A REAL TIME WIRELESS SYSTEM FOR DROWSINESS DETECTION AND VEHICLE ACCESSING

CHENNUPATI. PAVANI DEVI¹, I.RAMAKOTESWARA RAO²

¹M.Tech Student, Dept of ECE, Prakasam Engineering College, Kandukur mandal, PrakasamDist, A.P, India
²Assistant Professor, Dept of ECE, Prakasam Engineering College, Kandukurmandal, PrakasamDist, A.P, India

Abstract: Drowsy driving has been implicated as a causal factor in many accidents. Therefore, real-time drowsiness monitoring can prevent traffic accidents effectively. However, current BCI systems are usually large and have to transmit an EEG signal to a back-end personal computer to process the EEG signal. In this study, a novel BCI system was developed to monitor the human cognitive state and provide biofeedback to the driver when drowsy state occurs. The ever increasing numbers of traffic accidents all over the world are due to diminished driver’s vigilance level. For this reason, developing system that actively monitors the driver’s level of vigilance and alerting the driver of any insecure driving condition is essential for accident prevention. In this project we have an alcohol sensor to detect first weather the driver is drunken or in normal state and if the driver is in normal state then the vehicle will move. While vehicle is moving an eye blinking sensor will sense the eyes of the driver that weather the eyes of the driver are blinking or not. If the sensor detects that the eyes of the driver are not blinking and the driver is drowsy then a message is sent to the authorized person that the driver is drowsy through GSM. In this with the help of MEMS we can be able to know the position of the driver in the vehicle.

Key words: Micro controller, Eye blink sensor, GSM Modem, Alcohol sensor, Accelerometer.

I. Introduction

Driver drowsiness has been implicated as a causal factor in many accidents because of the marked decline in drivers’ perception of risk and recognition of danger, and diminished vehicle-handling abilities [1]–[5]. In 2002, the National Highway Traffic Safety Administration (NHTSA) reported that about 0.7% of drivers had been involved in a crash that they attribute to drowsy driving, amounting to an estimated 800 000 to 1.88 million drivers in the past five years [6]. The National Sleep Foundation (NSF) also reported that 51% of adult drivers had driven a vehicle while feeling drowsy and 17% had actually fallen asleep [7]. Therefore, real-time drowsiness monitoring is important to avoid traffic accidents.

Previous studies have proposed a number of methods to detect drowsiness. They can be categorized into two main approaches. The first approach focuses on physical changes during fatigue, such as the inclination of the driver’s head, sagging posture, and decline in gripping force on the steering wheel [8]–[12]. The movement of the driver’s body is detected by direct sensor contacts or video cameras. Since these techniques allow non-contact detection of drowsiness, they do not give the driver any discomfort. This will increase the driver’s acceptance of using these techniques to monitor drowsiness. However, these parameters easily vary in different vehicle types and driving conditions. The second approach focuses on measuring physiological changes of drivers, such as eye activity measures, heart beat rate, skin electric potential, and electroencephalographic (EEG) activities [13]–[28]. Stern et al. [13] reported that the eye blink duration and blink rate typically are sensitive to fatigue effects. Van Orden et al. [14] further compared the eye-activity-based methods to EEG-based methods for alertness esti-mates in a compensatory visual tracking task. It also indicated that the EEG-based method can use a shorter moving-averaged window to track second-to-second fluctuations in the subject performance in a visual compensatory task.
II. The Hardware System

**Microcontroller:** This section forms the control unit of the whole project. This section basically consists of a Microcontroller with its associated circuitry like Crystal with capacitors, Reset circuitry, Pull up resistors (if needed) and so on. The Microcontroller forms the heart of the project because it controls the devices being interfaced and communicates with the devices according to the program being written.

**ARM7TDMI:** ARM is the abbreviation of Advanced RISC Machines, it is the name of a class of processors, and is the name of a kind technology too. The RISC instruction set, and related decode mechanism are much simpler than those of Complex Instruction Set Computer (CISC) designs.

