ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering
Vol. 2, Issue 2, February 2013

Driver Fatigue Monitoring and Warning System

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ABSTRACT: Road users have long been known to fall asleep while driving. Driving long hours can induce fatigue causing lack of concentration and occasionally road accidents. This project is mainly based on eye detection and simple distributed force sensor to monitor the driver's fatigue. The sensor can be used in automotive active safety systems that aim at detecting driver's fatigue, which is a major issue to prevent road accidents. The key point of our approach is to design a prototype of sensor units, so that it can serve as platform The purpose of this project is to investigate the development of a system for detecting the likelihood that a driver is about to fall asleep in control of the vehicle, and to sound an alarm . In this system the driver's fatigue is going to detect with the help of MATLAB based eye monitoring and steering wheel grip sensors.

I. INTRODUCTION

The Federal Motor Carrier Safety Administration (FMCSA), the trucking industry, highway safety advocates, and transportation researchers have all identified driver drowsiness as a high priority commercial vehicle safety issue. Drowsiness affects mental alertness, decreasing an individual's ability to operate a vehicle safely and increasing the risk of human error that could lead to fatalities and injuries. Furthermore, it has been shown to slow reaction time, decreases awareness, and impairs judgment. Long hours behind the wheel in monotonous driving environments make truck drivers particularly prone to drowsy-driving crashes .Successfully addressing the issue of driver drowsiness in the commercial motor vehicle industry is a formidable and multi-faceted challenge. Addressing the need for a reduction in crashes related to driver drowsiness in transportation will require some innovative concepts and evolving methodologies. In-vehicle technological approaches, both available and emerging, have great potential as relevant and effective tools to address fatigue. Within any comprehensive and effective fatigue management program, an on-board device that monitors driver state in real time may have real value as a safety net. Sleepy drivers exhibit certain observable behaviors, including eye gaze, eyelid movement, pupil movement, head movement, and facial expression. Noninvasive techniques are currently being employed to assess a driver's alertness level through the visual observation of his/her physical condition using a remote camera and state-of-the-art technologies in computer vision.

II. SYSTEM MODEL

Power supply

The power supply section is the important one. It should deliver constant output regulated power supply for successful working of the project. A 0-12V/1 mA transformer is used for this purpose. The primary of this transformer is connected in to main supply through on/off switch& fuse for protecting from overload and short circuit protection. The secondary is connected to the diodes to convert 12V AC to 12V DC voltage. And filtered by the capacitors, which is further regulated to +5v, by using IC 7805.

Microcontroller:

4Kb of ROM,128Kb of RAM (including SFRs) satisfies the user's basic needs. 4 ports having in total of 32 input/output lines are in most cases sufficient to make all necessary connections to peripheral environment.

Driver circuit:

The ULN2003 is a monolithic high voltage and high current Darlington transistor arrays. It consists of seven NPN darlington pairs that features high-voltage outputs with common-cathode clamp diode for switching inductive loads. The collector-current rating of a single Darlington pair is 500mA. The darlington pairs may be paralleled for higher current

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capability. Applications include relay drivers, hammer drivers, lamp drivers, display drivers (LED gas discharge), line drivers, and logic buffers.

The ULN2003 has a 2.7kW series base resistor for each Darlington pair for operation directly with TTL or 5V CMOS devices.

III. FEATURES

500mA rated collector current (Single output)High-voltage outputs: 50V Inputs compatible with various types of logic. Relay driver application A relay is an electrically operated switch. Electric current through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. The coil current can be on or off so relays have two switch positions and there are double-throw (changeover) switches. It consists of a coil of wire surrounding a soft iron core, an iron yoke, which provides a low reluctance path for magnetic flux, a movable iron armature, and a set, or sets, of contacts. In this condition, one of the two sets of contacts in the relay pictured is closed, and the other set is open. The P0_0, P0_1, P0_2 and P0_3 pin of controller is assumed as data transmit pins to the relay through relay driver ULN 2003. ULN 2003 is just like a current driver.

Liquid crystal display:

A liquid crystal display (LCD) is a flat panel display, electronic visual display, or video display that uses the light modulating properties of liquid crystals (LCs). LCs do not emit light directly. LCDs are more energy efficient and offer safer disposal than CRTs. Its low electrical power consumption enables it to be used in battery-powered electronic equipment. It is an electronically modulated optical device made up of any number of segments filled with liquid crystals and arrayed in front of a light source (backlight) or reflector to produce images in colour or monochrome.

