An IoT Based Accident Prevention, Protection and Information Tracking System for Drunkards

Gowri K K[1], Rahul Kumar S[2], Indu N[3], Harish Kumar C[4]

[1234]*U.G. Student, India*[1]Sindhushree H N[5] *Assistant Professor,Dept. of C.S.E,*

BGS Institute of Technology, Mandya, India[2]

Abstract - Fatal Road accidents can be easily avoided by understanding the psychological state of drivers. Majority of road accidents occur during night driving due to drowsiness state of vehicle drivers (Subject).This paper provides Eye Blink Monitoring System (EBM) that alerts the subject during state of drowsiness. An embedded system based on psychological state of Subject by monitoring eye movements and head movements are useful in warning drivers during initial sleep cycle phase of drowsiness. The physiological sleep state analysis of subject can be determined by monitoring subject's eye-blink rate using an IR sensor and head movement using an accelerometer. A normal eye blink rate has no effect on the output of the system. However ,if subject is in extreme state of sleep-cycle, then IR sensor receives abnormal eye blinking rate & a vibrator is initiated to wake the subject. An Internet of Things (IOT) enabled sensors are used to transmit the entire data collected by sensors over a smart grid network for quick response team to take actions under emergency conditions.

Keywords:
InternetofThings(IOT),EyeBlinkMonitoringSystem(EBM),M2M-machinetomachinecommunication, IPv6, URL- universal resource locator, URN- universal resource name, sensors, drowsiness,accidentpreventionsystem.

I. INTRODUCTION

TheInternetofThings(IOT)istheinterconnectionofuniquelyidentifiableembeddedcomputingdeviceswithintheexisting Internet infrastructure. Typically, IOT offers advanced connectivity of devices, systems, and services thatgoesbeyond machine-to-machine communications (M2M) and covers a variety of protocols, domains, and applications.Theinterconnection of these embedded devices (including smart objects), is implemented in nearly all fields ofautomation enabling advanced applications like a Smart Grid. The term ―things‖inthe IOT refers to a wide variety of devicessuchas heart monitoring implants, biochip transponders on farm animals, electric clams in coastal waters, automobileswithbuilt-insensors,orfieldoperationdevicesthatassistfire-fightersinsearchandrescue.Currentmarketexamplesinclude thermostat systems and washer/dryers that utilize Wi-Fi for remote monitoring. Inthisprojectwearepresentinganinternetbasedsystementitled_EyeBlinkandheadmovementMonitoring System whichwillhelpdriverstoalertindrowsiness.Thissystemisbasedonprincipleofmonitoringeye movementsofdrivercontinuouslyusinganIRsensorandheadmovementusingaccelerometer.Ifhe/shefalls asleep, then an alarm will ring to wake him/her up. IntegrationwiththeInternetimpliesthatdeviceswillutilizeanIPaddressasauniqueidentifier.However,duetothelimited address space of IPv4 (which allows for 4.3 billion unique addresses), objects in the IOT will have to useIPv6to accommodate the extremely large address space required. Objects in the IOT will not only be devices withsensorycapabilities, but also provide actuation capabilities (e.g., bulbs or locks controlled over the Internet). Largely, thefutureof the Internet of Things will not be possible without the support of IPv6 and consequently the global adoption ofIPv6inthecomingyearswillbecriticalforthesuccessfuldevelopmentoftheIOT inthe future.

II. FUNCTIONING OF INTERNET OF THINGS (IOT)

The Internet of Things is the expansion of the current Internet services so as to accommodate each and every object which exists in this world or likely to exist in the coming future. This article discusses the perspectives, challenges and opportunities behind a future Internet that fully supports the "things", as well as how the things can help in the design of a more synergistic future Internet. Things having identities and virtual personalities operating in smart spaces using intelligent interfaces to connect and communicate within social, environmental, and user contexts. There are several fuzziness about the

concept of Internet of Things such as IoT can be broken in two parts Internet and Things. The worldwide network of interconnected computer networks based on a standard communication protocol, the Internet suite (TCP/IP) while a things is an object not precisely identifiable. The world around us is full of objects, smart objects and the existing service provider known as Internet. The convergence of the sensors like smart objects, RFID based sensor networks and Internet gives rise to the Internet of Things. With increased usage of sensors the raw data as well as distributed data is increasing. Smart devices are now connected to Internet using their communication protocol and continuously collecting and processing the data. Ubiquitous computing which was thought as a difficult task has now become a reality due to advances in the field of Automatic Identification, wireless communications, distributed computation process and fast speed of Internet. From just a data perspective the amount of data generated, stored and processed will be enormous. We focused on making this architecture as a sensor based architecture where each sensor node will be as important as the sensor network itself. Visualizing each sensor as having intelligence is the ultimate aim of any architecture in the IoT domain.

