Monitoring The Stress Level And Driving Pattern of Drivers To Minimize Road Accidents.

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***ABSTRACT**:*

The objective of the project is to present a system capable of detecting real-life events, and driver behavior, and report such events to a dedicated server. The system relies on Smartphone to act as both the sensing platform and the reporting mechanism. Data gathered from individual vehicles are aggregated to authenticate events based on the frequency of detection, and alert governmental agencies about the event, along with a measured level of urgency. Smartphone are utilized in various ways to attain the goals. The system is designed to function without interrupting the driver's focus, and is seamlessly able to detect dangerous road conditions and driving pattern. In case the passenger would wish to contribute actively in the monitoring process, the system also allows for a detailed mode of operation that entails interaction and media collection. The obtained data from the sensors is then stored in ThingSpeak. The hardware used to implement this system is PICI6F877A Microcontroller which encodes and decodes data. It requires no additional analog to digital converter. The results obtained with the help of the sensors and Matlab mobile app will be classified into three categories such as Normal speed, slow speed and Rash speed along with the driving pattern of the driver. Based on the obtained results the vehicle is controlled if there is any abnormality observed.

KEYWORDS**: **PICI6F877A Microcontroller, Matlab, ThingSpeak.

INTRODUCTION

Stress is one of the crucial factors to be considered in this modern world. Stress experienced by the drivers cause several health problems and road accidents leading to deaths. While driving the stress level of the driver leads to change in their driving pattern. In-order to avoid this we need to re-propose the existing hardware available to all drives that is capable of sensing, processing and reporting events in real time. The smart phone consists of many sensors with distinct degrees of quality and sensitivity. These phones are capable of acquiring information such as current location, direction, speed, tilt etc. The acquired data from sensors is reported through multiple forms of communication available like cellular Wi-Fi and Bluetooth. The proposed model has a client server system which uses the smart phone sensor to monitor both stress level of the driver and driving pattern of an individual driver from the collected sensor data. The data obtained through the sensors are put in a cloud using THINK SPEAK (open IOT platform). If there is any abnormality observed in the drivers stress level and driving pattern, the vehicle will be controlled for safe transportation.

Yueqi Liu, et.al [9]**,** in the year 2013, proposed the Study of Wireless Safety Monitoring System for Driver Based on The Information Fusion Technology. The ARM Cortex-A8 vehicle terminal kernel with various information acquisition modules was developed in this paper many kinds of sensors such as video camera and infrared temperature tester were used to collect the data, and the information were fused to build embedded information collection system of Android. So we can monitor the driver's bad behaviors such as fatigue driving, talking on the phone, driving with ill symptoms, driving in agitated state and so on. At the same time the driver's information monitored were sent to monitoring center through wireless network. Monitoring center software was developed, in monitoring center, all kinds of signals were processed by image processing technology such as edge detect, image matching and so on. Through image process, we can accurately judge the driver's bad behaviors, so it realizes remote monitoring for driver and improve the driving safety of driver.

K. U. G. S. Darshana, et.al [3], in the year 2013, proposed the Riyadisi-Intelligent Driver Monitoring System. Road accidents have become a major problem that causes nearly 1.3 million people die and 25-50 million people injured or disabled in each year all around the world. It has been calculated that 10% to 20% of traffic accidents with dead drivers are caused by driver inattention. Drowsiness and distraction of drivers have become the main causes for driver inattention. Drowsiness is something unavoidable and out of control of the driver. Sleepiness increases reaction time and generates the decreased vigilance level, alertness and concentration. Hence the quality of decision making may be affected. Reduced attention and raised reaction time increase the probability of road accidents. Distractions such as looking away, using mobile phone or navigation systems are also obviously cause to make driver loses his/ her focus.

Hua Gao, et.al [4], in the year 2014, proposed the Detecting Emotional Stress From Facial Expressions For Driving safety. Monitoring the attentive and emotional status of the driver is critical for the safety and comfort of driving. In this work a real-time non-intrusive monitoring system is developed, which detects the emotional states of the driver by analyzing facial expressions. The system considers two negative basic emotions, anger and disgust, as stress related emotions. We detect an individual emotion in each video frame and the decision on the stress level is made on sequence level. The experimental results show that the developed system operates very well on simulated data even with generic models. Additional pose normalization step reduces the impact of pose mismatch occurring due to camera setup, pose variation and hence improves the detection accuracy further.

