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A Driver Health Monitoring-based Accident Prevention System for Commercial Vehicles in India

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ABSTRACT

In the growing nation, road transportation is crucial. Accident rates will rise in tandem with an increase in road traffic. There are several categories in which accidents might arise. Among these reasons, one significant cause—the accident resulting from a heart attack—is chosen here. The majority of the time, it is seen that drivers who experience heart attacks abruptly lose control of their vehicles, which leads to accidents. The suggested system aims to address this problem by identifying heart attack symptoms early and automatically slowing down the vehicle. It also applies a gentle hand brake to bring the car to a stop, and it uses GSM services to send a GPS-coordinated message to the relevant department, such as the health department. The goal of the suggested approach is to raise the survival rate.

***Keywords*—** Arduino, GSR Sensor, Flex Sensor, Servo Motor, DC Motor, Motor Driver

I. INTRODUCTION

Road transport is playing an important role in the developing country. As road transport increases it will increase the chances of accidents. In most of the cases it is observed that accidents were happened due to driver gets heart attack and suddenly driver loses his control on vehicle so that accident happens. The proposed system will try to resolve this issue by early detecting the heart attack condition. This paper mainly focusing on the implementation of two type of sensors one is GSR sensor and another is flex sensor these are used to provide safety measures for the driver. The human heart beats are changing according to the situations if there is panic situation GSR sensor will detect it so the driver's heart beats are continuously monitored by that sensor, which uses Internet of Things control to prevent accidents. IOT notifies the owner, the ambulance, and the police of the emergency. For that notification the GSM SIM 800L is used with.

If it is discovered that the person's heartbeat has risen, the brakes will be applied automatically, and the car will gradually come to a halt, with one alarm message sent to family or the emergency system with GPS coordinates so that they can quickly approach the location. There is an alcohol detection sensor that detects whether or not the driver is intoxicated, and if so, the engine will not start. If the driver believes he is in a severe position and his hand grips are losing from the steering wheel, an alarm will be issued within the car, and if he does not reply, the automobile's speed will be reduced. The entire system is built on IoT and operates via GSM.

II. METHODOLOGY

The ATMEGA 328P serves as the foundation for the suggested project. The signal from the sensor is detected by the Arduino. There are two sensors used to assess the driver's health, one of which measures the driver's heartbeat. This sensor should be worn on the driver's finger. It will use the Pan-Tompkins algorithm to monitor heartbeats. The steering wheel has a gripper that senses when a person's hands are pressing down on it. Loss of grip due to a change in pulse rate indicates the onset of a heart attack. The message will be send on the registered mobile number regarding the alert about drivers health and slowly speed is reduces as well as the handbreak is applied using servo motors and movement of wheels will be changing to the road side according to the signal receiver from the ultrasonic sensor. Means vehicle will try to maintain the safe distance to protect the vehicle from accident. That system will try to improve the survival rate and reduce the chance of accident after driver bad health condition. The following diagram is used for the working of proposed system.

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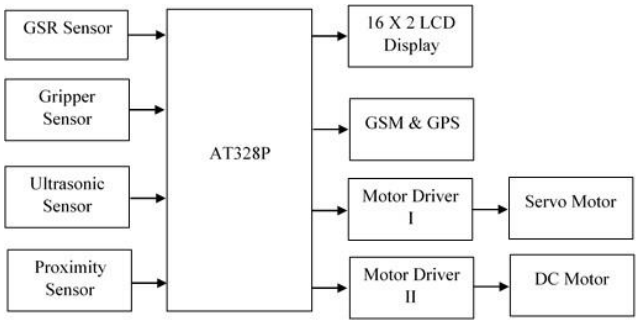

