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Driver Assistance System for Safe Driving

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ABSTRACT:

The main primary purpose of the project is Drowsy and drunk driver Detector is to develop a system that can reduce the number of accidents. In this project we have two monitoring steps by this we can provide a more accurate detection. For the detecting stage, the eye blink sensor always monitoring eye blink moment. (We can use ECG or EEG). It continuously monitoring eye blink moments and where collected data will be transmitted to a micro controller and the micro controller digitizes the analog data. If the warning feedback system is triggered, the micro controller makes a decision which alert needs to be activated. And the second application in this paper is to detect the alcohol detection and also to track the vehicle to find the culprit and in intimation to the Control Room with their location, and also the vehicle can be stopped or we can also slow down the car by reducing the vehicle speed. In this we use of GSM modem to trace the vehicle and also to inform to the control room. ECG sensor is used to detect the pulse of the driver. If the driver is in abnormal condition that is pulse rate of the person is high then the vehicle is stopped and the position of the vehicle is traced by GPS this information is sent to the concerned doctor.

Keywords:

Driver Assistance System, ECG, Adaptive Speed Controlling, GSM, GPS, Ultrasonic Sensor.

I. INTRODUCTION:

Driver Assistance System the following technologies are designed for implementation of the Intelligent Driver Assistance System for safety. Based on intelligent sensor technology, driver assistance systems constantly monitor the vehicle surroundings as well as the driving behavior to detect potentially dangerous situations at an early stage. In critical driving situations, these systems warn and actively support the driver and, if necessary, intervene automatically in an effort to avoid a collision or to mitigate the consequences of the accident. Adaptive speed Control (ASC) has been under development .Today ASC relies on radar or laser technology to track a vehicle ahead and maintain a safe gap.

It lets the vehicle hold a speed but adjusts to changing traffic conditions with automatic braking and acceleration.ASC reduces the number of sudden accelerations and decelerations, enables speed synchronization among vehicles, and encourages smooth lane change behaviours, and reduces accident possibility. When situation is out of driver hand the vehicle is decelerated and stopped in worst conditions for the safety of the driver.

The introduction of collision warning/avoidance systems allows the driver to take appropriate corrective actions in order to mitigate, or completely avoid the collision event. Some of the dangers that sensors can pick up include how close the vehicle is to other vehicles surrounding it, how much its speed needs to be reduced while going around a curve, and how close the vehicle is going off the road. The system uses sensors that send and receive signals from other vehicles; obstacles in the road.

The sensors will detect that vehicle and inform the driver, preventing him from potentially getting into a serious accident Driver drowsiness detection Drowsy driving sleep-related vehicle accidents are a common type of road crash. In case of hypo vigilance, this system provides an adequate warning to the driver, with various levels of warnings, according to the estimated driver's hypo vigilance state and also to the estimated level of traffic risk. The Driver Warning System uses different modalities – acoustic, visual and haptic output signals to warn the driver against his drowsiness which prevents from accidents

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II. LITERATURE REVIEW:

The literature review about the proposed system involves three steps of survey of the required technology. First and for most the research done on the ECG sensor. The book of clinical electrocardiography for post graduates resident doctors and practicing physicians 3rd edition 2012 by SN Chugh, ISBN: 978-93-58025-040-2 describes the working principle of ECE sensors and measuring of pulse rating mentioned in that textbook.

1.The literature review continued on the existed technologies for driver assistance system for safe driving One of the existed systems,T.Wartzek, B.Eilebrecht, J. Lem, H.-J. Lindner, S.Leonhardt, and M. Walter, "ECG on the road: Robust and unobtrusive estimation of heart rate," IEEE Trans. Biomed. Eng., vol. 58, pp. 3112–3120, 2011. In this paper, they implementedModern automobiles include an increasing number of assistance systems to increase the driver's safety. This feasibility study investigated unobtrusive capacitive ECG measurements in an automotive environment. Electrodes integrated into the driving seat allowed measuring a reliable ECG in 86% of the drivers; when only (light) cotton clothing was worn by the drivers, this value increased to 95%. Results show that an array of sensors is needed that can adapt to the different drivers and sitting positions. Measurements while driving show that travelling on the highway does not distort the signal any more than with the car engine turned OFF, whereas driving in city traffic results in a lowered detection rate due to the driver's heavier movements. To enable robust and reliable estimation of heart rate, an algorithm is presented (based on principal component analysis) to detect and discard time intervals with artifacts. This, then, allows a reliable estimation of heart rate of up to 61% in city traffic and up to 86% on the highway: as a percentage of the total driving period with at least four consecutive QRS complexes.

