create an on-board information interaction framework that combines vehicle and roadside sensor data.[6]

Although numerous traffic signs on the road help keep people safe, variable message signs (VMSs) demand extra attention, which can lead to distraction. ADAS (advanced driver assistance system) devices are sophisticated systems that assess the surroundings and give support to the driver to improve his comfort or safety. The goal of this project is to create a prototype of a VMS (variable message sign) reading system utilizing machine learning techniques, which are yet underutilized.[8]
The development of trimming technologies to maintain users safety and dangerous incidents on the road costs automakers millions of dollars every year. In the industry, these technologies are referred to as ADAS, and All of them are managed by sophisticated actual integrated devices.This presentation will cover the current state of the art in ADAS, as well as detailed overviews of previous, current, and future concepts for each kind. The development of the actual actual integrated devices will be the emphasis of each overview.[9]

In his paper, S. Kailasam [11]From the time the automobile begins, an application is built to keep an eye on the face of the driver. This allows us to keep an eye on the driver's blinking. They utilized a speed control device to keep track of the vehicle's speed, as well as a camera installed in front of the driver to check the driver's facial image and alert him if the car slowed. It is divided into two sections: low light camera operation and estimation of eye movement rate. This research displays drowsy detection and helps to avoid accidents. The controller accurately feeds data to the speedometer when the automobile is thought to be rushing, which leads the car to slam on the breaks or slow down at an arbitrary rate.

III. METHODOLOGY

In this vehicle monitoring system, there are different objectives and features. For engine overheating protection features, we have used LM-35 temperature sensors which will indicate to the user if the temperature of engines gets overheated and rises to a certain extent, and then the user will get alerted. For connecting all the things and for data transferring, we have used NodeMCU based on ESP8266 which is an open source platform and for connecting wires, we have used jumper wires. For resetting the mail sender notification system, we have added one push button. So all the email notification systems will be set to default to work again. For alerting the user when the engine overheats, we have used LED so it will turn on and blink so the driver will get alerted and for placing all the components and connecting, we have used a breadboard.

The flowchart in Fig 1 depicts how the model of AVMS works.

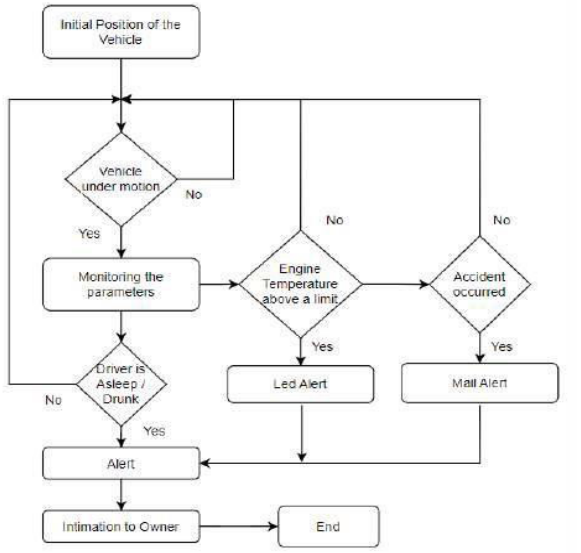

Fig.1. Model Flowchart

Once the vehicle starts its motion the process of monitoring different parameters like Engine Temperature, Acceleration of the car, its acceleration difference and drowsiness parameter (like eye and pupil coordinates). And once these parameters are recorded, they are processed to check whether the engine temperature is above the designated level, whether the driver is drowsy/ drunk/asleep and whether an accident has occurred or not . Now if the driver is drowsy, drunk or asleep he is intimated through an audio alert. If the engine temperature is above a certain threshold the driver is alerted through an led alert. And if an accident has occurred an email alert to a designated person with a google map link depicting the location of the accident is sent. And this whole process continues to loop until the car's motion stops.

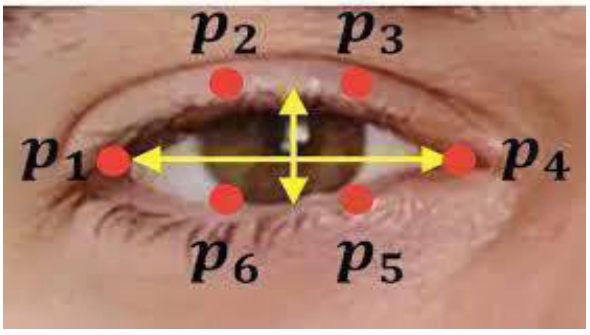

Fig.2. Eye Coordinates

The pupil coordinates are P1 to P6. When the eyes are open, the EAR is approaching 0.25. When the EAR is less than 0.25, the person is said to be sleepy.

