

Distratto: Impaired Driving Using Textile Sensors

Sylvia.F¹, Taskeen Sultana.A², Vinodhini.R³, Sangeetha.D⁴and Sundarajeyalakshmi.V⁵
UG Scholar, Department of ECE, Adhiyamaan College of Engineering, Hosur, TN, India ^{1,2,3,4}
Professor, Adhiyamaan College of Engineering, Hosur, TN, India ⁵

ABSTRACT: Statistical data show that the driving related accidents and human casualties caused by vehicles globally. Most of these accidents are caused by impaired or distracted driving. Existing systems that detect impaired driving use cameras that perform eye and head tracking and do not capture full body movements that are indicative of dangerous driving. To address this problem, we present, distratto, a system that uses capacitive textile sensors embedded into car seats, headrests and armrests to capture whole body motion. The system also uses inertial and sensors for determining vehicle speed and turns. We show that is system can detect impaired driving instances and driver movements with high accuracy.

KEYWORDS: Capacitive Sensors, Liquid Crystal Display, Buzzer, Motor, Microcontroller.

I. INTRODUCTION

In this Distratto system we use PIC (Peripheral Interface Controller) Microcontroller which act as an interface with the entire process of this system. Four different sensors are fixed inside a car. Alcohol sensor is one of the important sensor which is used to detect the presence of alcohol (iso-butane propane) and cigarette smoke inside the car. Accelerometer sensor is used to sense the position of a head while driving a car. Heartbeat sensor will check the heartbeat rate whether it is at normal rate (70-90 bpm), if not it will indicate by alarming. If driver fell asleep, the eye blink sensor will sense and indicate. If any of the thing happens while driving, the buzzer will ring an alarm and the vibration motor will start to vibrate which is fixed under the seat of a driver to bring him back to his original position.

II. RELATED WORK

The main objective of this project is to avoid accidents while driving. Mostly the accidents are occurred due to the usage of mobile phones and driver gets drowsy while driving and also they get distracted by consuming alcohol. In this project, we implement four types of sensors which sense the alcohol consumption, heartbeat pressure, position of a head and eye blink of a driver. Hence by sensing these types of activities and providing an alarm will reduce the risk of accidents.

III. EXISTING METHOD

In the existing method of distratto system, the system will capture only the position of a driver by using cameras. Capturing images will not help the driver to overcome the happening of accidents. The main cause for the accidents includes Sleep deprivation, cardiac arrest, drunk and drive. In the existing system, it does not have any proper methods to detect these types of occurrences while driving.

IV. PROPOSED METHOD

The normal heartbeat ranges from 70bpm to 90 bpm. If the pulse rate of a driver increases or decreases from the normal heartbeat rate, then the sensor detects the cardiac arrest of the driver and alerts him. If the driver consumes alcohol, the alcohol sensor will detect it when the alcohol concentration exceeds more than 0.5ppm and it will also sense the cigarette smoke. If the position of a head is not at 90 degree for more than 2 minutes, then the accelerometer sensor alerts the driver. Driver control input, vehicle state, driving context and driver state data, individually and in combination, reveal signatures of alcohol impairment. Algorithms built on these signatures detect drivers with BAC levels that are over the legal limit with an accuracy of approximately 80%, similar to the Standardized Field Sobriety Test (SFST) used by law enforcement. Each of the three algorithms combined information across time to predict impairment. If the driver fell asleep while driving for more than 20seconds, the IR sensor will make the buzzer to ring. Vehicle-based countermeasures use sensors that describe drivers' control inputs (e.g., steering wheel and brake pedal movement), vehicle state (e.g., accelerometer and lane position), driving context (e.g., speed zone information and proximity of surrounding vehicles), and driver state (e.g., eyemovements and posture). Data from these sensors can be transformed, combined, and processed with a variety of algorithms to develop a detailed description of the driver's response to the roadway.

