International Journal Of Engineering Research Excellence And Applied Science (IJEREAS)
Volume-III (Issue 1) – March 2025 ISSN : 3048-5355

Vitality and Risk Detection for Automotive Analysis and Navigation (VARDAAN)

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Abstract - In the contemporary context of transportation, accidents attributed to tiredness, medically caused emergencies, and intoxication remain a major concern. VARDAAN or- Vitality and Risk Detection for Automotive Analysis and Navigation- is an advanced system for providing the authentication for the driver, real-time health monitoring, and emergency response mechanisms. The project entangles a wearable health monitoring system with an in-car authentication module and a centralized web server for adopting a fully- fledged safety solution.

1. Introduction

It continuously captures the pulse rate, body temperature, oxygen levels (SpO2), and ECG. The data are sent to the ESP32 system controller in the automobile through Bluetooth. The device collects alcohol levels, drowsiness, and authentication with the help of steering-mounted sensors[1-2]. The controller would then analyze the condition of every driver and would take the following specific actions:

- If the data indicates some abnormality in health or intoxication, the car will not ignite.If the driver has a medical emergency while driving, the system will gradually and safely stop the vehicle.
- The emergency contacts and nearest hospital will automatically be notified through GSM or internet-based APIs. [3]
- All health data can be viewed by the car owner from a web server so as not to leave any side of remote monitoring to chance.
- The system combines Bluetooth, Wi-Fi, GSM, and IoT cloud technologies to provide a fully equipped smart vehicle safety ecosystem reducing road accidents, improving driver well-being, and speeding up emergency response.

Problem Statement:
Road accidents due to driver fatigue, intoxication, and medical emergencies have become a leading cause of fatalities worldwide. Standard safety measures such as seat belts and airbags do not address the root cause, which is the driver's health and alertness. With more intelligent vehicles that could assess the driver's body condition and take action accordingly, there could be millions of saved lives.[9-11]

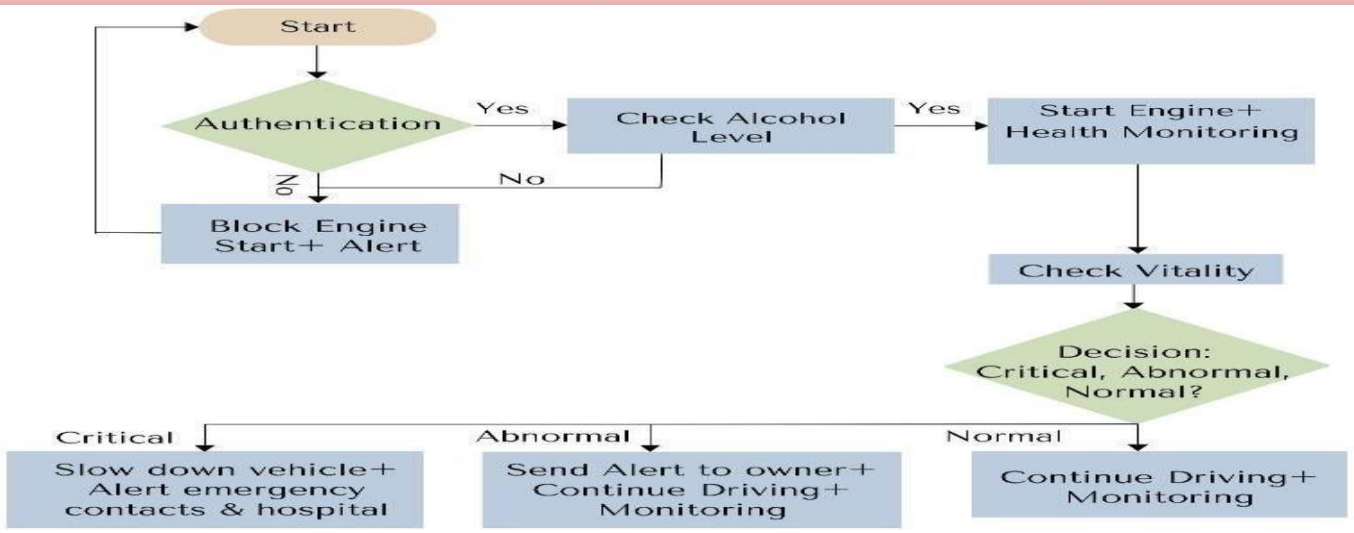
Key challenges include:

- The driver may suffer from medical conditions such as heart attack, high BP, or unconsciousness while driving.
- There are no real-time health monitoring and alerting systems for emergency intervention.
- Accidents occur when unauthorized or intoxicated individuals drive a vehicle.
- Emergency actions take time to activate and worsen the situation for the driver.

Solution to the Problem:
VARDAAN attacks all these challenges by implementing a multi-layered safety system incorporating wearable health tracking, vehicle authentication, and automated emergency response.

2. Working

- The person must authenticate with an RFID and alcohol sensor mounted on the steering wheel [4] for the vehicle to start. He is providing the authenticated user within the car.
- Real-Time Health Monitoring System: A suitable device attached to the person monitors heart rate levels, oxygen levels, temperature, and ECG data[5]. It will assist in sending data via Bluetooth to the car controller.
- Emergency:
  a. When the system detects any severe health problems, it gradually, and in a safe manner, stops the car.
  b. An alert to the nearest hospital and emergency contacts will begiven by GSM and Wi-Fi with map location and health status.[10]
  c. Remote Monitoring through a Web Server: The car owner can observe the live health parameters and alerts from a cloud-based dashboard.[3][10]



The Flowchart represents the pictorial presentation of the above working of this model.

3. Result and Analysis:

Results:

- RFID Authentication effectively prevented unauthorized users[4] from accessing the vehicle.
- Alcohol Sensor correctly detected high alcohol levels and prevented engine starting .[6- 8][11]when required.
- Health Monitoring through a wearable device effectively monitored vital signs and initiated proper responses:
- Normal: Continued driving.
- Abnormal: Alert to owner.
- Critical: Vehicle slowed down, and emergency contacts notified.
- Real-time Monitoring and updates were effectively shown on the web dashboard.

Analysis:

The system functioned correctly in all conditions. Sensor inputs were consistent, alarms sounded appropriately, and real-time updates performed just as required. The incorporation of safety features enhanced vehicle control and monitoring of driver health efficiently.

4. Conclusion:

The project is able to integrate various technologies to improve vehicle and driver safety by monitoring in real-time and making intelligent decisions. Through RFID-based authentication, alcohol sensors, and wearable health monitoring systems, the system prevents only authorized and sober drivers from starting the vehicle. In addition, ongoing health monitoring detects unusual or critical conditions, sending timely alerts to the driver, emergency contacts, and nearby

hospitals if necessary. Web service integration allows remote monitoring and data logging, which makes the system an all-around solution for emergency response and accident prevention. Overall, this project illustrates a real-world and effective use of IoT and embedded systems to enhance road safety and save lives.

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