Eye Aspect Ratio (EAR) is measured for eyes,

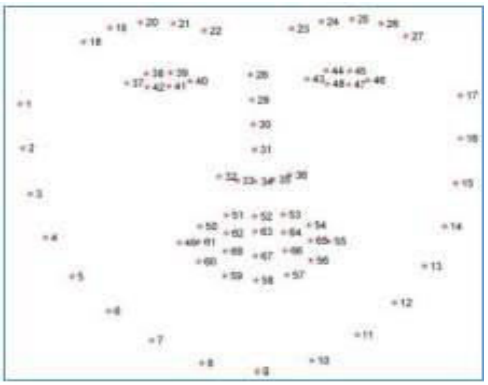

Fig.3. Face Landmarks

$$\frac{(|\ 6-P\ 2|+|P\ 5-P\ 3|)}{2(|\ P\ 4-P\ 1|)}$$

This overall model will be carried out in 3 phases such as:

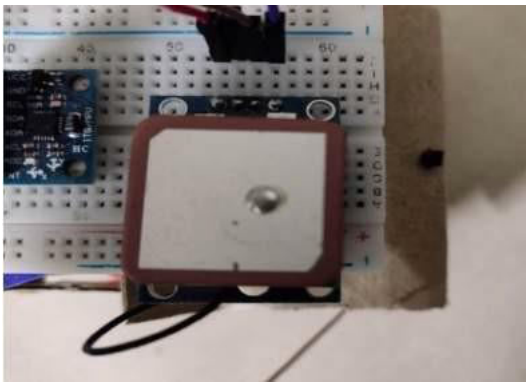

Fig.4. Neo 6m GPS module

3.1 Drowsiness Detection

In this phase, we have detected the driver's drowsiness which works on two processes. The technique starts with capturing the camera's live video pixels and then transferring them onto a nearby server. The Dlib package is shown on the client side to identify markers, and a limit is used to determine whether or not the driver is tired. After that, the EAR (Eye Aspect Ratio) is calculated and returned to the driver utilizing these facial landmarks. In our system, the EAR value acquired at the application's end is compared to a 0.25 threshold value. If the EAR number is below the threshold value, it means you're tired. An alarm would sound if the driver or passengers were drowsy. The next section explains how each module works.

3.1.1 Components

We used OpenCV and Python to create a sleepiness detection system. The Dlib package has a pre-trained facial marks detector which is used to identify and locate face landmarks. 68 face landmarks were utilized in this strategy.

and this sensor can add up to 5 location updates in the interval time of 1 second.

3.2 Accident Detection

3.2.1 Components

Now, for vehicle accident detection or if a vehicle gets collided with some obstacle, so we have used Mpu 6050 sensor which is a six-axis motion tracking device with a gyroscope and accelerometer and another component we have used is the neo-6m chip which is a GPS receiver with built-in ceramic antenna which will work as GPS module

3.2.2 Working

In this phase, we have mainly focused on accident detection
systems. So, whenever a vehicle will get collided with any obstacle or vehicle got an accident thempu 6050 sensors will sense that and it will gather coordinates of the current

The distance between the upper and lower eyelids is calculated by the numerator. The divisor represents the fundamental distance between the eyes. When the eyes are open, the numerator value rises, which raises the EAR value, and when the eyes are closed, the numerator value falls, which lowers the EAR value. EAR readings are utilized in this situation to assess the driver's alertness. It calculates the mean of the EAR readings for the left and right eyes. In our sleep detector, the Eye Aspect Ratio is monitored to check whetherIt drops below the cutoff value and won't rise beyond it in the following frame. The person in the foregoing situation has closed his or her eyes and is drowsy. If the EAR value goes up again, the person has just opened their eyes and is alert now.
location of the vehicle and it will send the current coordinates to the recipient's email address via mail and that individual will be received one email regarding the accident context and the coordinates of the current location of the vehicle.

3.3 Engine Overheating Prevention

3.3.1 Components

We have used the LM-35 temperature sensor for the detection of overheating of the engine.

3.3.2 Working

In this phase, we have mainly focused on the engine overheating problem, and many times, cars directly start to catch up with heat because of this engine overheating problem. So, whenever the engine overheats and crosses the temperature at a certain level, the user will be alerted by LED which will blink and will give a signal to the driver and for this purpose, we have used the LM-35 temperature sensor.

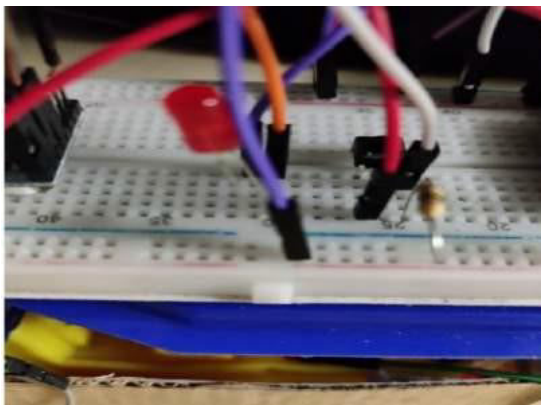

Fig.5. Led Interface

IV. RESULT AND DISCUSSIONS

The whole system can be mounted on the vehicle for working properly. The system has a sensor MPU 6050 which can be used for detecting the accident based on the decreasing acceleration. Also, the system has an integrated Neo 6m which can be used for getting the location. There is also a temperature sensor integrated with the system for getting the values of the temperature of the engine of the vehicle. If the temperature goes past a certain limit then the LED turns ON.

