Detection and Location Identification of an accident using an application programming-based driver health monitoring system

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Abstract: Lack of innovation in the latest technology is the cause of death rate owing to delay in the first aiding at the right time. Consequently, the main objective of the proposed method is accident detection and location identification, and driver health monitoring is intimated to First Aid Medical Centre, Police Control Room, and family person. The proposed system incorporates novel Mobile Application Software installed in driver mobile, and two modules, one at the Bike section and another at the driver Helmet section. The function of the proposed method as follows, in the Bike section, initially accident is monitored using vibration sensor, upon the accident the information of the victim (heart rate) synchronous from the Helmet section using nRF24L01 transceiver. Formerly, the heart rate is sent to Mobile Application Software via Bluetooth. The Mobile Application Software is modelled to send the location and heart rate information to concern people without adjournment.

Keywords: Mobile Application Software, Bike section, Helmet section

1. Introduction

In the recent trend, countless automotive vehicles are traveling on the roads for every hour. Day by day, the manufacturing of automotive vehicles namely two and four-wheelers have been enhanced. The latest technology on driver assistant and alert systems has to be incorporated in the automotive vehicle because the quantity of vehicles on the road leads to more accidents. Under such constraint, in recent vehicles has an intelligent safety system to communicate intelligently on many tasks like accident avoidance, an alert system to the driver. In many cases, upon accident, many technologies have to be developed and implemented in recent days. Some of the research [1] and [2] discriminates the accident alert system using IOT with the existing methods. The articles [3-5] discriminates the accident alert system using GPS and GSM Modules and the report is sent to the concerned person. One of the reasons for the accident is traffic congestion, [6] proposed considering traffic scenario by prioritized traffic switching for Accident detection and rescue system. In advance, [7] discriminates on the Android SmartPhone for the Accident Detection system. Similarly, [8-11] analyzed the smart accident system using a smartphone and stated single alert information is transferred to the concerned person. In this proposed method, the accident detection and location identification information are communicated to the multiple people namely, First Aid Medical Centre, Police Control Room, and respective person in their family using a unique Mobile Software Application.

2. Design of Accident Detection and Location Identification and Driver Health Monitoring System

The objective of the proposed system is obtained by suitable modules embedded in the driver Mobile, Bike, and Helmet sections. These modules are interconnected via a wireless medium to send the accident location and driver heart rate information to the specific contacts namely First Aid Medical Centre, Police Control Room, and respective person in their family. Each section has a unique module to obtain the desired function as highlighted by the proposed method.

The working principle of the proposed system illustrated in Fig 1 conveys the vibration sensor in the bike section monitors accident based on the angle of inclination. Upon the accident, the vibration sensor will promptly trigger the ATEMEGA328P microcontroller in the bike section to communicate with nRF24L01 at both sections to extract the heartbeat rate of the drive-by proper synchronous communication. Once the heartbeat rate is fetched from the Helmet section, heat rate information is communicated to the Mobile Application Software via Bluetooth which is a unique design and installed in the driver mobile. The Mobile Application Software is coded

in such a manner to extract the heartbeat rate via Bluetooth, GPS Location via the internet as input parameters, and send the alert information to the three predefined contacts namely First Aid Medical Centre, Police Control Room and respective person in their family.