Figure 1: Block diagram of proposed system

III. LITERATURE SURVEY

Murali Subramaniyam and Deep singh in their article analyze the focuses on the latest advancements in driver health and comfort monitoring using IoT. After literature review Murali found an issue related to driver drowsiness and health there is in need of advancement. She categories the advancements which are divided into two categories: health monitoring achieved using seat pan, seat back, seat belt, steering wheel, eye and face tracking and second is the comfort monitoring/enhancement this is achieved by, smart sitting, smart seat cushion, smart door module, smart airbag, smart seat belt buckles[1]. Natalie Watson-Brown in her paper introduces the rules which should be followed by the system for the safety regularity of the driver [5]. This survey will give in-depth information on current developments in automotive and IoT. Tianyue and Zheng's research focuses on V2iFi, a new system for in-vehicle vital sign monitoring that addresses privacy and complexity limitations with current driver health monitoring approaches [7]. The work "Driver Vital Signs Monitoring Using Millimeter Wave Radio" focuses on a novel system for monitoring driver vital signs via millimeter-wave radio, overcoming the limitations of conventional methods that assume stationary settings [8]. In their research analysis, Hiroaki and Hayashi emphasize multi-sensor monitoring systems that evaluate physiological data, posture, and verbal exchanges to improve driver health detection and minimize accident risk [9]. Fayssal and Hamza introduced an intelligent system for real-time driver health monitoring that focuses on cardiac and respiratory activities using electrocardiographic and photoplethysmographic techniques, therefore improving road safety [10].

IV. COMPONENTS USED

The Following sensors are used in the proposed system,

a) **GSR Sensor:** Galvanic skin response, or GSR for short, is a technique for determining the skin's electrical conductance. Your sympathetic nervous system may be stimulated by intense emotions, which will cause your sweat glands to release more perspiration. Grove-GSR enables you to identify such intense feelings by simply placing two electrodes on one hand's two fingers. If the heart beats are increased that will be detected by this sensor easy and after calculation it will predict the heart attack symptoms.

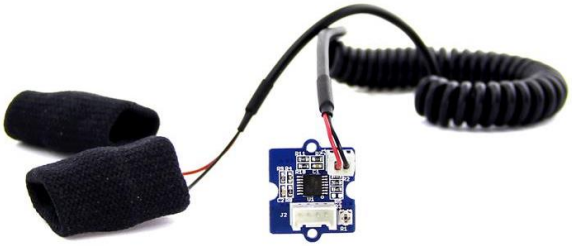

Figure 2: GSR sensor

b) **Flex Gripper Sensor:** A sensor that gauges the degree of deflection or bending is called a flex sensor or bend sensor. Typically, the sensor is adhered to the surface, and the surface is bent to change the resistance of the sensor element. It is used as a goniometer and is also known as a flexible potentiometer since the resistance is directly proportional to the amount of bend.

Figure 3: Flex Gripper sensor

c) **Ultrasonic Sensor:** Devices that produce or detect ultrasonic energy include ultrasonic transducers and ultrasonic sensors. Transceivers, receivers, and transmitters are the three main categories into which they may be separated. Transceivers can transmit and receive ultrasound, transmitters can convert electrical impulses into

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ultrasound, and receivers can convert ultrasound into electrical signals.

Figure 4: Ultrasonic sensor

d) **Proximity Sensor:** A proximity sensor (often simply prox) is a sensor able to detect the presence of nearby objects without any physical contact. A proximity sensor often emits an electromagnetic field or a beam of electromagnetic radiation (infrared, for instance), and looks for changes in the field or return signal. The object being sensed is often referred to as the proximity sensor's target. Different proximity sensor targets demand different sensors. For example, a capacitive proximity sensor or photoelectric sensor might be suitable for a plastic target; an inductive proximity sensor always requires a metal target.