There is a lot of pervasive presence in the human environment of things or objects, described general overview of internet evolution with several IoT services with the use of radio-frequency identification (RFID) tags, sensors, actuators, mobile phones, smart embedded devices, etc. o reach a common goal of making the system easier to operate and utilize. The objects that will be connected will be adaptive, intelligent, and responsive.

III. FUTURE VISION OF INTERNET OF THINGS

The Internet of Things is a vision which is under development and there can be many stake holders in this development depending upon their interests and usage. It is still in nascent stages where everybody is trying to interpret IoT in with respect to their needs. Sensor based data collection, data management, data mining and World Wide Web is involved in the present vision. Of course sensor based hardware is also involved. A simple and broad definition of the internet of things and the basic idea of this concept is the pervasive presence around us of a variety of things or objects – such as Radio-Frequency Identification (RFID) tags, sensors, actuators, mobile phones, etc. – which, through unique addressing schemes, are able to interact with each other and cooperate with their neighbours to reach common goals. Fig. 2 has been discussion on three particular visions given by.

They are:

• Things Oriented Vision

• Internet Oriented Vision

• Semantic Oriented Vision

A. Things Oriented Vision

This vision is supported by the fact that we can track anything using sensors and pervasive technologies using RFID. The basic philosophy is uniquely identifying any object using specifications of Electronic Product Code (EPC) .This technique is extended using sensors. It is important to appreciate the fact that future vision will depend upon sensors and its capabilities to fulfill the “things” oriented vision. We will be able to generate the data collectively with the help of sensors, and sensor type embedded system. The summarized vision will be dependent upon sensor based networks as well as RFID-based Sensor Networks which will take care of theIntegration of technology based on RFID and sophisticated sensing and computing devices and the global connectivity.

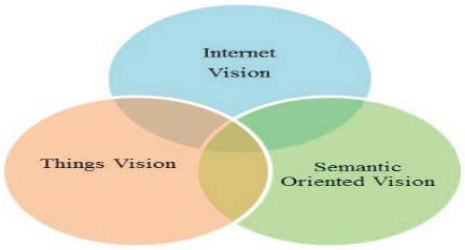

Fig. 3.1 Three main visions of Internet of Things.

B. Internet Oriented Vision

The internet-oriented vision has pressed upon the need to make smart objects which are connected. The objects need to have characteristics of IP protocols as this is one of the major protocols being followed in the world of Internet. The sensor based object can be converted in to an understandable format, which can be identified uniquely and its attributes can be continuously monitored. This makes the base for smart embedded objects which can be assumed to be Microcomputers having computing resources.

C. Semantic Oriented Vision

This vision is powered by the fact that the amount of sensors which will be available at our disposal will be huge and the data that they will collect will be massive in nature. Thus we will have vast amount of information, possibly redundant, which needs to be processed meaningfully. The raw data needs to be managed, processed and churned out in an understandable manner for better representations and understanding. If we are able to make the sets of data into homogeneous and heterogeneous formats then the interoperability issues of understanding the data will be dependent upon the semantic technologies to process the data. It is here that needs a generic vision of processing the raw data in to meaningful data and a marked separation of data and their interpretation.

- Wireless Sensor Networks hardware - Typically a WSN node contains interfaces to sensors, computing and processing units, transceiver units and power supply. More sophisticated sensor nodes can communicate over multiple frequencies
- Wireless Sensor Networks Communication Stack (WSNCS) – The nodes will be deployed in an adhoc manner. Communication topology will be an important factor for communication through the system of WSN nodes. There is this communication stack at one central node which will be able to interact with the connected world through the Internet and which will act as a gateway to the WSN subnet and the Internet.
- Middleware–This is associated with the internet infrastructure and the concept of service oriented architecture (SOA) for access to heterogeneous sensor resources as described in. WSNs technological advances in hardware domain catering to circuits and wireless communications have made robust and cost effective devices in sensing applications. This has led to the use of sensors in wireless communication devices in diversified environments. Sensor data is collected and sent for centralized, distributed or any hybrid processing
- Module for data processing. Hence, there are several challenges WSN has to face to develop a successful IoT communication networks.

