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IoT BASED DRIVER ALERTNESS AND HEALTH MONITORING SYSTEM

T.Shwetha[1], J.Panduranga Rao[2], B.Sreenivasu[3]

ABSTRACT

Fatal Road accidents can be easily avoided by understanding the psychological condition of drivers. Majority of road accidents occur during night driving due to the state of drowsiness. This project provides an eye blink monitoring system that alerts the driver during the state of drowsiness. A normal eye blink rate has no effect on the output of the system. Here we use one gate way Raspberry pi, in that gateway webcam is connected, with the help of webcam when the driver is going to close his eyes more than 5secs it will click the picture of driver and send to web application. In web application one admin will be there he is monitoring and send the message that will be converted into speech is initiated to wake the driver.For Health Monitoring of driver, making wearable device which will give the heart beat and body temperature of the driver, so before boarding to vehicle administrator should know the status of subject. Genuine following of driver will likewise track with versatile GPS.

Keywords: Face detection, Health monitoring, Raspberry Pi, Pulse sensor, Temperature Sensor, USB Cam

I INTRODUCTION

According to the U.S. National Highway Traffic Safety Administration (NHTSA), drowsiness and falling asleep while driving are responsible for at least 100,000 automobile crashes annually [1, 2].All existing methods are worked with sensors, but proposed system we implement behavior analysis with the help of open CV library. As computer vision has provide different application out of those human action detection is highly important in these days[3]. Here, we use open CV for detecting behavior of the driver, the goal of the system is to detect driver alertness and health monitoring. Several efforts to develop active safety systems have been reported in the literature for reducing the number of automobile accidents due to reduced vigilance. Among deferent techniques, measurement of physiological conditions like brain waves, heart rate, and pulse rate [4, 6] yields maximum detection accuracy.

The primary function of the system is to monitor a driver's physiological parameters such as, pulse rate, body temperature, etc., using sensors and transferred to a Smartphone using Bluetooth communication. If there is any significant difference with normal value details are communicated to both healthcare service providers and transport office via cellularnetworks.

In this proposed method healthcare monitoring unit is constructed as wearable one, like wristband where physiological sensors and transmitter is integrated in it.

The physiological parameters such as pulse rate, breathing rate, temperature and etc. are measured and transmitted to Smartphone using Bluetooth. The Health care monitoring system is will be connected to a gateway which consists of raspberry pi 3 with inbuilt BLE and a GPRS module to communicate with the Drivers Community.

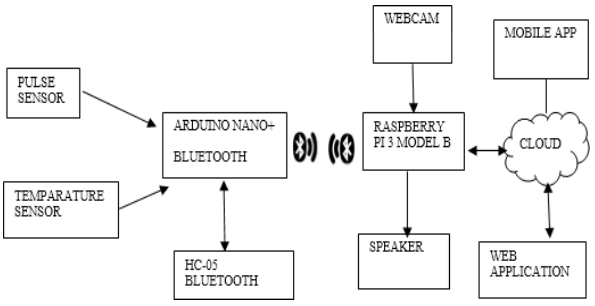


Figure (1) Block Diagram

A camera and an Emergency button is included for emergency support of the driver which sends a notification to the driver community. A picture of the driver can also be taken and sent. A web page is hosted with the complete health profile of the driver and location map .The driver community can sent commands from the web app to the concerned driver whenever it is required.

II DESIGN REQUIREMENTS

This system design requires Some Hardware and Software Components those are mentioned below

Hardware:

- Raspberry Pi 3 ModelB
- ArduinoNano
- Bluetooth (HC-05)
- PulseSensor
- Temperature Sensor(LM35)
- Webcam

Software:

- PythonIDE
- Arduino IDE

Communication Protocol:

- HTTP
- Bluetooth

2.1 IoT cloudplatform

IoT technology is an environment that transfers data through Internet in real time to attach sensor to object. Until now, devices connected to Internet needs some adjustment by humans to exchange data, But IoT enables to exchange data between humans and objects and among objects connected with Cloud and big data technology without the adjustment. Low Power Wide Area Network (LPWAN) technology was suggested to transfer object's data efficiently. It is a mobile radio communication network and a low power broadband convergence network for devices ofIoT.[7-10].

In such networks for IoT, nodes are distributed in a certain region for specific purpose and gather the required information, for example, the information about the temperature, motion, and physical changes.

2.2 Overview of Raspberry Pi3

The proposed system is implemented using a Raspberry Pi 3 Model B shown in Figure (2). Raspberry pi is a mini computer. It is a Credit – Card Sized Computer Manufactured and Designed in the UK by the Raspberry Pi Foundation. It is capable of several things such as, spreadsheets, word-processing and high-definition videos and games.