2.The literature review continued on the existed technologies for Drowsy driver monitor and warning system One of the existed systems R. Grace, and S. Steward, "Drowsy driver monitor and warning system," in Proc. the 1st Int. Driving Symp. Human Factors Driver Assessment, Training and Vehicle Design, Aspen, CO, Aug. 2001, pp. 64–69. This paper describes an vehicle nonintrusive bio potential measurement system for driver health monitoring and cardiac attack detection. Previous work has found that the health monitoring signals including eye blinking, electrocardiography (ECG), electroencephalography (EEG) and their secondary parameters which are heart rate or HR variability are good indicators of health state as well as driver fatigue. A conventional bio potential measurement system requires the charge sensing material to be in contact with human body. This not only interferes with the driver operation, but also is not feasible for long-term monitoring purpose. The driver assistance system in this paper can remotely detect the bio potential signals with no physical contact with human skin. With delicate sensor and electronic design, ECG, EEG, and eye blinking can be measured. Experiments were conducted on a high fidelity driving simulator to validate the system performance. The system was good enough to be able to detect the ECG/EEG signals through cloth or hair with no contact with skin. Eye blinking activities can also be detected at a distance of 10 cm. Digital signal processing algorithms were developed to decimate the signal noise and extract the physiological features. The extracted features from the vital signals were further analyzed to assess the potential criterion for alertness and drowsiness determination. Keywords – electro cardiograph, electro encephalography, eye blinking.

III. System Architecture:

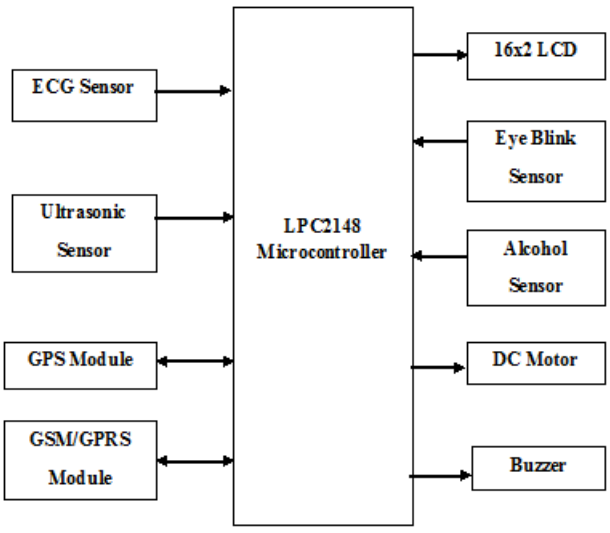

Fig:Block Diagram

The above figure shows the block diagram of the proposed safe driving system.The primary modules in this system involves Eye blink Sensor, Buzzer, GPS, GSM, Ultrasonic sensor, LCD, DC motor. A brief description about the hardware modules is given below.

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3.1 LPC2148:

In our proposed system, LPC2148 microcontroller is used. The LPC2148 is a 32-bit microcontroller. All the operations are take care by the microcontroller.Some of the main features of the LPC2148 are mentioned below

•64-pin ARM Microcontroller
•Flash Program Memory: 512 Kbytes
•SRAM Data Memory: 32 Kbytes
•45 I/O Pins
•Timers: Two 32-bit
•A/D Converter: 10-bit Fourteen Channels
•DAC: 10-bit
•Real-Time Clock
•I2C: Two Modules with Master or Slave Operation
•SPI: Full Duplex Serial Operation
•UART: Two Modules
•USB: 2.0B Fully adaptableController with RAM
•External Oscillator: up to 25MHz with integrated PLL for 60MHz Operation.