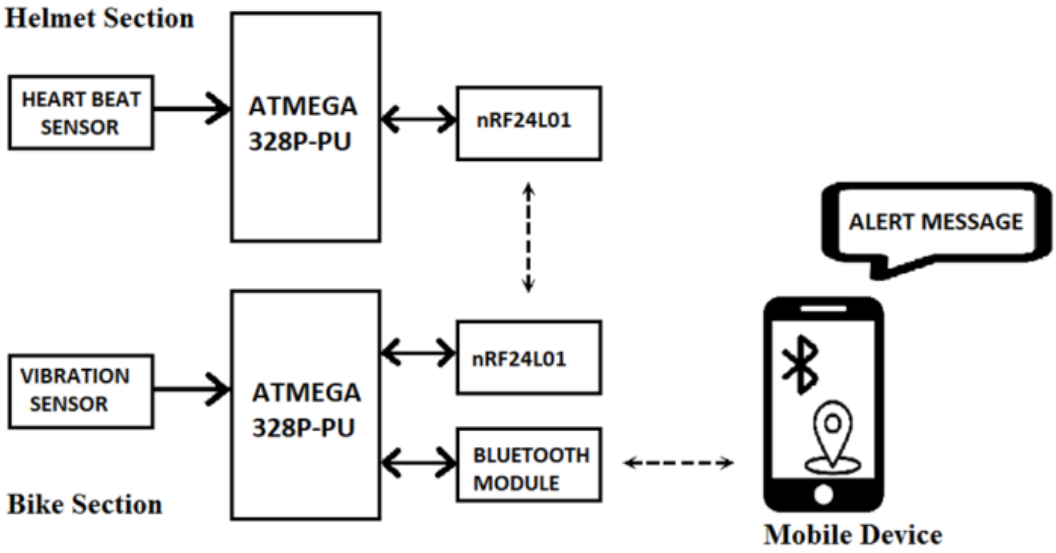

Figure 1.Interconnection of the proposed modules

The list of devices in the Bike section shown in Fig 2 incorporates Vibration Sensor (SW-420), ATMEGA328P, nRF24L01, and Bluetooth. These devices are interconnected to perform accident detection and communicate heartbeat rate to the Mobile Software Application driver installed in the driver mobile via Bluetooth.

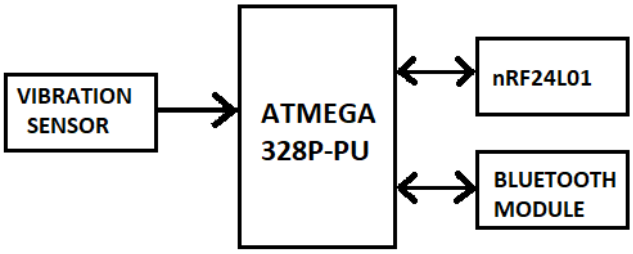

Figure 2. Bike Section

3. Sensor Unit

In the proposed method, SW-420 in the Bike section detects abnormal vibration owing to the accident met by the bike. Upon the accident, the SW-420 instructs the occurrence of the accident to the controller which is the interface to form an alert system.The ATMEGA328P microcontroller is used to control the operation of the alert system upon the accident, by delivering alert information to the Mobile Application Software.The nRF24L01 is a transceiver used to communicate with another nRF24L01 transceiver in the Helmet section to extract the heartbeat rate of driver upon an accident in this proposed method.This HC-05 Bluetooth module sinks with a mobile Bluetooth module to share the pulse rate of the drive upon the accident. The shared information is uploaded into Mobile Application Software.The Helmet section shown in Fig 3 incorporates Heart Rate or Pulse Sensor, ATMEGA328P, and nRF24L01. Upon the accident, the heartbeat rate is monitored and communicated to the bike section module via nRF24L01.

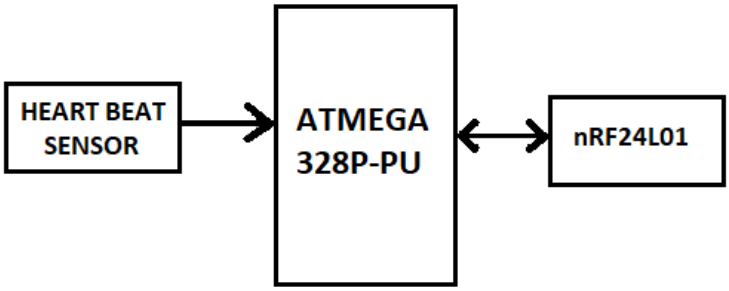

Figure 3. Helmet Section

In this proposed method, Heat rate or pulse sensor is used to measure the pulse rate of the driver. This pulse sensor is mounted on the Helmet in such a way, that the pulse sensor captures the pulse rate of the driver, otherwise, pulse sensor sandwiched between the helmet and human neck.The ATMEGA328P microcontroller is used to monitor the pulse rate of the driver, upon the commands by nRF24L01interfaced in the Helmet section.The nRF24L01 is a transceiver used to communicate with another nRF24L01 transceiver in the bike section to communicate the pulse rate owing to an accident in this proposed method.Contrarily, Mobile Application Software is uniquely designed to send the received heart rate and GPS location. Unique Mobile Application software is designed with three contacts, GPS location extracted via internet and pulse rate via Bike section, to send alert information to the specific people namely First Aid Medical Centre, Police Control Room, and respective person in their family without adjournment.