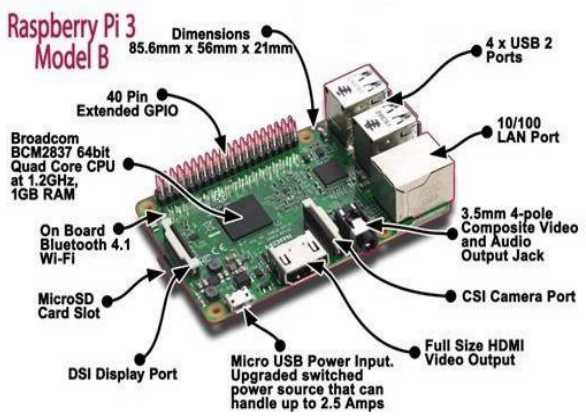


Figure (2) Raspberry Pi 3 Model B

It has a Broadcom BCM2837, an ARM Cortex- A53 64bit Quad Core Processor System-on-Chip and Linux-based operating system as Raspbian and Debian. It can do multifunctional ties at a time. Features arelistedbelow:

- 1Gb RAM
- CPUSpeed:1.2GHZ
- Micro SDHC Slot
- 4USB Ports
- Wireless Connectivity(On Board):Wi-Fi (802.11n Wireless LAN) & Bluetooth Low Energy (BLE)4.1
- Camera SerialInterface(CSI)
- Display SerialInterface(DSI)
- Micro SD Card Slot
- Video Core IV 3D graphicsCore
- HDMI(High Definition MultimediaInterface)Port
- Analog Video Out: Shared with Audio Jack
- Power ratings: 800 mA
- Ethernet Port is available on Model B andB+.

2.3 PulseSensor

Heartbeat Sensor fitting and-play heart-rate sensor for Arduino. It can used by understudies, craftsmen, creators, and engineers who need live heart-rate information into their activities. It can be utilized by understudies, craftsmen, competitors, producers, and diversion and versatile designers who need to effortlessly fuse live heart-rate information into their tasks. Heartbeat Sensor includes intensification and clamor cancelation hardware to the equipment. It's discernibly speedier and less demanding to get solid heartbeat readings. Heartbeat Sensor works used 3V or 5V Arduino. The sensor cuts onto a fingertip or ear cartilage and attachments directly into Arduino with some jumperlinks.

Figure (3) Front & Back view of pulse sensor

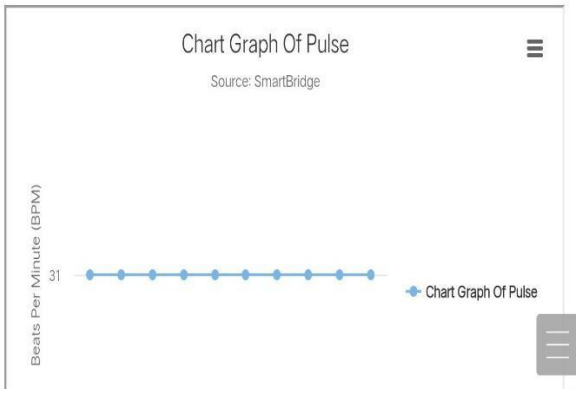


Figure (4) Graph Shows Pulse Sensor Values

2.4 TemperatureSensor

Temperature sensor is a device which senses variations in temperature across it. Which is designed specifically to measure the hotness or coldness of an object.

The LM 35 is an integrated circuit(IC) sensor that can be used to measure temperature.It gives the readings in centigrade (degree Celsius).since its output voltage is linearly proportional to temperature

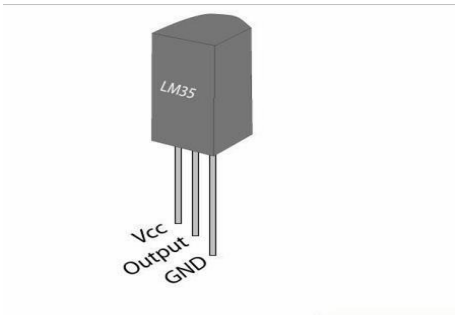


Figure (5) Temperature Sensor

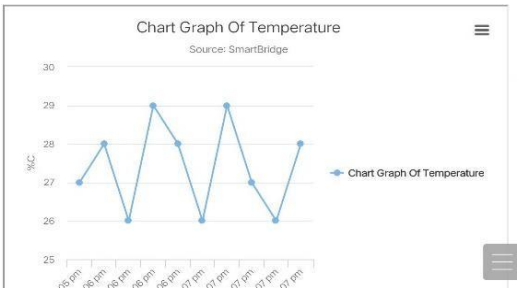


Figure (6) Graph Shows Pulse Sensor Values

2.5 Webcam

A camera is an optical instrument that recordsimages that can be stored directly, transmitted to another location, or both. These images may be still photographs or moving images such as videos or movies. The term camera comes from the word cameraobscura(Latin for "dark chamber"), an early mechanism for projecting images. The modern camera evolved from the camera obscura. The functioning of the camera is very similar to the functioning of the humaneye.