Figure 5: Proximity sensor

V. RESULT

Software simulation is developed for the proposed project to check the system accuracy and how system will be operated. According to that the resulting circuit diagram is as follows,

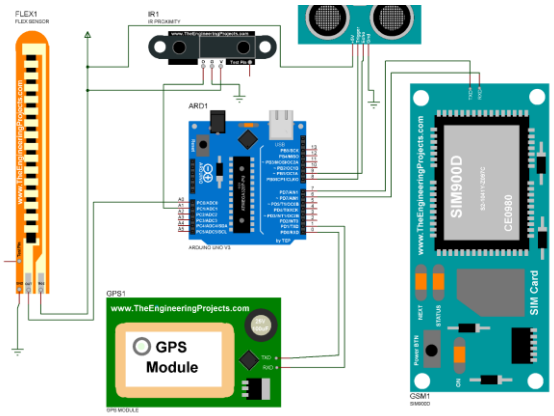

Figure 6: Actual Working Diagram of Proposed System

Here TX and Rx pins of GPS and GSM modules are attached with the arduino UNO. The serial data communication will be develop between UNO and these models. Flex gripper sensor measure the pressure exerted on the steering wheel and convert it into the electrical signal, whatever the signal received system will check the proximity sensors output and according to that motor driver will be operated the wheel motor and hand break motor. The Fig. 7 displays the motor connection diagram with the arduino uno.

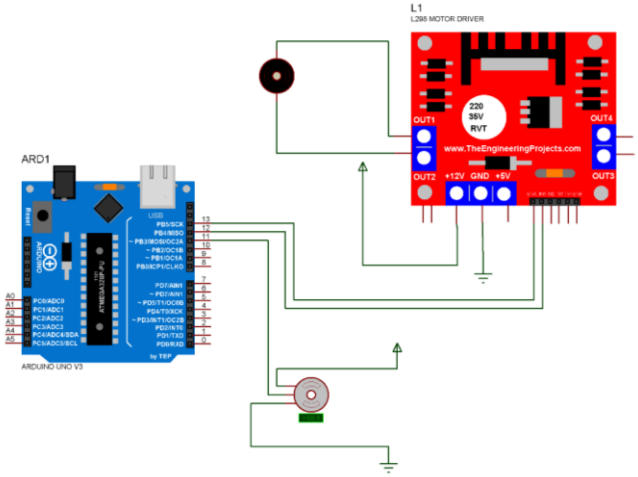

Figure 7: Actual Working Diagram of Proposed System

VI. FUTURE SCOPE

A driver health monitoring-based accident prevention system for commercial vehicles in India has a wide range of potential applications in the future, particularly given its alignment with the expanding trends in AI, IoT, and smart transportation. In the future, autonomous driving features may be combined with health monitoring systems, allowing the car to safely park or

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reduce speed in the event that the driver's condition unexpectedly deteriorates. The system's capacity to anticipate and stop incidents linked to health might be improved by applying machine learning models to a sizable collection of tiredness and health indicators. Authorities might establish rules and guidelines for driver health monitoring in commercial transportation by integrating health data with national safety databases.

VII. CONCLUSION

In conclusion, there is great promise for improving road safety, particularly in commercial vehicles, using an accident prevention system based on driver health monitoring that makes use of Arduino, GPS, GSM, flex sensors, and GSR (Galvanic Skin Response) sensors. The central controller, Arduino, effectively processes sensor data and permits real-time monitoring. GPS Enables accurate vehicle monitoring, which is essential if an alarm is set off since it lets fleet management and emergency services know the position of the vehicle. GSM Enables prompt action by facilitating contact between the car and control centers by delivering notifications regarding the driver's location or health. Flex sensors measure a driver's posture and can assist spot unexpected movements or symptoms of exhaustion that could point to a medical emergency or sleepiness. GSR Sensor Provides additional information about the driver's present condition by measuring skin conductivity to determine stress or alertness levels.

By integrating these components, the system is able to send notifications to fleet management or emergency contacts in the event of aberrant readings in addition to continuously monitoring the driver's vital signs and level of attentiveness. By preventing accidents brought on by driver weariness, stress, or unexpected health problems, this proactive approach to health monitoring can improve road safety overall.

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