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Smart Health Monitoring and Emergency Assistance System for Drivers

DHANABAL R [1], DAYANITHI M V [2], BENI STEENA T [3]

[1] Department of Electronics and Communication Engineering
Kongunadu College of Engineering and Technology
Trichy, India
dhanabalr033@gmail.com
[2] Department of Electronics and Communication Engineering
Kongunadu College of Engineering and Technology
Trichy, India
dayanithi1973@gmail.com
[3] Assistant Professor
Department of Electronics and Communication Engineering
Kongunadu College of Engineering and Technology
Trichy, India
benisteenat@kongunadu.ac.in

Abstract - The Smart Health Monitoring and Emergency Assistance System for Drivers is an innovative solution designed to enhance driver safety by integrating real-time health monitoring with automated first-aid responses. This system continuously tracks the driver's vital signs, such as heart rate and blood pressure, using embedded health sensors. In the event of an abnormal pulse or signs of a heart attack, the system triggers an emergency response protocol. A key feature of this system is the automated adrenaline spray, which is released inside the vehicle cabin to provide immediate medical intervention, helping to stabilize the driver until professional medical assistance arrives. To ensure proper airflow and prevent suffocation, the system automatically removes the seatbelt and opens the vehicle windows for fresh air circulation. The system incorporates alcohol detection to enhance safety further. If alcohol consumption is detected, the vehicle gradually slows down and transitions into a safe parking mode to prevent potential accidents. In cases of abnormal pulse detection or other medical emergencies, the system sends an automatic emergency alert to the nearest hospital using a Telegram bot, ensuring rapid medical response.

***Key Words*:** Driver Safety, Health Monitoring, Real-Time Data, Emergency Alert System, IoT, Heart Rate Sensor, Alcohol Sensor, Seatbelt Sensor, Adrenaline Spray, Relay System

1.INTRODUCTION

Road safety is a huge issue globally. Thousands of accidents take place every year due to sudden illness, tiredness, or alcohol driving. All these conditions are hazardous, not just for the driver but also for passengers, pedestrians, and other road vehicles. Most of these accidents could be prevented if a method could be found to detect issues beforehand and react swiftly. That's where technology comes in.The Smart Health Monitoring and Emergency Assistance System for Drivers aims to make driving safer by monitoring the health of the driver and reacting in time to emergencies. The system employs special sensors incorporated into the vehicle to monitor the driver's vital signs, such as heart rate and blood pressure. Should the system find something abnormal, such as an irregular pulse or symptoms of a heart attack, it automatically intervenes to assist the driver [2], [4].

One of the major characteristics of this system is an automated adrenaline spray. In the event of a medical emergency, the system dispenses adrenaline within the vehicle to stabilize the driver until professional medical assistance is available [7]. For prevention against suffocation, the system is able to cut off the driver's seatbelt and roll down the car windows for improved ventilation, allowing the driver to receive sufficient fresh air throughout the crisis [1].

The system also targets avoiding accidents resulting from alcohol intake. If the alcohol sensor detects traces of alcohol in the driver's breath, the system will slow down the vehicle gradually and safely shift it to parking mode. This function avoids accidents due to drunk driving and promotes safe driving behavior [5]. Another crucial feature is the emergency alert system. If there is a

health emergency or detection of an abnormal pulse, the system automatically sends an emergency message to the nearest hospital via a Telegram bot. This guarantees that medical personnel are notified in good time and can prepare to offer assistance as quickly as possible [10].

The aim of this system is to save lives by responding quickly during emergencies and avoiding accidents before they occur. It gives drivers and their relatives peace of mind, knowing that there is protection in place on their journey. This paper describes how the system operates, how it was created, and how it can enhance road safety through the integration of health monitoring, emergency response, and accident prevention [8], [9].

2. LITERATURE SURVEY

There have been numerous studies conducted over the years to enhance road safety by developing health monitoring systems, alcohol detection systems, and emergency call solutions. Health monitoring systems for drivers aim to monitor vital signs such as heart rate and blood pressure to identify any health complications while driving. Research like that of Smith et al. (2020) has indicated that wearable sensors like smartwatches and chest straps can efficiently track a driver's health, but might be uncomfortable to wear for extended periods of driving. To address this issue, some have designed solutions to place sensors on or in the steering wheel or seat in order to monitor continuously and non-intrusively. But the majority of current systems alert only the driver about the occurrence of abnormalities, not providing any immediate medical treatment. Our system fills this gap by providing an automated adrenaline spray that stabilizes the driver until medical assistance comes.