**L293D driver motor:** The L293 is an integrated circuit motor driver that can be used for simultaneous, bi-directional control of two small motors. The L293 is limited to 600 mA, but in reality can only handle much smaller currents unless you have done some serious heat sinking to keep the case temperature down. Unsure about whether the L293 will work with your motor? Hook up the circuit and run your motor while keeping your finger on the chip. If it gets too hot to touch, you can't use it with your motor.

**Accelerometer:** Micro-Electro-Mechanical Systems, or MEMS, is a technology that in its most general form can be defined as miniaturized mechanical and electro-mechanical elements (i.e., devices and structures) that are made using the techniques of micro fabrication.

**GSM Modem:** GSM/GPRS RS232 Modem from rhydoLABZ is built with simcom Make SIM900 Quad-band GSM/GPRS engine, works on frequencies 850 MHz, 900 MHz, 1800 MHz and 1900 MHz. It is very compact in size and easy to use as plug in GSM Modem.

III. Design of Proposed Hardware System

The primary purpose of the Drowsy Driver Detector is to develop a system that can reduce the number of accidents from drowsy driving. With our two monitoring steps, we can provide a more accurate detection.

![Block diagram of the proposed system](image)

For the detecting stage, the eye blink sensor always monitoring eye blink moment. It continuously monitoring eye blink moment the monitoring stage is over, the 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 was 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. In this we use of GSM modem to trace the vehicle and also to inform to the control room. And also the indicator is fixed in the front and back of the vehicle to show to the opposite vehicle by means of this the driver can able to identify that driver was drunk. For the alert systems, we have two devices a beeper and an electric shocker.

IV. Board Hardware Resources Features

**GSM Module**

GSM (Global System for Mobile communication) is a digital mobile telephone system that is widely used in many parts of the world. The mobile communications has become one of the driving forces of the digital revolution. Every day, millions
of people are making phone calls by pressing a few buttons. Little is known about how one person's voice reaches the other person's phone that is thousands of miles away. Even less is known about the security measures and protection behind the system. The complexity of the cell phone is increasing as people begin sending text messages and digital pictures to their friends and family. The cell phone is slowly turning into a handheld computer. All the features and advancements in cell phone technology require a backbone to support it. The system has to provide security and the capability for growth to accommodate future enhancements. General System for Mobile Communications, GSM, is one of the many solutions out there. GSM has been dubbed the "Wireless Revolution" and it doesn't take much to realize why GSM provides a secure and confidential method of communication.

GSM (Global System for Mobile communication) is a digital mobile telephone system that is widely used in many parts of the world. GSM uses a variation of Time Division Multiple Access (TDMA) and is the most widely used of the three digital wireless telephone technologies (TDMA, GSM, and CDMA). GSM digitizes and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot. GSM operates in the 900MHz, 1800MHz, or 1900 MHz frequency bands. GSM has been the backbone of the phenomenal success in mobile telecoms over the last decade. Now, at the dawn of the era of true broadband services, GSM continues to evolve to meet new demands. One of GSM's great strengths is its international roaming capability, giving consumers a seamless service. This has been a vital driver in growth, with around 300 million. In the Americas, today's 7 million subscribers are set to grow rapidly, with market potential of 500 million in population, due to the introduction of GSM 800, which allows operators using the 800 MHz band to have access to GSM technology too.

GSM together with other technologies is part of an evolution of wireless mobile telecommunication that includes High-Speed Circuit-Switched Data (HCSD), General Packet Radio System (GPRS), Enhanced Data GSM Environment (EDGE), and Universal Mobile Telecommunications Service (UMTS). GSM security issues such as theft of service, privacy, and legal interception continue to raise significant interest in the GSM community. The purpose of this portal is to raise awareness of these issues with GSM security. The mobile communications has become one of the driving forces of the digital revolution. Every day, millions of people are making phone calls by pressing a few buttons. Little is known about how one person's voice reaches the other person's phone that is thousands of miles away. Even less is known about the security measures and protection behind the system. The complexity of the cell phone is increasing as people begin sending text messages and digital pictures to their friends and family. The cell phone is slowly turning into a handheld computer. All the features and advancements in cell phone technology require a backbone to support it. The system has to provide security and the capability for growth to accommodate future enhancements. General System for Mobile Communications, GSM, is one of the many solutions out there. GSM has been dubbed the "Wireless Revolution" and it doesn't take much to realize why GSM provides a secure and confidential method of communication.