V. BLOCK DIAGRAM

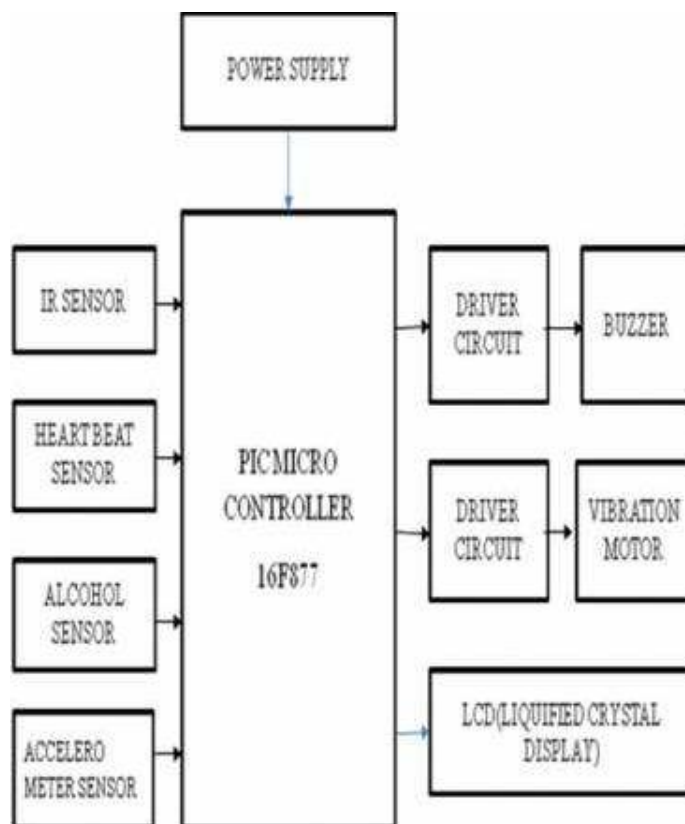


Fig 5.1: Block Diagram

The main blocks of the project are:

1. Microcontroller
2. IR Sensor
3. Heartbeat sensor
4. Alcohol sensor
5. Accelerometer sensor

PIC MICROCONTROLLER 16F877

The PIC microcontroller operates at the voltage range of 5volts. It consists of 40 I/O bi-directional pins and it has five ports such as Port A,B,C,D and E. It has high endurance Flash/EEPROM cell which can be enhanced about 100,000/1,000,000 erase/write. It is self reprogrammable under software control. The PIC microcontroller has high performance RISC CPU and it consumes low power than the other microcontrollers. Watch Dog Timer and Sleep mode timer is inbuilt in the system to reduce the time delay.

ALCOHOL SENSOR:

This sensor is suitable for detecting alcohol concentration (more than 0.5ppm) and it also sense the cigarette smoke. The sensor has high sensitivity combined with quick response time. It has 3 pins, pin1 is VCC, it operates at the voltage range of 5V and pin 3 is grounded where as the pin 2 is connected to the PIC microcontroller.

HEARTBEAT SENSOR:

Heartbeat rate is monitored by fixing this sensor at the fingertip of a driver. It checks whether the driver is in normal state of bpm(70-90 beats per minute). Heartbeat sensor operates at the voltage range of 5v.

IR SENSOR:

Infra-Red sensor is used to sense the eye blink of the driver and it will sense when the eyes are closed more than 20 seconds by alarming. IR transmitter and receiver LEDs should be fixed in front of the driver, to sense the eye blink and it operates at 5v.

VI. CONCLUSION

The normal heartbeat ranges from 70bpm to 90 bpm. If the pulse rate of a driver increases or decreases from the normal heartbeat rate, then the sensor detects the cardiac arrest of the driver and alerts him. If the driver consumes alcohol, the alcohol sensor will detect it when the alcohol concentration exceeds more than 0.5ppm and it will also sense the cigarette smoke. If the position of a head is not at 90 degree for more than 2 minutes, then the accelerometer sensor alerts the driver. If the driver fell asleep while driving for more than 20seconds, the IR sensor will make the buzzer to ring.

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