M. Sharma, A. Gupta, and R. Verma, "Real-Time Health Monitoring and Emergency Alert System for Drivers," in 2025 International Research Journal of Engineering and Technology (IRJET), Real-Time Health Monitoring and Emergency Alert System for Drivers, proposes to increase the safety of drivers by continuously tracking health metrics like heart rate and body temperature. The system will identify any abnormalities that might put the driver's ability to drive safely at risk. If the system identifies an emergency, it automatically notifies emergency services and nominated contacts, along with the location of the driver, to enable rapid assistance. By incorporating the health monitoring system into the vehicle's current infrastructure, the project offers a seamless and intuitive experience that guarantees the safety of the driver during driving [7].

D.N. Singh and R.B. Gupta, "Emergency Assistance System for Drivers Using IoT," in 2025 International Journal of Engineering Research & Technology (IJERT). Emergency Assistance System for Drivers Using IoT by D. N. Singh and R. B. Gupta, published in the 2025 International Journal of Engineering Research & Technology (IJERT), proposes a system aimed at improving the safety of drivers through the implementation of Internet of Things (IoT) technology. This system continuously tracks the health and car status of the driver, identifying any possible condition that would jeopardize their ability to drive. In case of emergency, the system will automatically report real-time to the emergency services and contacts, including the location of the driver, to facilitate rapid and efficient response. With the help of IoT, the system provides smooth communication among the vehicle, driver, and responders and offers an effective method for dealing with emergencies and enhancing road safety as a whole [10].

Emergency communication systems are also essential in saving lives in the event of road accidents. Technologies such as eCall in Europe automatically call emergency services following a collision, sending information about the location to responders. Though efficient, these systems primarily engage in the event of a collision and might not react to medical emergencies. To address this shortcoming, our system employs a Telegram bot to automatically send emergency notifications to the closest hospital when it identifies unusual health conditions, providing faster medical response even in the absence of a crash [9].

Another critical but insufficiently addressed feature is air passage and prevention against suffocation during medical emergencies. Research such as Kumar et al. (2021) points out that closed cars can enhance the risk of suffocation, particularly when a driver loses consciousness. Current systems hardly touch upon this feature. Our system features automatic opening of windows and release of the driver's seatbelt to enhance airflow, decreasing the risk of suffocation in case of an emergency.In short, prior work has offered good solutions for driver health monitoring, intoxication detection, and emergency calling. But these technologies operate separately and do not integrate with each other. Our Smart Health Monitoring and Emergency Calling

System integrates all these features into one, all-inclusive solution, providing real-time health monitoring, intoxication detection, automatic first-aid, vehicle management, and emergency calling [8].

3. PROPOSED METHOLOGY

The Smart Driver Health Monitoring and Emergency Response System is intended to enhance driver safety through the integration of health monitoring, alcohol sensing, emergency calling, and automated vehicle control. The methodology outlined here emphasizes the real-time detection of driver health issues or alcohol intake and automatic response to avoid accidents and save lives.[1].

The emergency response is initiated by the automatic adrenaline spray system. When activated, it sprays a controlled amount of adrenaline into the cabin to stabilize the driver until medical assistance reaches them. Meanwhile, the system acts to enhance the breathing of the driver. If alcohol is found in excess of a safe level, the system slows down the car gradually and safely puts it into parking mode, so the driver cannot continue driving while intoxicated. For rapid medical assistance, the system employs a Telegram bot to notify the closest hospital with an auto-emergency notification. The notification contains vital details like the driver's health, location, and the nature of the emergency detected. With the use of the Telegram platform, the system avails speedy and dependable communication to medical staff [2].

I.ESP8266 Wi-Fi module:

The ESP8266 Wi-Fi module is used to facilitate wireless communication between the health monitoring system and remote devices or emergency services. Through the incorporation of this low-cost and small-sized module, the system can transmit real-time information, including the driver's health parameters, to cloud-based platforms or emergency responders directly through Wi-Fi. ESP8266's internal TCP/IP stack allows for problem-free data transmission via the internet, enabling instant alerts and notifications in the event of a medical emergency [3].