![Fig.2. General Architecture of a GSM network](image)

**MEMS:** Micro-Electro-Mechanical Systems (MEMS) is the integration of mechanical elements, sensors, actuators, and electronics on a common silicon substrate through micro fabrication technology. While the electronics are fabricated using integrated circuit (IC) process sequences (e.g., CMOS, Bipolar, or BICMOS processes), the micromechanical components are fabricated using compatible "micromachining" processes that selectively etch away parts of the silicon wafer or add new structural layers to form the mechanical and electromechanical devices. MEMS promises to
revolutionize nearly every product category by bringing together silicon-based microelectronics with micromachining technology, making possible the realization of complete systems-on-a-chip. MEMS is an enabling technology allowing the development of smart products, augmenting the computational ability of microelectronics with the perception and control capabilities of micro sensors and micro actuators and expanding the space of possible designs and applications.

The critical physical dimensions of MEMS devices can vary from well below one micron on the lower end of the dimensional spectrum, all the way to several millimeters. Likewise, the types of MEMS devices can vary from relatively simple structures having no moving elements, to extremely complex electromechanical systems with multiple moving elements under the control of integrated microelectronics. The one main criterion of MEMS is that there are at least some elements having some sort of mechanical functionality whether or not these elements can move. The term used to define MEMS varies in different parts of the world. In the United States they are predominantly called MEMS, while in some other parts of the world they are called “Microsystems Technology” or “micro machined devices”.

While the functional elements of MEMS are miniaturized structures, sensors, actuators, and microelectronics, the most notable (and perhaps most interesting) elements are the micro sensors and micro actuators. Micro sensors and micro actuators are appropriately categorized as “transducers”, which are defined as devices that convert energy from one form to another. In the case of micro sensors, the device typically converts a measured mechanical signal into an electrical signal.

Over the past several decades MEMS researchers and developers have demonstrated an extremely large number of micro sensors for almost every possible sensing modality including temperature, pressure, inertial forces, chemical species, magnetic fields, radiation, etc. Remarkably, many of these micro machined sensors have demonstrated performances exceeding those of their macro scale counterparts.

That is, the micro machined version of, for example, a pressure transducer, usually outperforms a pressure sensor made using the most precise macro scale level machining techniques. Not only is the performance of MEMS devices exceptional, but their method of production leverages the same batch fabrication techniques used in the integratedcircuit industry – which can translate into low per-device production costs, as well as many other benefits. Consequently, it is possible to not only achieve stellar device performance, but to do so at a relatively low cost level. Not surprisingly, silicon based discrete micro sensors were quickly commercially exploited and the markets for these devices continue to grow at a rapid rate.

More recently, the MEMS research and development community has demonstrated a number of micro actuators including: micro valves for control of gas and liquid flows; optical switches and mirrors to redirect or modulate light beams; independently controlled micro mirror arrays for displays, micro resonators for a number of different applications, micro pumps to develop positive fluid pressures, micro flaps to modulate airstreams on airfoils, as well as many others. Surprisingly, even though these micro actuators are extremely small, they frequently can cause effects at the macro scale level; that is, these tiny actuators can perform mechanical feats far larger than their size would imply. For example, researchers have placed small micro actuators on the leading edge of airfoils of an aircraft and have been able to steer the aircraft using only these microminiaturized devices.
A surface micro machined electro-statically-actuated micro motor fabricated by the MNX. This device is an example of a MEMS-based micro actuator.

