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Smart Safety Systems for Automotives using IOT

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Abstract:

This project is mainly directed towards the safety of automotives by monitoring the various different parameters of the person who is driving it.This experiment are encountering many cases of accidents which are caused due common human errors like Drowsiness and less concentration during driving and also alcohol consumption before or during driving process. The project also concentrates on driver health monitoring parameters like heart beat/pulse rate. This project proposes a real time detection of driver's drowsiness by eye blink and level of driving concentration both via image processing concept as well as alcohol intoxication detection by respective sensor. The main aim of this proposed system is to reduce the number of accidents caused due to various factors and increases the transportation safety. Seat belt of driver is also monitored to increase the safety and ultrasonic sensor to detect the obstacle. GPS and GSM module is used to send the location of automotive to third person for help when any abnormalities are found in monitoring parameter of driver. Android app is developed via which an authorized person can monitor the health and various parameters of driver any-time from any-where involving the Internet of Things (IoT) concept.

Keywords:*GPS, GSM, Internet of Things(IOT)*

1. Introduction

Introduction deals with the important reason for accidents and how we can stay away from accidents, various techniques developed to avoid accidents. The goals and motivations for this proposed project is to develop cost effective system that can be implement in all range of cars and it should save people. The driver fatigue results in over 50% of the road accidents each year. Using new technology to detect driver fatigue/drowsiness is an exciting challenge that would help in preventing accidents. In the past various efforts have been reported in the literature on approaches for drowsiness detection of automobile driver. In the last decade alone, many countries have begun to pay great attention to the automobile driver safety problem. Most of the times, even if the vehicles are flawless, the human errors may result in the deadlyconsequences. Drivers lose their control on the vehicle when they are feeling sleepy or when they are consuming alcohol and also if suddenly any vehicles or any other objects come close to vehicle that may also causes rear end collision. Road accidents cause damage toproperty as well as life. Thus there is need of development of methods for avoiding hazardous effects of drowsiness on roads while driving, alcohol consumption while driving and rear end collision. Seat belt monitoring is also important to avoid major injuries caused during accidents and also GSM and GPS is used to send the location to 3rd person for help when any help situation occurs due to abnormality condition and also the 3rd person can monitor the driver location and health parameter and various other parameters on App using IoT concept.

1. Literature survey

Several smart interface systems exist in literature. Boon-Giin Lee and Wan- Young Chang [1] proposed an eye blink detection using IR light. IR light is harmful to the human eye Swhen it is used for long period. Lai and Liu [3] developed a fuzzy-control massage seat to keep drowsy drivers awake. Bergasa *et al*. [4] proposed a

nonintrusive prototype of a computer vision system for monitoring driver's attentiveness in real-time. Kasukabe *et al.* [5] developed a system with visual, cognitive, and decision- making functions for elderly drivers.
Pauwelussen and Feenstra [6] developed a traffic-simulation model in which the vehicle is equipped with an adaptive cruise-control (ACC) and lane- departure warning (LDW) system to monitor the driver's behaviour in a real traffic environment. Lee *et al.* [7] proposed a system with two fixed cameras to capture images of the driver and the road respectively. These images are mapped to the global coordinates to monitor the driver's line of sight. The authors found four distinctive driving patterns through analysis by a hidden Markov model (HMM). Zhao *et al.* [8] studied the reliability of steering wheel behavior to detect driver fatigue by multi wavelet packet energy spectrum using a support vector machine (SVM).

Lee and Chung [9] developed a video sensor- based eye-tracking and blink-detection system with Haar-like features and template matching for an automated drowsiness warning system. In addition, Yanget *et al*. [10] demonstrated that drowsiness has a greater effect on rule-based driving tasks than on skill-based tasks using a Bayesian network (BN) paradigm through simulator-based human-in-the-loop experiments.
Wang and Gong [11] proposed system, this system adopted a latent variable to represent the attributes of individual drivers for recognizing the emotional state of drivers. Four sensors, each for respiration, skin conductance, temperature, and blood pressure is used. Shin *et al.* [2] proposed the design of an electrocardiograph (ECG) and photoplethysmography (PPG) sensor to measure the driver's metabolic condition. Eye blink was also detected using EEG signal from the neurons.