IV. SYSTEM MODEL

The process of working of this project is explained as follows:

This project involves measure the eye blink using IR sensor and head movement using accelerometer. 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. If the eye is closed means the output of IR receiver is high otherwise the IR receiver output is low. This to know the eye is closing or opening position. This output is given to logic circuit to indicate the vibrator and status will displayed on LCD. Accelerometer is placed on driver fore-head it measures tilt angle of the drivers in vertical either forward or backward direction and left or right direction from the driver knee. If tilting angle exceeds certain threshold range, this output is given to logic circuit to indicate the alarm and status is displayed on LCD.

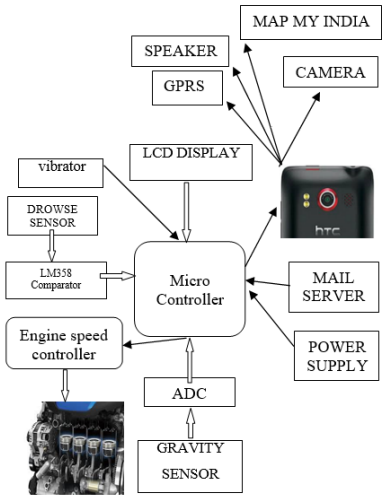

Fig. 4.1 Block Diagram of the proposed system.

V. PREVIOUSWORK

In this project we are implementing EBM (Eye Blink Monitoring Technique) to detect drowsiness of night driversandpreventingaccidents.Theothertechnologiestha tdetectDrowsinessareEEGorBrainwavesmonitoringtech nique.Suchatechniquerequiressophisticatedsystemtoma pormonitorthebrainofsubjectanddeterminethestateofdro wsiness based on the neurological sleep cycle. Though EEG technique is accurate to a larger extent, yet it is notcosteffectiveandhasadifficultimplementation.Ontheo therhandEyeBlinkMonitoringTechniqueisdependentonp hysiological state of sleep of the subject and by understanding it, drowsiness can be detected and accident canbeprevented. Drowsiness causing accident can be effectively prevented by designing an embedded system that isefficientenoughtotakecriticaldecisionsduringemergenc yconditions.Majorityofaccidentpreventionsystemscome intopicturewhenaccidenthappens, howeverthepropoſeds ystemisequippedwithadvantageoftakingdecisionsbyanal yzing the symptoms of accident causing events. Brain wave technique only measures the drowsiness levelbut,EBM technique can be interfaced with a network of sensors in a cost effective manner to provide an efficientaccidentpreventionsystem.Thefollowingkeypoi ntswereconsideredwhileestimatingthefeasibilityandwid eexpansionofIOT based devices:

1. Gartner,Inc.(atechnologyresearchandadvisor ycorporation),therewillbenearly26billiondevi cesontheInternet of Things by2020.
2. ABIResearchestimatesthatmorethan30billion deviceswillbewirelesslyconnectedtotheIntern etofThings (Internet of Everything) by2025.

Few research Survey indicates that a large majority of the technology experts and engaged Internet userswhoresponded 83percent agreedwiththenotionthattheInternet/CloudofThings,embe ddedandwearablecomputing (and the corresponding dynamic systems) will have widespread and beneficial effects by2025.

VI. AIMS&OBJECTIVESOF PROPOSED PROTOTYPE

Thisprojectprototypedisaimedtodesign&implementuniqu elyidentifiableembeddedcomputingdeviceswithinexisting internetinfrastructurefornightvehicledriverstolocateandpr eventroadaccidentcausedduetodrowsiness. The objectives of proposed model are summarized below:

I. Establish an eye blink & head movement monitoring sensor system for Drowsinessdetection.

II. In case of drowsinessdetected
   - Alert the driver via a wake call (vibration/Buzzer)
   - Reduce speed and stabilize vehicle.
   - Mediate the Sensor information and locate accident location using GPRS for help and rescue.