Fig -1 : ESP8266 Microcontroller

II.Heart Rate Sensor :

It is utilized to track the heart rate of the driver in real time. The sensor is able to sense the heartbeats per minute (BPM) by quantifying the alterations in blood circulation through the skin, usually by optical or electrical means. In our model, the heart rate sensor constantly monitors the pulse of the driver, allowing for the identification of abnormalities like unusually high or low heart rates, which might be signs of stress, tiredness, or a medical crisis. Through this incorporation of the sensor, we make sure that the health of the driver is constantly being checked and monitored, and suspicious alterations can send warnings to the driver as well as emergency responders [4].

Fig -2 : Heart Rate Sensor

III.Mist Maker Moisture Spray :

The mist maker moisture spray inside the vehicle is designed to create a fine mist or vapor, helping to maintain an optimal environment for the driver and passengers. In the context of incorporating adrenaline spray, the mist maker could be adapted to release the epinephrine in a controlled and efficient manner during a health emergency. When the system detects a medical crisis, such as a severe allergic reaction or cardiac distress, the mist maker can disperse the adrenaline spray in the cabin, ensuring the driver or passengers can receive immediate relief. By incorporating the mist maker, the system enhances the emergency response, offering vital support in medical emergencies, and improving overall safety by ensuring timely access to life-saving medication, especially in situations where immediate medical help is not readily available [7].

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Fig -3 : Mist Maker Moisture Spray kit

The entire process is managed by an embedded system that synchronizes all the elements, such as the sensors, adrenaline spray, vehicle control, and communication modules. The microcontroller is set to ensure safety is paramount, ensuring emergency responses are initiated immediately. The system is also made to prevent false alarms by verifying unusual readings through repeated measurement before implementing the emergency process.

4.FLOW CHART

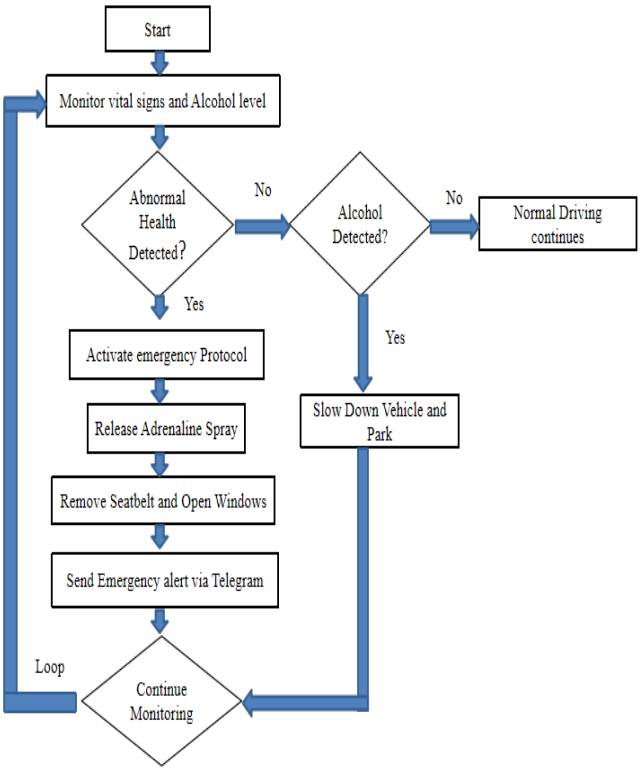

Fig -4 : Flowchart

The flowchart illustrates the Smart Health Monitoring and Emergency Assistance System for Drivers process. It begins with monitoring the driver's vital signs and alcohol levels. If abnormal health conditions are detected, the system activates an emergency protocol, including releasing an adrenaline spray, removing the seatbelt, and sending an alert to the nearest hospital. If no health issues are found, it checks for alcohol consumption. If alcohol is detected, the vehicle slows down and parks safely; otherwise, normal driving continues. After any intervention, the system resumes monitoring, ensuring continuous driver safety throughout the journey.