Figure (7) Webcam

2.6 CloudModule

The cloud module in this system explains about the webpage designed for user services and maintenance of data. This cloud module will function in two ways, the first one is front end application of webpage and the other one is database.

At frontend, the system will take the user details from the registration and creates a user profile in database with unique user key. Later on it will create and maintains the devices data according to the user's specification.

At backend, the data received from gateway is stored according to the specific user and their devices. And the data is visualized under device data in user profiles.

III RESULTS ANDDISCUSSIONS

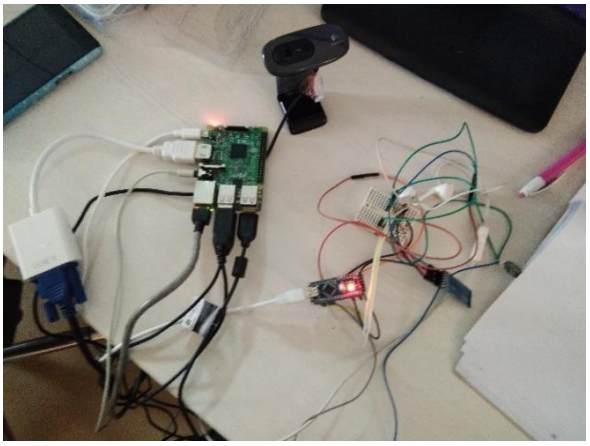


Figure (8) Interconnections of the System

OpenCV allows user to select us region of interest (ROI). In this region of interest is eye region. Eyes are detected with a rectangular box. System is also able to detect eyes when wearing spectacles. Open and close eyes are detected by system. Images shown are the rectangular extraction of the eye area fromface.

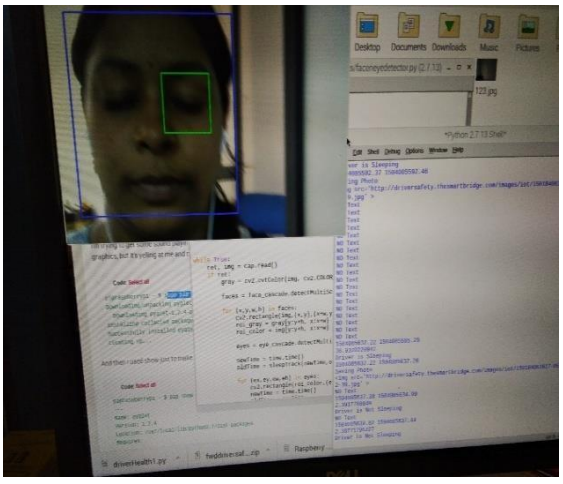
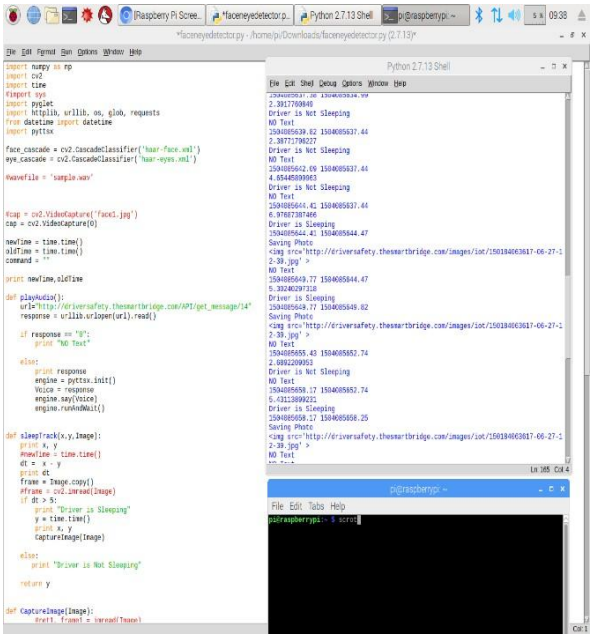


Figure (9) Sleep State of Person

Fatigue detection can be achieved by detecting closed eyes. If driver eyes are off the road or if he is drowsy then alert will be generated. System is robust as two methods are combined to find gaze. If one method is failed to detect properly, other will work. System is also robust under night or low light conditions due to use of IR illuminators and build on raspberry pi to be compact and low cost. Future work can include improving driver monitoring system with help of automatic calibration, determining vehicle states, weather conditions, vehicle speedetc.