III. Display the activities of designed system on LCDdisplay.

VII. FEATURES

1. Solution for Drunkards When They Are Over Drunk Wake Them When They Are Drowsing.
2. Solution For Night Drivers When They Feel Sleepy While Driving Overnight Wake Them Up.
3. Solution For Rash Driving, Cut The Speed By Stopping The Spark To The Starter Or Sparkplug & Wake Them Up.
4. Advice for Drivers by Their Loved Ones When They Are Over drunk Or Rash driving.
5. Solution for Preventing Accidents.
6. Solution for Detecting Accidents Using Impact Sensors.
7. Global Message Transfer Using GPRS In Arm 11 Device And Mailing It To Required People.
8. Tracking & Locating the Location of Accident Using GPS& Plotting In Google Maps.

VIII. PROBLEM STATEMENT

Theproblemstatementincludesimprovingthequalityofdat aacquisitionaboutdistraction-relatedcrashesalongwith

better analysis techniques. By analyzing the understanding of the extent and nature of the distraction problem.Themain aim is to reduce the driver workload associated with performing tasks using both built-in and portablein-vehicledevicesvialimitingthevisualandmanualdemandassociatedwithin-vehicledeviceinterfacedesigns.

IX. WORKING

Infrared transmitter is one type of LED which emits infrared rays generally called as IR Transmitter. Similarly IR Receiver is used to receive the IR rays transmitted by the IR transmitter. One important point is both IR transmitter and receiver should be placed straight line to each other. The transmitted signal is given to IR transmitter whenever the signal is high, the IR transmitter LED is conducting it passes the IR rays to the receiver. The IR receiver is connected with comparator. The comparator is constructed with LM 358 operational amplifier. In the comparator circuit the reference voltage is given to inverting input terminal. The non-inverting input terminal is connected IR receiver. When interrupt the IR rays between the IR transmitter and receiver, the IR receiver is not conducting. So the comparator non inverting input terminal voltage is higher than inverting input. Now the comparator output is in the range of +5V. This voltage is given to microcontroller or PC and led so led will glow. When IR transmitter passes the rays to receiver, the IR receiver is conducting due to that non inverting input voltage is lower than inverting input. Now the comparator output is GND so the output is given to microcontroller or PC. This circuit is mainly used to for counting application, intruder detector etc.

X. RESULTS

The following conclusions can be made from the following proposed prototype:

1. The subject's drowsiness can be effectively measured based on eye blink monitoring system.
2. If drowsiness is detected then automatic responses from designed embedded system is possible such as alarm and reducing the speed of vehicle.
3. In case of accident occurrence the designed system is equipped with the capability of sending response messages to the host android device by means of an IoT enabled application. The response messages are in form of voice and text notifications.
4. The GSM module involved in the designed system is used to effectively track the location of the vehicle. The location of vehicle and nearby emergency service facilities are effectively displayed on the portable android devices of host device and embedded device through Google Maps.

The below figure depicts the IR sensors and accelerometer connected to designed hardware for drowsiness detectionand indicates the two sensor inputs into the designed embedded system. The drowsiness of driver is detectedbased on the threshold

Fig. 10.1 IR Sensor with Accelerometer.

Values on IR sensor and accelerometer and the corresponding results are shown on LCD screen mounted on the hardware. At the same time the required response in terms of physical alarm (vibration) and text messages are sent over IoT android application to intimidate driver and host emergency response in respective case of initial drowsiness and accident occurrence.

Fig. 10.2 LCD response on drowsiness detection

Fig 10.2 indicates the LCD messages displayed during response of drowsiness detection conditions. In case of drowsiness LCD screen Shows Sleeping message and initiates the physical alarm.

XI. CONCLUSION

Majority of portable devices are aimed at providing unlimited access to internet services for data storage and synchronization with other remote devices. Hence, there is a need of faster data acquisition and quick decision making of embedded computing system for real time applications for making vehicles safe, automatic, responsive and intelligent. Interfacing of simple sensors to various micro-controller platforms enables the ease of regulating the embedded system at a sophisticated levels of automation and mediating the sensor information over a smart gridenables large amount of data acquisition for taking accurate decisions over the emergency conditions. Further, the development of smart grids fascinates the overall process of communication between human and machine rather than machine to machine communication. Hence, IoT can revolutionize the way embedded systems interact and respond for variety of applications especially in case of vulnerable night drivers by monitoring the state of their drowsiness for a quick, safe and effective response for a safer road travel.

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