3. Components ofSystem:

3.1 Arduino Mega 2560

The Arduino Mega 2560 is a microcontroller board based on the ATmega2560.It has 54 digital input/output pins (of which 14 can be used as PWM outputs), 16 analoginputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, apower jack, an ICSP header, and a reset button. It contains everything needed to supportthe microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Mega is compatible with most shields designedfor the Arduino Duemilanove or Diecimila.

3.2 Pulse Sensor

The Pulse Sensor is the original low-cost opticalheart rate sensor (PPG) for Arduino and other microcontrollers. It's designed and made by World Famous Electronics, who actively maintain extensive example projects and code. Includes Kit accessories for high-quality sensor readings. Designed for Plug and Play. Its features are: small size and embeddable into wearables, works with any MCU with an ADC, works with 3 Volts or 5 Volts.

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3.3 SIMCom

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3.4 MQ3 gas sensor

They are suitable for alcohol checker. MQ - 3 gas sensor composed by micro AL2O3 ceramic tube, Tin Dioxide (SnO2) sensitive layer, measuring electrode and heater are fixed into a crust made by plastic and stainless steel net. The heater provides necessary work conditions for work of sensitive components. The enveloped MQ - 3 has 6 pin, 4 of them are used to fetch signals, and other 2 are used for providing heating current.

3.5Systronix 20X4 LCD

It is a Data Vision part and uses the Samsung KS0066 LCD controller. It's a clone of the Hitachi HD44780. We're not aware of any incompatibilities between the two at least we have never seen any in all the code and custom applications we have done. This 20x4 LCD is electrically and mechanically interchangeable with 20x4 LCDs from several other vendors.

3.6 NEO-6 GPS Module

The NEO-6 module series is a family of stand-alone GPS receivers featuring the high performance u-blox 6 positioning engine. These flexible and cost effective receivers offer numerous connectivity options in a miniature 16 x 12.2 x 2.4 mm package. Their compact architecture and power and memory options make NEO-6 modules ideal for battery operated mobile devices with very strict cost and space constraints. The 50-channel u-blox 6 positioning engine boasts a Time-To-First-Fix (TTFF) of under 1 second. The dedicated acquisitionengine, with 2 million correlators, is capable of massive parallel time/frequency space searches, enabling it to find satellites instantly. Innovative design and technology suppresses jamming sources and mitigates multipath effects, giving NEO-6 GPS receivers excellent navigation performance even in the most challenging environments.

3.7 ESP8266 Wi-Fi Module

ESP8266 is Wi-Fi enabled system on chip (SoC) module. It is mostly used for development of IoT (Internet of Things) embedded applications. ESP8266 comes with capabilities of 2.4 GHz Wi-Fi (802.11 b/g/n, supporting WPA/WPA2), general-purpose input/output (16 GPIO), Inter-Integrated Circuit (I^2C) serial communication protocol, analog-to-digital conversion (10-bit ADC), Serial Peripheral Interface (SPI) serial communication protocol, I^2S (Inter-IC Sound) interfaces with DMA(Direct Memory Access) (sharing pins with GPIO), UART (on dedicated pins, plus a transmit-only UART can be enabled on GPIO2), and pulse-width modulation (PWM).

4. Configuration of System &Working

This project mainly concentrates on the safety of the automotive by continuously monitoring the driver activities and this monitoring action is done through different modules such as:

1] Eye Blink Monitoring.
2] Face motion Monitoring.
3] Heart beat/pulse monitoring.
4] Alcohol Sensing.
5] Obstacle Detection.
6] Seat Belt Monitoring.
7] Smart connect App.

1] Eye Blink Monitoring:

Drowsiness is detected by monitoring the eye blink rate via image processing concept. Where we detect the human face and then a Eye region where an eye blink is monitored by its blink rate, if any abnormalities are found then driver is given a buzzer/vibration alert to make him concentrate on driving.