3.2 Ultrasonic Sensor:

HC-SR04 used to determine distance to an object form vehicle. It operates with high accuracy and stable readings from 2cm to 400 cm or 1 to 13 feet. It completes with ultrasonic transmitter and receiver module. The waves emitted by the transducer are reflected by an object and received back in the transducer. After having emitted the sound waves, the ultrasonic sensor will switch to receive mode. The time elapsed between emitting and receiving is proportional to the distance of the object from the sensor. Ultrasonic sensor produce ultrasonic frequencies that human cannot hear, making them ideal for quiet environments. They do not use much electricity, are simple in design, and are relatively inexpensive.

Fig: Ultrasonic Sensor

3.3 Alcohol Sensor:

MQ303A has good sensitivity and fast response to alcohol. It is suitable for making Breathalyzer. This sensor outputs a voltage inversely proportional to the alcohol concentration in air..

It has a high sensitivity and fast response time. Sensor provides an analog resistive output based on alcohol concentration.

Fig: Alcohol Sensor

3.4 ECG Sensor:

The ECG sensor is used to measure heart electrical waveforms, voltage which is generated with the contraction of the heart and its muscles. This sensor is used to create 3-lead ECG tracing to store electrical function in the heart and save collect surface EMG data on it, to capture the contractions in muscles in your legs, arms or all important body parts.

3.5 Eye Blink Sensor:

Eye Blink sensor is IR based .The IR transmitter is used to transmit the infrared rays in our eye. The IR receiver is used to receive the reflected infrared rays of eye. The output of IR receiver is high, if the eye is closed otherwise the IR receiver output is low. The output is given to logic circuit to indicate the alarm. It will helps in controlling accidents due to unconsciousness through Eye blink. Here one eye blink sensor is fixed in vehicle.

Fig: Eye Blink Sensor

3.6 16x2 LCD:

The 16x2 matrix LCD is used for the displaying of the certain operational conditions of the sensors in the system and the moving direction of the vehicle. It display 32 characters with 16 characters in each row. It is capable to display any character with ASCII values ranging from 0 to 255.LCD accepts two types of signals, one is data, and another is control.

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These signals are recognized by the LCD module from status of the RS pin. Now data can be read also from the LCD display, by pulling the R/W pin high. As soon as the E pin is pulsed, LCD display reads data at the falling edge of the pulse and executes it, same for the case of transmission.

3.7 DC Motor:

The DC motor is a device that consists of a rotor and a shaft in it. Whenever the power source is applied to the motor, the rotating part rotor will be rotated according to the polarities of the applied voltage. The two different polarities of the voltage will rotate the DC motor in either the direction but the same polarities will stop the motor.

Fig: DC Gear Motor

In most of the robotic systems, the DC motor will be used for the wheels rotation in our project. We can program the microcontroller according to the direction of the vehicle by applying corresponding polarities of the output voltage.

3.8 GPS:

GPS is increasingly used as an input for Geographic Information Systems particularly for precise positioning of geospatial data and the collection of data in the field. Precise positioning is possible using GPS receivers at reference locations providing corrections and relative positioning data for remote receiver.

3.9 GSM:

GSM (Global System for Mobile) / GPRS (General Packet Radio Service) TTL-Modem is SIM900 Quad-band. TTL interfacing circuitry and which allows User to directly interface with Microcontroller. We can send or receive SMS using AT commands. The modem is interfaced with a Microcontroller using USART (Universal Synchronous Asynchronous Receiver and Transmitter).

IV. SOFTWARE DESIGN:

The proposed system requires the following software's.

- Keil IDE Compiler
- Flash Programmer.
- Embedded c

Keil mu Vision is a windows based front end for the C Compiler and Assembler. The Compiler, Assembler and Linker are DOS executables, this provides maximum flexibility. All IDE functions are easy to use via pull down menus with prompted selections.