Shahina Begum et.al [7], in the year 2015, proposed the Intelligent Driver Monitoring Systems Based On Physiological Sensors Signals. Drowsiness, stress and lack of concentration caused by a variety of different factors is a serious problem in traffic. Many traffic accidents are due to these risky behaviors of the drivers. A system which recognizes the state of the driver and e.g. suggests breaks when stress level is too high or driver is too tired would enable large savings and reduces accident. Today different physiological sensor signals such as Electrocardiogram (ECG), Electrooculogram (EOG), Electroencephalogram (EEG) and Pulse Oximeter (Oxygen saturation measurements) enable clinician to determine psychological and behavioral state with high accuracy. There are researchers working on developing intelligent systems help to monitor potential risky behaviors of drivers using sensor signals. Thus, this paper provides an overview and analysis of driver monitoring/alerting systems developments and implementations which are based on physiological sensor signals. Summarizing published research works and systems this review provides a resource for researchers, scholars and developers working in the area.

G. Li, et.al [5], in the year 2015, proposed a Field Operational Test Of Advanced Driver Assistance Systems. In Typical Chinese Road Conditions: The Influence Of Driver Gender, Age And Aggression. Although various Advanced Driver Assistance Systems (ADASs) have been developed to assist drivers, their performances and driver acceptances in China have not been well tested and analyzed. This study aims to examine how do driver gender, age, and aggression affect the performances and driver acceptances of typical ADASs by means of Field Operational Tests (FOTs), including FCW (Forward Collision Warning), LDW (Lane Departure Warning), and SBZA (Side Blind Zone Alert). Thirty-three participants were recruited to drive an equipped vehicle on the test route in and around Beijing City. Vehicle states, environmental information, and driver feedback were recorded by CAN bus, cameras, and post-drive questionnaires. The test results showed that the alert frequencies of FCWs and LDWs increase in higher speed traffic scenarios, whereas that of SBZA declines. Driver acceptance rate of SBZA ranks the highest, with FCW ranking the second and LDW being the last. Driver gender, age, and aggression effects were analyzed in details, showing their relationships with total alert times, alert times per 100 km, and driver acceptance rate of each system. The findings are helpful for future development of ADASs for automotive industry.

Boon-Giin Lee, et.al [1], in the year 2016, proposed a Wearable Glove-Type Driver Stress Detection Using a Motion Sensor. Increased driver stress is generally recognized as one of the major factors leading to road accidents and loss of life. Even though physiological signals are reported as the most reliable means to measure driver stresses, they often require the use of unique and expensive sensors, which produce dynamic and varying readings within individuals. This paper presents a novel means to predict a driver's stress level by evaluating the movement pattern of the steering wheel. This is accomplished by using an inertial motion unit sensor, which is placed on a glove worn by the driver. The motion sensor selected for this paper was chosen because for its low cost and the fact that it is least affected by environmental factors as compared with a physiological signal. Experiments were conducted in three different environmental scenarios. The scenarios were classified as “urban,” “highway,” and “rural” and they were chosen to simulate contrasting stress conditions experienced by the driver. In this paper, skin conductance and driver self-reports served as a reference stress to predict the driver's stress level. Galvanic skin response, a well-known stress indicator, was captured along the driver's palm and the readings were transmitted to a mobile device via low energy Bluetooth for further processing. The results revealed that indirect measurement of steering wheel movement with an inertial motion sensor could obtain accuracies up to an average rate of 94.78%. This demonstrates the opportunity for inclusion of motion sensors in wireless driver assistance systems for ambulatory monitoring of stress levels.

Chien-Yu Chiou, et.al [2], in the year 2016, proposed an Abnormal Driving Behavior Using Sparse Representation, to reduce the chance of traffic crashes, many driver monitoring systems (DMSs) have been developed. A DMS warns the driver under abnormal driving conditions. However, traditional approaches require enumerating abnormal driving conditions. In this paper, we propose a novel DMS, which models the driver's normal driving statuses based on sparse reconstruction. The proposed DMS compares the driver's statuses with his/her personal normal driving status model and identifies abnormal driving statuses that greatly change the driver's appearances. The experimental results show good performance of the proposed DMS to detect variant abnormal driver conditions.

Shubham Yadav, et.al [8], in the year 2016, proposed a Performance Monitoring System for Driver with Light Motor Vehicle (LMV) Learner’s License. There are many parameters on which a driver's performance should be analyzed during training phase. In the prevailing system, few important parameters are missing. A major drawback of conventional licensing method is that the licensing authority is unaware of the performance of driver during learning phase. In this paper, we present an alternative method of assessing driving skills, which

will also try to cover these missing parameters. This Performance Monitoring System will continuously monitor and record the performance during learning phase; it will also help in enhancing the driving skills and can help in reducing the number of accidents which are caused by driver's mistakes. This system uses a CAN (Controller Area Network) based approach to acquire basic car parameters (Speed, Acceleration and Load) from car's OBD (On-Board Diagnostics) system. Additionally, force applied on clutch and brake will be acquired by the system using force sensors. All this acquired data will be processed to give errors and corrective measures.