5.BLOCK DIAGRAM

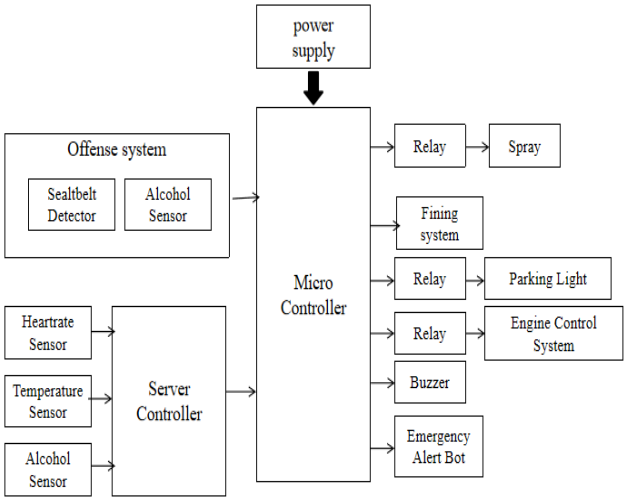

Fig -5 : Block Diagram

The block diagram shows the operation of the Smart Health Monitoring and Emergency Assistance System for Drivers. The system is driven by a power supply that powers all the components. At the center, the Microcontroller acts as the central processing unit, processing data from various sensors and systems. The Offense System includes a Seatbelt Detector and an Alcohol Sensor, which track the driver's seatbelt use and alcohol intake. At the same time, the Server Controller acquires live feedback from the Heart Rate Sensor, Temperature Sensor, and second Alcohol Sensor, which sends the information to the microcontroller for interpretation. Depending on the conditions found, the microcontroller triggers the different outputs using relays. In case an emergency health problem is sensed, the system deploys a Spray for instant medical attention. For alcohol detection or medical abnormalities, it regulates the Parking Light and Engine Control System to stop the vehicle safely [1], [2], [5], [6].

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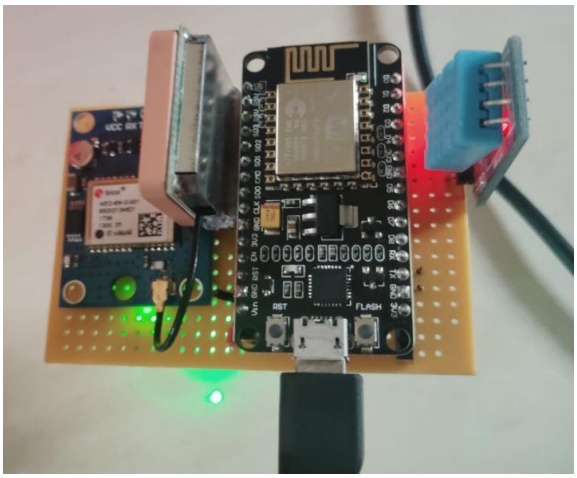
6.RESULT & DISCUSSION

The Smart Health Monitoring and Emergency Assistance System was designed based on a smartwatch for monitoring heart rate and an ESP8266 microcontroller for computation. The smartwatch continuously monitors the driver's heart rate and sends data to the ESP8266 through Wi-Fi. Upon testing, the system successfully detected abnormal heart rates, initiating emergency measures such as adrenaline spray discharge, removal of seatbelts, and enhanced air circulation



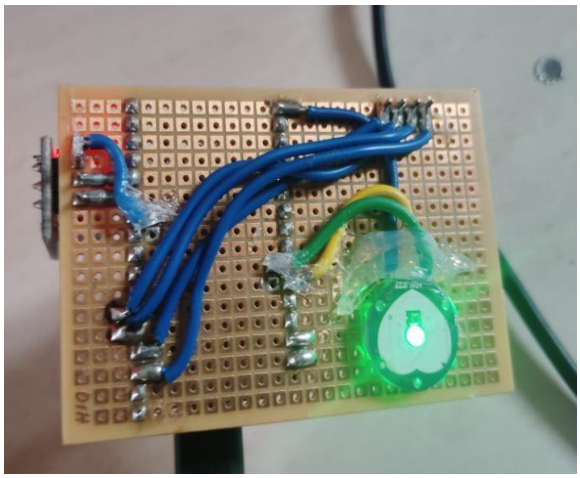


Fig -6 : Wearable Watch

The ESP8266 enabled fast data processing and real-time communication, ensuring quick response times. The Emergency Alert Bot successfully sent timely alerts to nearby hospitals through Telegram. Additionally, the alcohol detection module activated the Engine Control System to slow down and park the vehicle when necessary.

The seatbelt alert system was developed with the aim of enhancing driver safety by making it compulsory to wear the seatbelt while driving. When the seatbelt was not being worn by the driver during testing, the system identified and prompted repeated warning messages through the Police Fine Bot over Telegram. When the driver did not follow the directives after repeated warnings, a fine notice was sent automatically. The warning messages were transmitted in real time, alerting the driver instantly of their infraction. The system promotes seatbelt use, reducing the chances of injuries in case of accidents.