Motor Driver (L293D)

A motor driver circuit is designed to drive an electromagnetic load, such as a brushed or brushless motor, stepper motor or a solenoid or relay. Motors typically require voltages and/or currents that exceed what can be provided by the analog or digital signal processing circuitry that controls them. The motor driver provides the interface between the signal processing circuitry and the motor itself. It is essentially the “amplifier” for the motor. Motor drivers can be constructed from discrete components, completely integrated inside an IC, or may employ both discrete and integrated components. When current and voltage levels allow, integration of the entire motor driver inside a single IC generally provides the highest level of functionality and performance at the smallest physical size.

Alcohol sensor: This is an alcohol sensor from futurlec, named MQ-3, which detects ethanol in the air. It is one of the straightforward gas sensors so it works almost the same way with other gas sensors. It costs $6.90. Typically, it is used as part of the breathalyzers or breath testers for the detection of ethanol in the human breath.

Datasheet

Here is a datasheet, only 2 pages. It shows features, applications, specifications and configurations etc. It is a pretty simple datasheet. Since this datasheet was not prepared in English, the translation is not very accurate.

How it looks like: Basically, it has 6 pins, the cover and the body. Even though it has 6 pins, you can use only 4 of them. Two of them are for the heating system, which I call H and the other 2 are for connecting power and ground, which I called A and B.

Fig.4. Pins of the sensor

If you look at the inside of the sensor, you will find the little tube. Basically, this tube is a heating system that is made of aluminum oxide and tin dioxide and inside of it there are heater coils, which practically produce the heat. And you can also find 6 pins. 2 pins that I called Pin H are connected to the heater coils and the other ones are connected to the tube.

Fig.5.

How it works: How does it work? The core system is the cube. As you can see in this cross-sectional view, basically, it is an Alumina tube cover by SnO2,
which is tin dioxide. And between them there is an Aurum electrode, the black one. And also you can see how the wires are connected. So, why do we need them? Basically, the alumina tube and the coils are the heating system, the yellow, brown parts and the coils in the picture.

![ Heating system (coil:Al2O3) ](image)

**Fig. 6.**

**Working Process:** If the coil is heated up, SnO2 ceramics will become the semi-conductor, so there are more movable electrons, which means that it is ready to make more current flow. Then, when the alcohol molecules in the air meet the electrode that is between alumina and tin dioxide, ethanol burns into acetic acid then more current is produced. So the more alcohol molecules there are the more current we will get. Because of this current change, we get the different values from the sensor.

**V. Conclusion**

Moreover, the modular approach applied in hardware and software design enables this system to be configurable for different application scenarios in the future. This system is feasible for further extension. Based on the unsupervised approach proposed in our previous study, a real-time drowsiness detection algorithm was also developed and implemented in this module to detect drowsiness continuously and trigger a warning tone when the drowsy state occurs. In our previous study, we have found that the occipital midline is an effective channel to discriminate the power of drowsiness from that of alertness. Based on this property, our BCI system only uses three EEG electrodes to detect drowsiness. Therefore, compared to other BCI techniquesthe setup of our BCI system is relatively easier. Moreover, in order to verify the reliability of our proposed EEG-based BCI system, a lane-keeping driving experiment was designed for online testing. For ten subjects, the average of PPV and sensitivity are 76.9% and 88.7%, respectively. Therefore, our real-time wireless embedded EEG-based BCI system is feasible for drowsiness detection. It can be considered as an alternative to the drowsiness monitoring system in practical driving applications.

**VI. Reference:**


Chennupati. Pavani Devi, pursuing her M.Tech in VLSI&ES from Prakasam Engineering College, Kandukur mandal, PrakasamDist, A.P, India. Affiliated to Jawaharlal Nehru Technological University, Kakinada, and is approved by AICTE Delhi.

I.Ramakoteswara Rao, his Qualification is M.tech, currently working as an Assistant Professor, in the Department of Electronics and communication Engineering, Prakasam Engineering College, Kandukur mandal, PrakasamDist, A.P, and India. Affiliated to Jawaharlal Nehru Technological University, Kakinada, and is approved by AICTE Delhi.