IV. PRESSURE SENSORAND IMAGE PROCESSING PRESSURE GRIP SENSOR

The key point of our approach is to integrate a distributed sensor network into the steering wheel, as sketched in Fig. 1.Each unit of the distributed sensor network embeds a tiny microcontroller, which is in charge of reading the actual sensing element and transmitting the local data over the sensor chain. In addition, it is possible to cascade an almost arbitrary number of units through a simple interface made up of 4 wires, which comprise power supply, clock, and a bidirectional data signal.In this work, we focused our efforts on the measure of the grip force applied to the steering wheel. As sensing element we investigated the possibility of using the capacitor that is introduced by the presence of the hands, whose value can change with the pressure applied to the steering wheel. The sensing capacitor is inserted in a free running oscillator, whose frequency can easily be measured by the microcontroller.

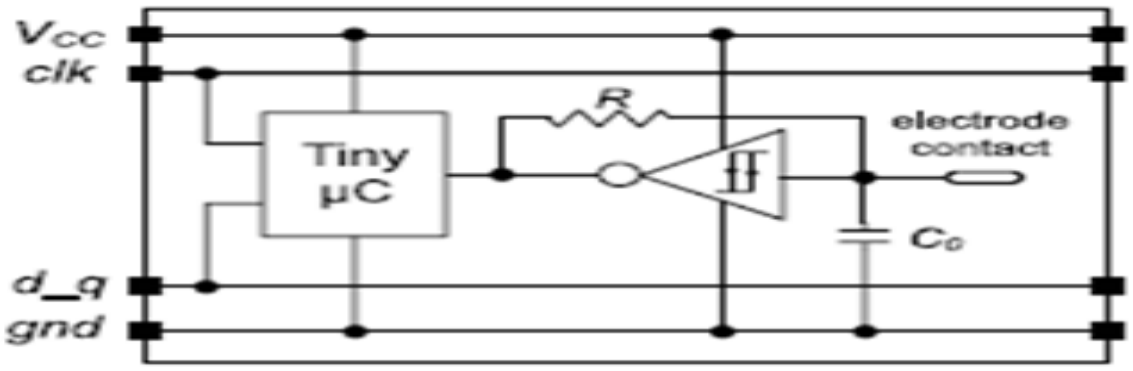

Fig. 2. Basic schematic of the sensor unit.

The capacitance comprises a fixed term C0 and a variable one that is introduced through the electrode contact. Consequently, the oscillation frequency can be related to the the external capacitance, whose value can be made to vary with the pressure applied by hands to the steering wheel. The oscillator output is routed to the input of the TIMER/COUNTER peripheral embedded in the microcontroller, which implements a frequency meter, that is, it counts the number of oscillation cycles within a given time integration window.

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In the absence of driver's hands, the only capacitance added to C0 is the capacitance Ce between sensing and gnd electrodes.On the contrary, the presence of the driver's hand introduces three additional capacitors, i.e., Che between hand and sensing electrode, Ch between hand and gnd electrode, and Cb that is the driver capacitance towards gnd. The values of the first two capacitors depend on the grip force, so that the frequency of the oscillator is related to the presence of the hand and to its grip force to the steering wheel. The on-board components R and C0, as well as the integration window of the frequency meter, can be tailored to the above electrode parameters to increase sensor sensitivity.

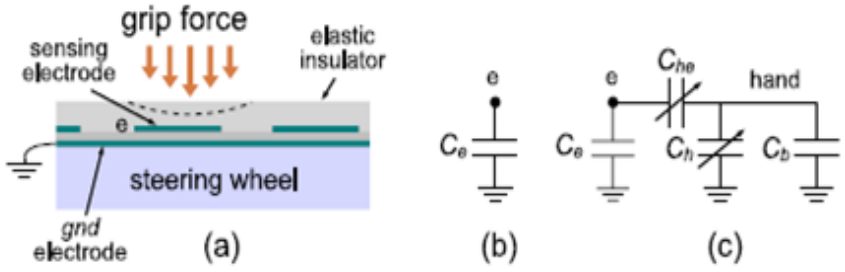

Fig. 5. (a) Capacitive sensing element. (b) and (c) Electrical models in the absence and presence of the driver's hand respectively.

V. IMAGE PROCESSING

Here the reference image is taken by the camera.Then the current status of the eye is recognised by comparing with the reference image. The current image and reference image are subtracted by morphological principle using matlab software. Thus the status of the eye is detected.

VI. CONCLUSION

This project deals with warning of driver's fatigue by sensing the grip on the steering wheel using pressure sensor ,which is done by comparing the measured pressure value with the reference value and tracking the status of eye using image processing with the help of matlab.If any of the above conditions is not satisfied alarming is activated.So the occurance of accident can be minimized. In our project we are using camera instead of IR sensor to detect the status of the eye, which is one of the major advantage and cost effective too.

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