Fig -7 : Police Fine Bot

The emergency alert system monitors the driver's heart rate using a smartwatch and detects

abnormalities, such as signs of a heart attack. When triggered, the system uses the ESP8266 microcontroller to send an emergency message to the nearest hospital through the Hospital Service Bot on Telegram. The alert includes a Google Maps location link, enabling quick location tracking of the vehicle.

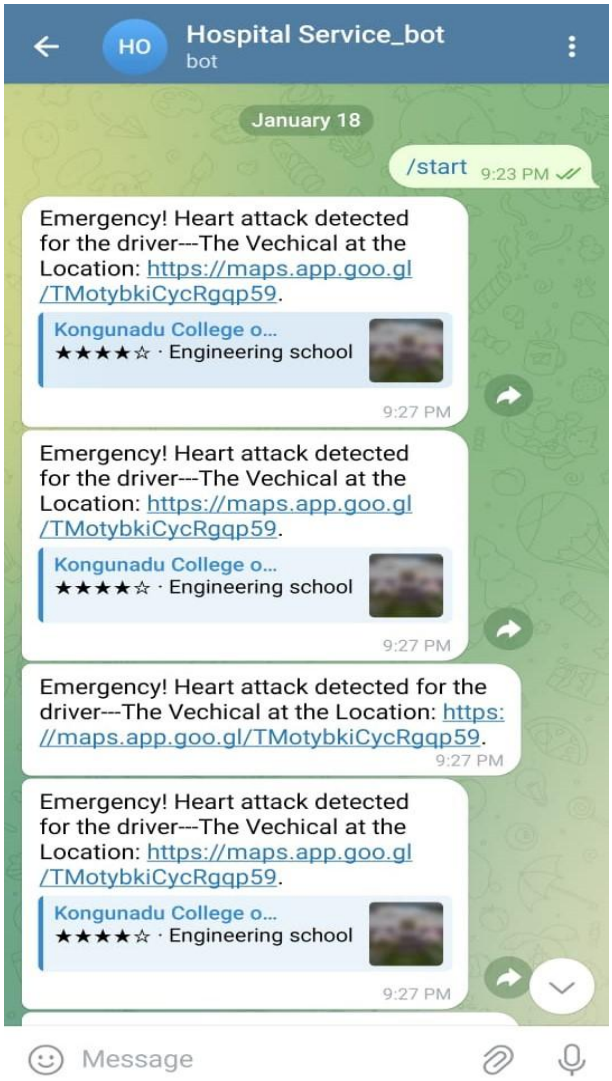


Fig -8 : Emergency Bot

7.FUTURE ENHANCEMENT

The Smart Health Monitoring and Emergency Support System for Drivers can greatly benefit from incorporating other sophisticated features. For example, the system might be combined with Advanced Driver Assistance Systems (ADAS) to facilitate automatic responses such as braking or steering when a medical condition is sensed, providing a safe stop [1]. Voice command support would enhance the user-friendliness of the system by facilitating hands-free use, thereby enhancing accessibility and security [2]. Sharing real-time data with emergency services may speed up response times in emergency situations, enabling quicker medical intervention [3]. In addition, the inclusion of fatigue and drowsiness detection using sensors or camera systems may assist in detecting when a driver is likely to doze off, prompting an alert or intervention to avoid accidents [4]. A specialized mobile application can give drivers and their relatives the facility to track health information, monitor vehicle status, and get instant emergency notifications [5]. Automatic vehicle braking and hazard alerting in emergency situations can avoid additional accidents by slowing down the vehicle safely and alerting other road users [6].

Moreover, AI-driven predictive health monitoring may monitor trends in health data to enable the system to anticipate potential health problems and notify the driver or healthcare services ahead of a crisis [7]. Finally, support for multiple languages would guarantee that drivers across regions are able to utilize the system, adding more to its worldwide usability [8]. These updates are intended to provide a more efficient, dependable, and user-friendly system that enhances the safety of drivers and facilitates quick response to emergencies in emergencies.

8. CONCLUSIONS

The Smart Health Monitoring and Emergency Alert System for Drivers effectively combines health monitoring, offense detection, and emergency alert functions to promote driver safety. Utilizing a smartwatch to track heart rate and an ESP8266 microcontroller for computation, the system efficiently identifies abnormalities, including heart attacks, and sends emergency alerts with location information to nearby hospitals through Telegram bots. The seatbelt warning system promotes safe driving practices through the issuance of warnings and fines in case the driver does not use the seatbelt. Overall, the system is intended to minimize accident-caused deaths and enhance emergency response times, and thus make the roads safer for all.

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