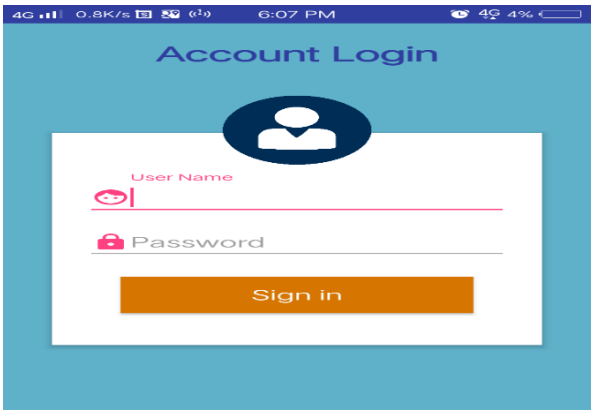


Figure (10) Mobile App

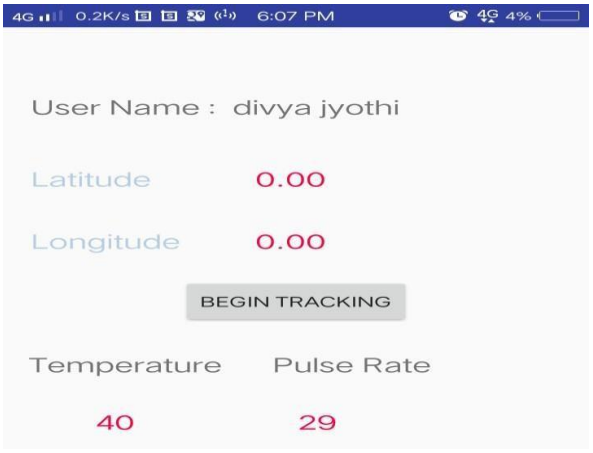


Figure (11) Before Tracking

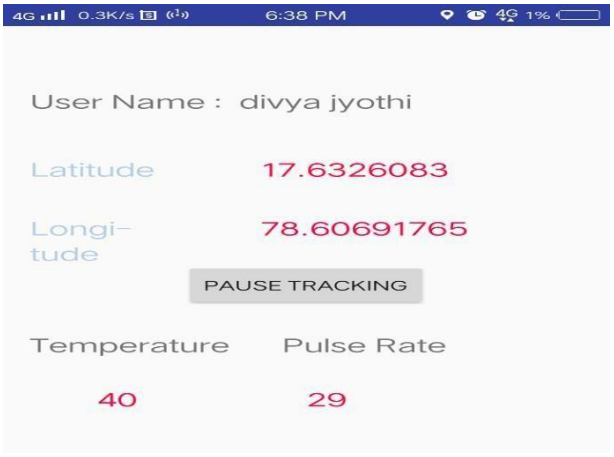


Figure (12) After Tracking

IV CONCLUSION&FUTURE ENHANCEMENTS

- Majority of portable devices are aimed at providing unlimited access to internet services for data storage and synchronization with other remote devices. Hence, there is a need of faster data acquisition and quick decision making of embedded computing system for real time applications for making vehicles safe, automatic, responsive and intelligent.

- Interfacing of simple sensors to various microcontroller platforms enables the ease of regulating the embedded system at a sophisticated levels of automation and mediating the sensor information over a smart grid.

- Further, the development of smart grids fascinates the overall process of communication between human and machinerather than machine to machine communication.

Hence, IoT can revolutionize the way embedded systems interact and respond for variety of applications especially in case of vulnerable night drivers by monitoring the state of their drowsiness for a quick, safe and effective response for a safer road travel enables large amount of data acquisition for taking accurate decisions over the emergency conditions.

The following future enhancement can be made into proposed system by devising software algorithms, hardware implantations and interfacing sensors:

- ➢ Solution for drink and drive cases. Detect whether the driver is drunk or not. And the vehicle can be stopped if the driver is drowsy.
- ➢ For emergency speed control of vehicles.
- ➢ For rash driving by obstructing Spark plug.
- ➢ For wheel grip using gravity sensor.
- ➢ Voice based real time advice for drivers by their loved ones when they are overdrunk Or Rash-driving.
- ➢ For detecting accidents using impact sensors. & Global photos transfer using GPRS

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T. Shwetha[1]
Dept. of ECE ,
Sreyas Institute of Engineering & Technology, Hyderabad.
Telangana, India.
+919705186406.

J. Panduranga Rao[2]
Associate Professor,
Dept. of ECE,
Sreyas Institute of Engineering & Technology, Hyderabad.
Telangana, India.

B. Sreenivasu[3]
Associate Professor & HOD,
Dept. of ECE,
Sreyas Institute of Engineering & Technology, Hyderabad.
Telangana, India.