4. Hardware Implementation of the Proposed method

The proposed system has three different modules namely the Bike section, Helmet section, and Mobile Application Software. These modules are communicated wirelessly to obtain driver health monitoring, accident detection, and location identification.The proposed Helmet section is designed, implemented, and tested in the real-time condition shown in Fig 4. The power supply to the devices is properly regulated owing to low power devices. The ATMEGA328P microcontroller is a control device that measures the heart rate from the pulse sensor and communicates to the Bike section via nRF24L01 upon the accident.

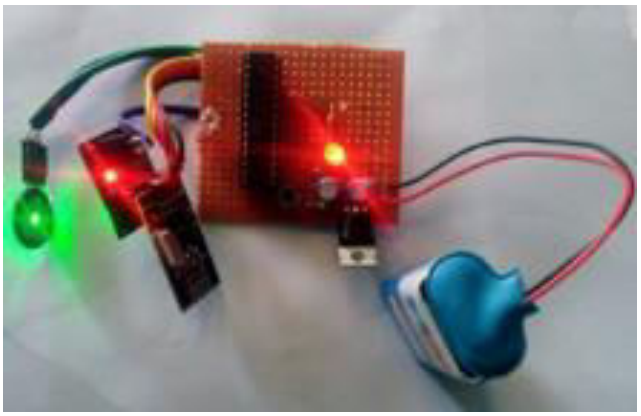

Figure 4. Hardware implementation of the proposed Helmet section

The proposed Bike section illustrated in Fig 5 is properly regulated, and the ATMEGA328P microcontroller measures the accident detection using a vibration sensor and communicates to Mobile Application Software via Bluetooth upon the accident. At this juncture, the application algorithm is coded using Arduino IDE and dumped into the ATMEGA328P microcontroller and similarly for the Helmet section ATMEGA328P microcontroller.

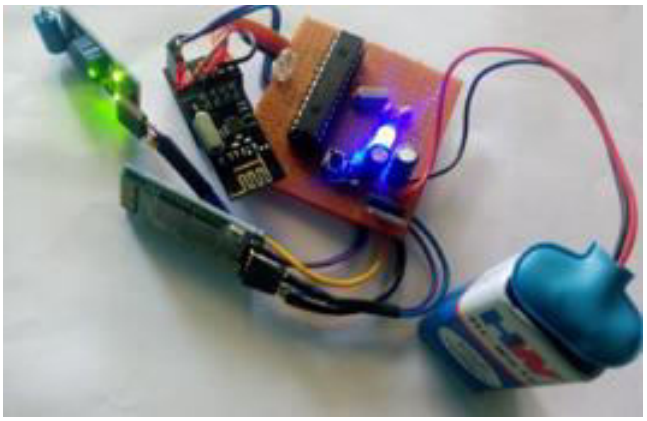

Figure 5. Hardware implementation of the proposed Bike section

The unique Mobile Application Software is configured with suitable features like three contacts as illustrated in Fig 6. Moreover, the accident location is identified via Google Maps by suitable coding in the Mobile Application Software.Besides, Mobile Application Software sends accident information illustrated in Fig 7(a) and Fig 7(b) to the specific people namely First Aid Medical Centre, Police Control Room, and respective person in their family.