2] Face motion Monitoring:

In most of the situations driver during driving period makes some human errors and turn his face for long time to talk to co-passengers or any other reason which is an abnormal behavior and can cause accident, to avoid this we check the concentration level of driver. The concentration level of driver towards driving is monitored via image processing concept where human face motion is monitored when he turn his face left/right during driving for more than normal time, then an alert is provided by buzzer/vibration to make him concentrate on driving.

3] Heart beat/pulse monitoring:

Driver's Heat beat/pulse rate is monitored to keep a note on health monitoring parameters , when any abnormalities is found then an 3rd person is given an alert for help, GSM and GPS module is used, where GPS is used to fetch location and the location is sent to 3rd person as SMS via GSM module.

4] Alcohol Sensing:

Before starting the automotive an alcohol presence is monitored, if alcohol is detected before initiating the vehicle then automotive will not start, if alcohol traces are detected during driving process then vehicle will reduce its speed gradually and stop at some moment to avoid accidents.

5] Obstacle Detection:

In most of the situation any vehicle/animal/human can appear suddenly in front/back of vehicle so to avoid the collision an obstacle detector is installed which monitors and provide an alert to the driver.

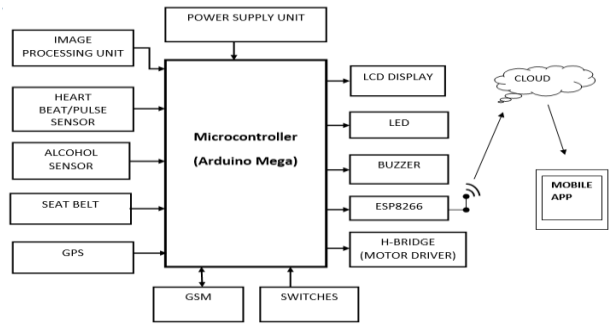
6] Seat Belt Monitoring:

Before starting the automotive a seat belt is monitored, if seat belt is not plugged in then vehicle will not start, so it is mandatory to plug in the seat belt to start the automotive. If seat belt is removed during driving process then an buzzer alert is provided to notify the driver.

7] Smart connect App:

Smart connect is an mobile app provided to authorized person of automotive where an app will display the run/real time values of parameters using IoT concept which can be accessed anywhere anytime via internet, parameters as follows are displayed on app.

A] Drowsiness detection is displayed on app.
B] Alcohol detection is displayed on app.
C] Seat Belt detection is displayed on app.
D] Current location of car can be tracked via app.
E] Car ignition logs are monitored when every time car starts an log is created in app which contains time and location of car where it was started
F] Anti-theft control button to turn off the car via app.



5. Experimental Analysis

We are encountering many cases of accidents which are caused due common human errors like Drowsiness and less concentration during driving and also alcohol consumption before or during driving process. The project also concentrates on driver health monitoring parameters like heart beat/pulse rate. This project proposes a real time detection of driver's drowsiness by eye blink and level of driving concentration both via image processing concept as well as alcohol intoxication detection by respective sensor. The main aim of this proposed system is to reduce the number of accidents caused due to various factors and increases the transportation safety. Seat belt of driver is also monitored to increase the safety and ultrasonic sensor to detect the obstacle. GPS and GSM module is used to send the location of automotive to third person for help when any abnormalities are found in monitoring parameter of driver. Android app is developed via which an authorized person can monitor the health and various parameters of driver any-time from any-where involving the Internet of Things (IoT) concept.

6. Conclusion

If drowsiness or abnormal face turn is detected during driving then vibration and buzzer alert is provided. If alcohol traces are found then automotives will not start. If alcohol traces found during driving period then automotives will reduce speed and stop after sometime. Seat belt plugin is mandatory to start automotive if seat belt is unplugged during driving period then buzzer alert is triggered. Heart beat/pulse rate is monitored continuously, if found abnormal then SMS is triggered tohospital and to third person for help which includes GPS current location of automotive. Obstacle detection is used to monitor the obstacles behind automotive and buzzer alert is triggered. Smart connect is an app which monitors the driver activities by sending all the above monitoring parameters on app and it can also be used to track automotive and control its ignition on/off for anti-thefting features.

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