Margarida Urbano, et.al [6], in the year 2017, proposed a Cooperative Driver Stress Sensing Integration eCall System For Improved Road Safety. Understanding drivers' behavior under various challenging situations, to avoid accidents, is considered a key research area in the field of safety for Intelligent Transportation System (ITS). Various events (stressors) occurring while driving vehicles may negatively impact drivers' ability to detect and react to unpredictable incident that can possibly cause accidents. Therefore, this paper presents an experimental assessment on the feasibility of such visionary system. For this purpose, we estimate the driver emotional state relying on previously identified user emotional profiles and stress modeling techniques. The eCall system is mainly used to inform the public health authorities and ensure on-time medical assistance. Real-world tests, consisting six drivers and two different cities, are performed to validate the functionality of the proposed system.

PROPOSED METHOD

Here the driver's stress level is traced using his facial expressions. Immediate response occurs when the expression is detected. The facial expressions are detected by placing a Near-infrared camera (NIR) facing the driver. The camera is mounted to the dashboard to face the driver which will have face tracker applied to trace a set of facial features. In-order to classify the facial expressions in every frame, the local texture features will be extracted. There will be mismatch in pose due to the position of the camera and hence a pose normalization step is being applied which will generate a virtual frontal view of the driver's face.

The stress level of the driver is monitored with the help of sensors in the smart phones by default. The data obtained through the sensors will trace the driving pattern of the drivers by storing it in the cloud. If the driving pattern of any driver is found to be abnormal the speed of the vehicle will be controlled.

BLOCK DIAGRAM

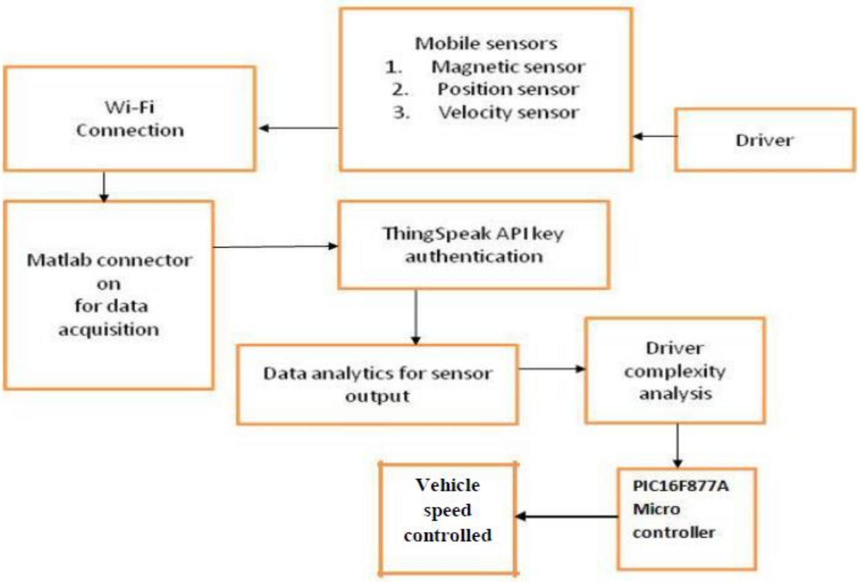

Fig.1 Block diagram

ACCELEROMETER SENSOR: The accelerometer sensor in mobile phones is used to trace the linear movement encountered by the user. This comes inbuilt in smart phones and hence no additional attachment is necessary.

POSITION SENSOR: The position sensor or the gyro sensor in smart phone is used to measure the rotation, tilt or rotational velocity.

MAGNETIC SENSOR: The magnetic sensor in mobile determines the orientation of the Earth's magnetic field. The major four directions are known with the help of this sensor.

PROXIMITY SENSOR: The proximity sensor is used to identify any nearby physical objects present without any contact. It does so by emitting an electromagnetic radiation and observes changes in the field.

MATLAB: Matlab is a tool widely used for technical computing, computation and visualization in a circumstance like Data acquisition, algorithm development, data analysis, exploration, engineering graphics, application development etc.