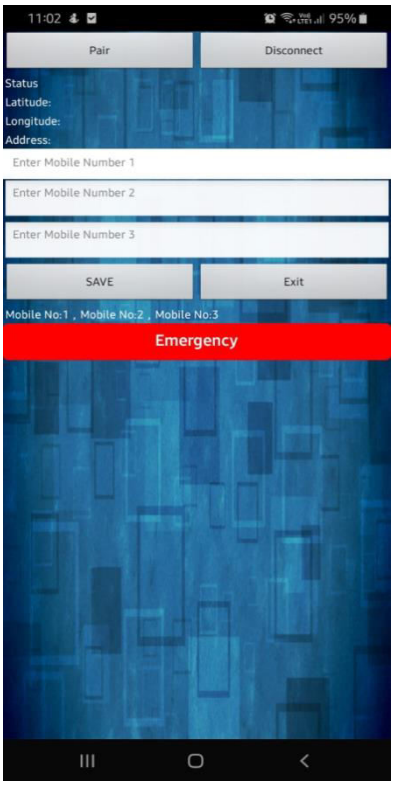

Figure 6. Proposed Mobile Application Software

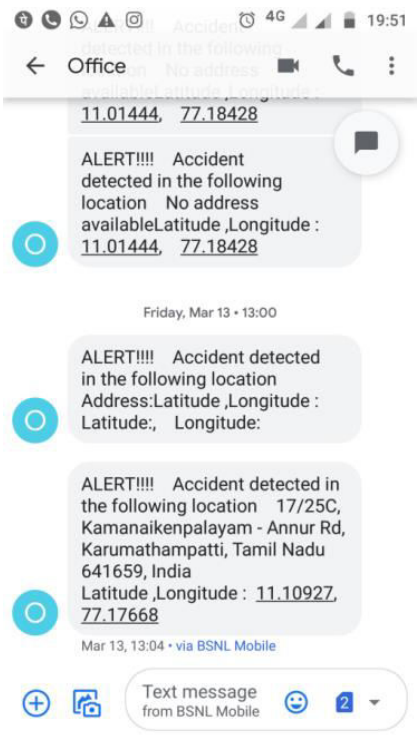

Figure 7(a). Alert message on Accident detection and location identification

Figure 7(b). Alert message on Accident location and driver health monitoring

5. Conclusions

Generally, the Accident death rate is directly proportional to the latest technology proposed by valuable researchers. The proposed research expresses accident detection and GPS location identification to the concerned people at the right time to lessen the death rate around the world. The novelty of the proposed method conscripts the complete modules with the latest technology to provide an alert and emerging system about human safety applications. The result and analysis of the proposed method are practically experimented in real-time, relate to the status of the driver health monitoring, accident detection, and location identification information. At the same time, the acquired information is communicated to the specific people namely First Aid Medical Centre, Police Control Room, and respective persons in their family without any delay to assistance medically.

Conflicts of Interest

The authors declare no conflict of interest.

References

K.L.S. Soujanya, Sri Sai Rajasekar Gutta, "Accident alert system with IOT and mobile application" *International Journal of Recent Technology and Engineering,* Vol. 7 Issue-5S2, pp.337-340, Jan. 2019.

S.Dharani, P.Manikandan, "IOT Based Accident Identification and Alerting System", *International Journal of Pure and Applied Mathematics*, Vol. 118, no. 20, pp. 547-551, Mar. 2018.

Parthasarathy, P., & Vivekanandan, S. (2020). A typical IoT architecture-based regular monitoring of arthritis disease using time wrapping algorithm. *International Journal of Computers and Applications*, 42(3), 222-232.

Dinesh Kumar HSDK, Shreya Gupta, Sumeet Kumar, Sonali Srivastava, "Accident Detection and Reporting System Using GPS and GSM Module." *Journal of Emerging Technologies and Innovative Research*, Vol. 2, Issue 5, pp. 1433-1436, May 2015.

Vijayarajeswari, R., Parthasarathy, P., Vivekanandan, S., & Basha, A. A. (2019). Classification of mammogram for early detection of breast cancer using SVM classifier and Hough transform. *Measurement,* 146, 800-805.

Rashida Nazir, Ayesha Tariq, Sadia Murawwat, Sajjad Rabbani, "Accident Prevention and Reporting System Using GSM and GPS", *International Journal of Communications, Network and System Sciences,* Vol. 07, no. 08, pp. 286-293, Jan. 2014.

Panchatcharam, P., & Vivekanandan, S. (2019). Internet of things (IOT) in healthcare–smart health and surveillance, architectures, security analysis and data transfer: a review. *International Journal of Software Innovation* (IJSI), 7(2), 21-40.

G.Sandeep , N.V.K.Ramesh, "Accident detection and rescue system using prioritized traffic switching", *International Journal of Innovative Technology and Exploring Engineeri*ng, Vol. 8, Issue 7, pp. 1000-1003, May 2019.

Parthasarathy, P., & Vivekanandan, S. (2019, March). Detection of suspicious human activity based on CNN-DBNN algorithm for video surveillance applications. In 2019 *Innovations in Power and Advanced Computing Technologies (i-PACT)* (Vol. 1, pp. 1-7). IEEE.

P.Kaladevi, T.Kokila, S.Narmatha, V.Janani, "Accident Detection Using Android Smart Phone*", International Journal of Innovative Research in Computer and Communication Engineering*, Vol. 4, Issue 3, pp. 3546-3551, Mar. 2016.

Adnan Bin Faiz, Ahmed Imteaj, Mahfuzulhoq Chowdhury, "Smart vehicle accident detection and alarming system using a smartphone", *International Conference on Computer and Information Engineering*,Feb. 2016.