V. WORKING DESCRIPTION:

In this implemented system consists of Eye blink sensor, Alcohol sensor, ECG sensor, and ultrasonic sensor, Buzzer, GSM and GPS on it. Initially the vehicle is in moving condition. The microcontroller will receive the information which was collected through sensors and GSM and GPS module. If any one of the output of Eye blink sensor and Alcohol sensor are high, the microcontroller will send the information which leads to stop the motor.

Then the microcontroller will connects to the GPS module that will determine the longitude and latitude of the vehicle which will be send to the nearer controller in the form of SMS that the driver is in drowsy condition or consumed by alcohol.If any one of the output of ultrasonic sensor and ECG sensor are low, the microcontroller will send the information which leads to stop the motor.

Then the microcontroller will connects to the GPS module that will determine the longitude and latitude of the vehicle which will be send to the nearer controller in the form of SMS that the driver is in critical condition.For example, let us consider if the pulse rate of the driver is very low that will be detected by the ECG sensor which will leads to stop the vehicle and SMS will be sent to the controller room that the driver ECG down detected at LAT:1727.5780,N LOG:7833.4038,E.

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RESULTS:

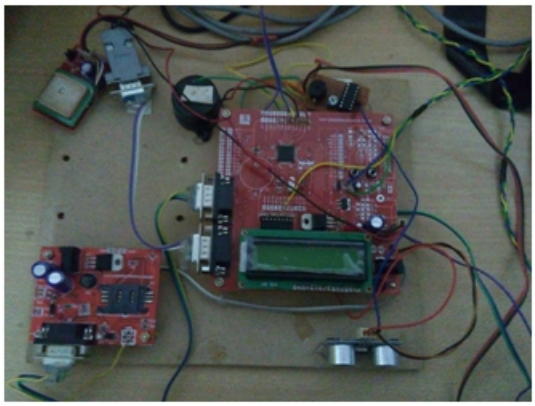

Fig:Driver assistance system

In this driver assistance system results by using MQ303A sensor through we are detecting the alcohol drunk of driver, then sensor will send the information to micro controller. This microcontroller will send the text message AT commands information of alcohol detection and location of the vehicle are longitude latitude values using GPS to particular mobile using GSM Sim-900 modem.Then when we are sleeping in driving the eye blink sensor detecting the sleeping mode of driver, then it will send the information to micro controller, that micro controller will produce the alerts through buzzer. Similarly ultra sonic sensor is used for detecting the opposite vehicle distance to our vehicle then send the MSG to particular mobile.ecg also send the heart beat range of driver information to particular mobile when he did drunk and drive . Dc motor is used to controlling the vehicle speed in drunk and drive. LCD displays the all text commands of controller.

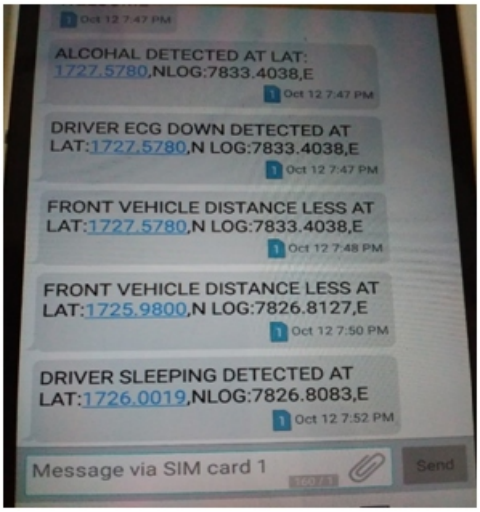

Fig:Location of driver

CONCLUSION:

It does not require physical contact with skin. This method is advantageous for long term drive monitoring purpose. The system can measure signals such as eye blinking activity, ECG, Ultrasonic sensor, Alcohol Sensor which are widely accepted signals for health monitoring drowsiness and distance of obstacle measures. It is mainly used to improve the health and safety of drivers.

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