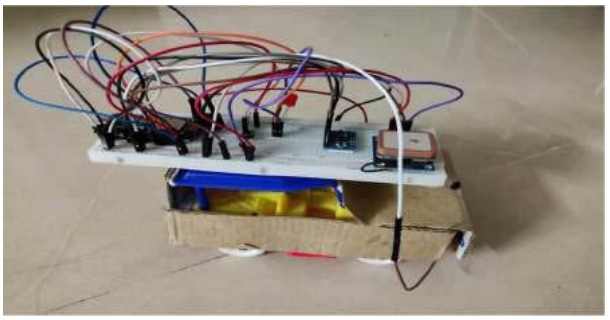

Fig.6. Circuit Diagram

We used a camera connected to the computer for this project. When sleepiness is detected (In Fig.7), the system's built-in speaker is used to emit a sound to awaken the driver. The framework was tested on a variety of people in a variety of lighting settings (daytime and evening).

Fig.7. Drowsiness Detected

Knowing the location of the accident plays a significant role in reducing casualties. Because if the coordinates are known a person will be able to call an ambulance and give them their location coordinates. Now if an accident is detected the latitude and longitude are fetched from Neo6m and then they are transferred to Thingspeak which then displays those locations as depicted in fig 7.

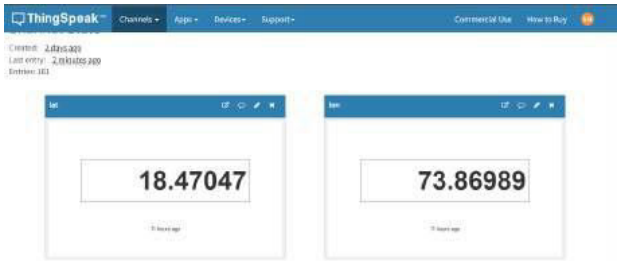

Fig.8. Location Coordinates

An automatic vehicle monitoring system is developed which can detect the accident and send the email to the concerned person that the accident has happened and that person can call an ambulance as also the location is sent on the email as shown in figure 8.

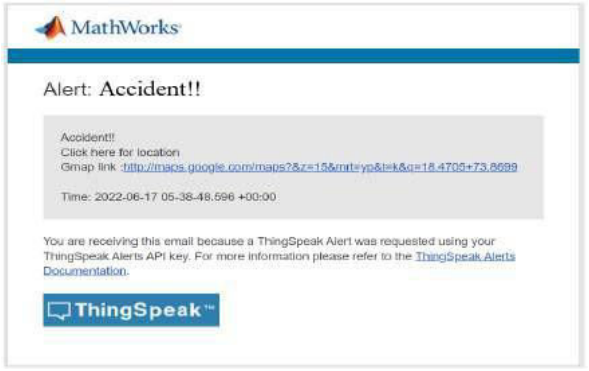

Fig.9. Gmail Alert

V. FUTURE SCOPE

Further, we can add vehicle wheel tire monitoring systems which will alert the driver if the pressure of the wheel gets reduced at a certain level. It will eventually save people time for checking their tire pressure again and again.

Also, we can directly send messages and coordinates to the nearby hospitals and ambulances if a vehicle gets engaged in any accident so immediate help can be carried out and the lives of the people can be saved. Many times the reason for the person's death in an accident is due to late medical assistance which can be reduced to a great extent due to this system.

VI. CONCLUSION

Automatic vehicle monitoring systems are the need of today's world and as day by day passes, vehicles will evolve to a great extent. This technology will also get evolved by adding more and more advanced features which will be realistic also and on the same side from the side of security also.

Automobile accidents are considered to be one of the most harmful events. Although there are many distinct factors that contribute to automobile accidents, driver negligence and irrational speeding are the main causes of injuries. Additionally, it appears that difficulty in reaching the accident site on time is a big issue. Therefore, an automatic vehicle monitoring system using Internet of Things (IoT) technology is the answer to lowering accident rates. The death toll from accidents can be decreased because of the vehicle monitoring system. By using a few sensors and a controlling board, an automatic vehicle monitoring system can prevent accidents. The usage of GPS and GSM modules makes it simple to provide medical assistance in the event of an injury, which can be incredibly helpful in saving lives. Vehicle monitoring systems are the need of the time as accidents or mishaps on road are very common nowadays, therefore vehicles are supposed to be more advanced and evolved so that even if anything happens, the lives of people are not lost.

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