HARDWARE: PIC16F877A Microcontroller

It is the Peripheral Interface Controller which encodes and decodes the data. It is a 28 pin DIP package. It has HARVARD architecture and requires no additional analog to digital converter. It has three pins namely Port A, Port B, Port C. Port AS has 6 pins where analog signal is fed. The ports B and C have 8 pins each. There are three memory blocks in PIC which are program memory, Data memory, data EEPROM. It has certain exceptional features mentioned below

- High performance RISC CPU
- Options in oscillator selection
- Programmable code protection
- Power saving SLEEP mode
- Direct, Indirect and relative addressing modes.
- Interrupt capability (11 sources)
- Lesser single word instructions
- 8 level deep hardware stack
- 2K * 14 words of flash memory
- 128 * 8 bytes of RAM
- 64 * 8 bytes of EEPROM Data memory

It has several advantages which are mentioned below

- Low power consumption
- Easy writing
- Alterations are easy
- Low cost
- Flash memory which can be rewritten up to 100,000 times.

ThingSpeak IoT:

ThingSpeak is an open IoT platform which lets the user to analyze, visualize live data in cloud. Matlab code can be executed in ThingSpeak also allows to perform online analysis and processing of data. ThingSpeak is widely used as a proof for IoT systems where analytics are required. It is utilized to store and recover the data from things with HTTP convention over internet. It has certain key features like

- Visualizing the sensor data in real
- Easy configurability
- Automatic action on data and communication through third party services
- Functions on schedules or events

Matlab mobile app is utilized to obtain the sensor data from the smart phone. The obtained data is then put into an IoT platform using the Wi-Fi connection.

The figure shows that initially the data of the driver is obtained through the sensors in smart phone which should be connected to a Wi-Fi network. The Matlab connector is used to acquire data which is then stored in an open Iot platform (ThingSpeak). Then the data obtained is analyzed to produce the output. If there is abnormality absorbed in the results obtained, the speed of the vehicle is controlled using a PICI6F877A microcontroller.

Flow chart

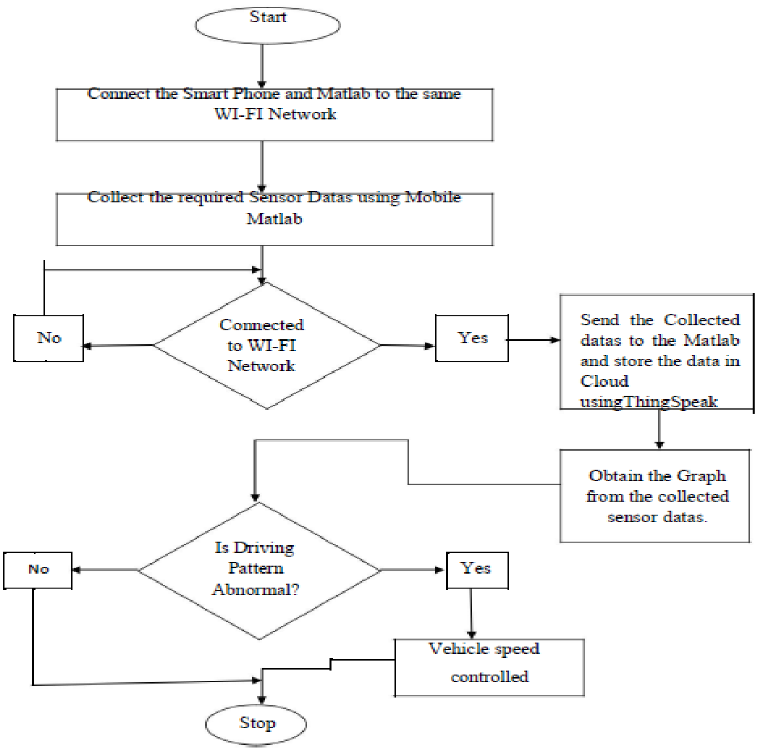

Fig.2 Flow chart of the detection of stress level

Results

The stress level and driving pattern of the driver is monitored in this proposal. The facial expression of the driver is traced by placing a NIR camera in the dashboard. Matlab mobile app is used to acquire data from the sensors.

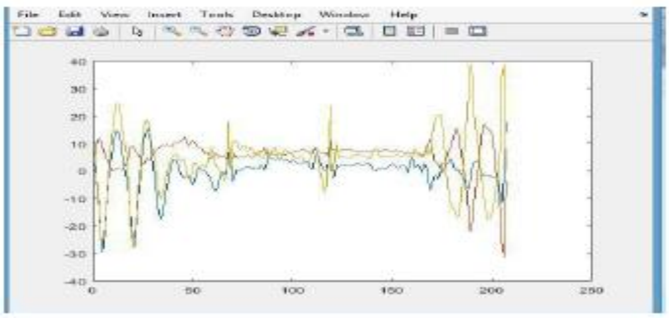

Fig.3 Normal speed

The fig.3 displays the obtained output through the Matlab code which traces the data with the usage of Matlab mobile app.

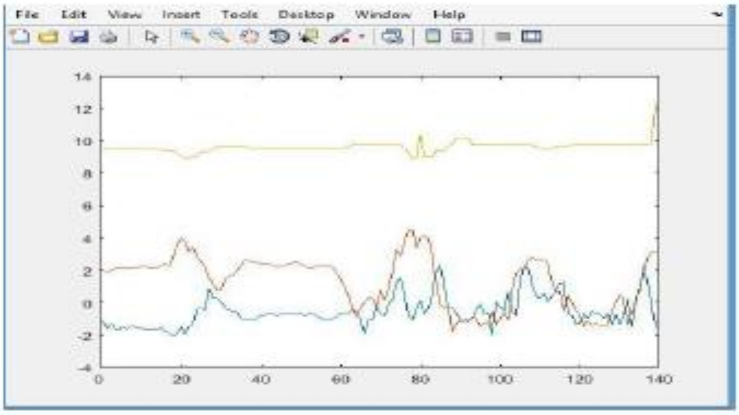

Fig.4 Slow speed

Fig 4 shows the result of the Matlab code which obtains the data from the Matlab mobile app.

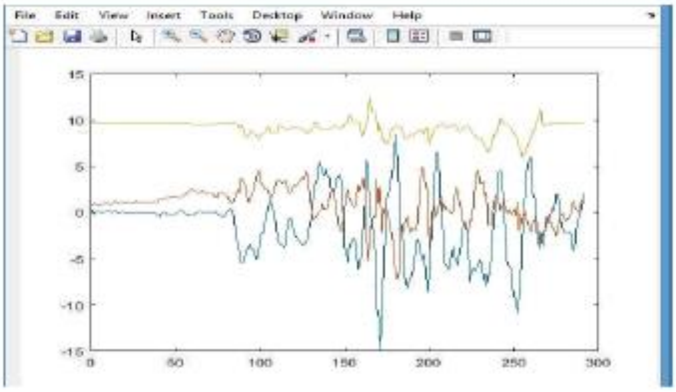

Fig.5 Rash Driving

The above figure shows the output of the matlab code which acquires data from the matlab mobile app.

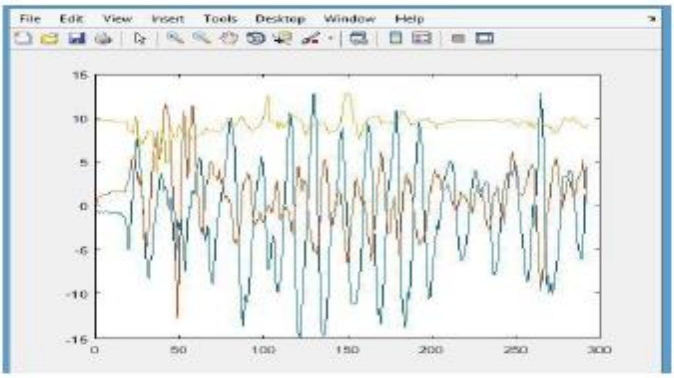

Fig.6 Zig Zag

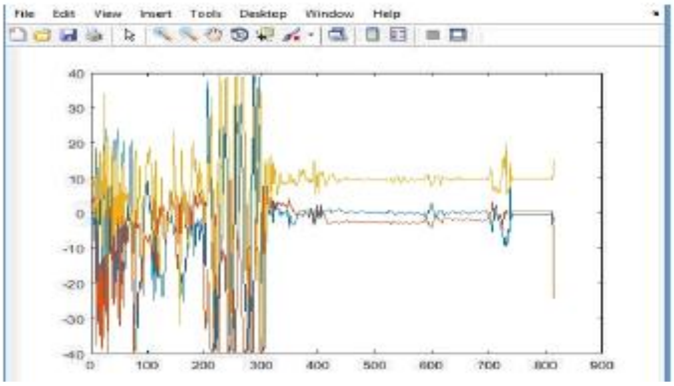

Fig.7 High speed

Fig.8 ThingSpeak Graph

ThingSpeak software stores data obtained in cloud and allows the user to access it irrespective of place and time.

CONCLUSION

This proposed method is helpful in identifying the stress level and driving pattern of the driver to reduce the road accidents which occur due to sudden illness and stress. The system used the user environment data and information about the activity of the drivers captured by the smart phones. If the driving pattern of the driver or the stress level of the driver is found to be in an abnormal state the speed of the vehicle will be controlled which will reduce the speed of the vehicle.

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