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IOT BASED VEHICLE MONITORING SYSTEM WITH COLLISION DETECTION

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ABSTRACT

The advancement in technology has created a thrive for a materialistic world. People are using road as a faster means of travel within the city. The trivial traffic control technology is still a step behind in ensuring road safety and monitoring everyone. The growth of road traffic in India has resulted in fatal road accidents. The main objective of this paper is to provide a proper method to monitor accidents and over speeding. This paper proposes a method that uses various sensors for monitoring vehicles and uses Internet of Things (IOT).

Keywords— MEMS Sensor, Heart Beat Sensor, IR Sensor, Internet of Things-IOT

INTRODUCTION

In general, the vehicle population is growing at a faster rate than the economic growth. World Health Organization (WHO) [3] has revealed in its first ever global status report on road safety that more people die in road accidents in India than anywhere else in the world. In 2014, over 4.5 lakh cases of road accidents were registered and more than 2 lakh people faced death. At least 16 people die every hour in road accidents.

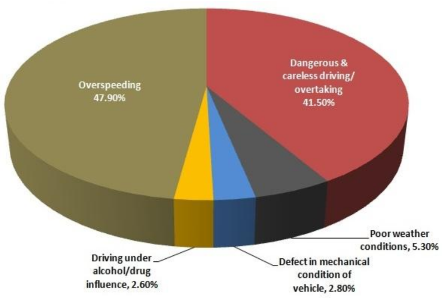

Fig-1: Major causes of road accident deaths in 2014

If we observe the Fig-1 chart, we can conclude that the major deaths caused in road accidents are due to over speeding. Although road transport safety is a worldwide problem, India needs to improve road safety measures by ensuring proper surveillance of vehicles. This shows it is not only necessary for everyone to follow certain rules but should be made accountable if they do not follow the rules. So, the surveillance system should ensure that it notes every detail of the vehicle and passes the information automatically.

EXISTING SYSTEM

Major existing systems use GPS and GSM [1][2] for accident detection. The position of the vehicle is found using GPS and the alert signal is sent via GSM. This can also be interfaced with mobile applications like Android [11] for sending alert messages via SMS, email, facebook etc. There are systems that use RFID for monitoring. When an active RFID tag [9][10] crosses a receiver, it passes information. Hence, the position of the vehicle can be found. Also there are devices like radar gun [12] which are widely used for speed detection. They are sometimes interfaced with high speed camera to decipher the number plate of the vehicle.

But these systems fail to take into account the passenger's health conditions after an accident and the fact that GSM and GPS signals may not be available everywhere is a liability. RFID tags are costly for long range and they pass only fixed information. Radar guns are better for manual use and high speed cameras are not economical and the image quality depends on the environmental conditions.

To overcome this we can use IOT which can be accessed from anywhere in the world and can give real time surveillance of the vehicle. We can also use heart beat sensor for knowing the health condition of the driver and act accordingly.

PROPOSED SYSTEM

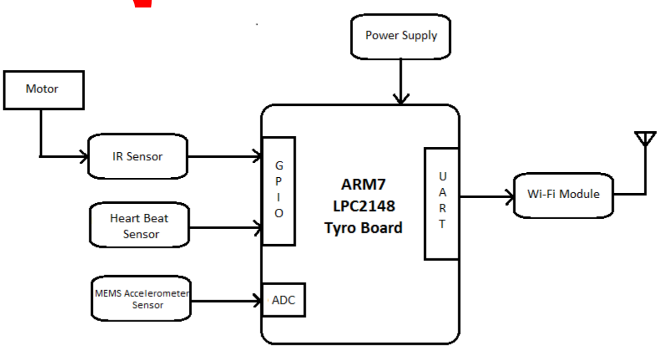

Fig-2: Proposed System

The proposed system consists of MEMS accelerometer-ADXL335 [4] to detect accidents, IR sensor to measure speed, Heart Beat sensor to read the pulse of the driver. These components are all interfaced with ARM-7 tyro board which has LPC2148 microcontroller [5].

Output from different sensors are obtained and is sent to the cloud using a Wi-fi module- ESP8266 [7][8]. Fig-2 gives the functional block diagram of the system.

After the user passes the values the cloud, a remote user can access them from anywhere. Thus, IOT [6] communication is established without human intervention.

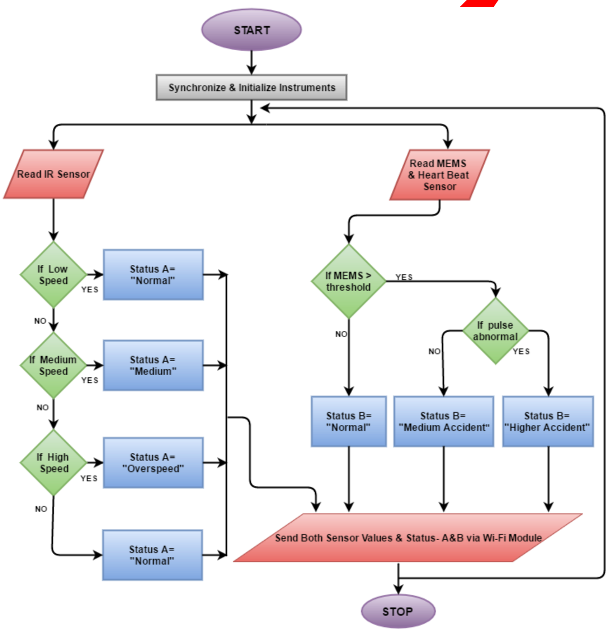

Fig-3: Proposed System Flowchart

The MEMS sensor reads the axis with which the chip is positioned initially. When there is change in angle then the voltage is varies respectively for each axis. This helps as to decide the threshold for different scenarioes. Here, we are using a prototype Heart Beat Sensor (HBS) that consits of a photodiode and a LED. It basicaly counts the number of heart beats by measuring the voltage fluctuations. Parallely the controller also reads the IR sensor. Here the speed is determined by counting the the rate of rotation of the wheel. The output for different conditions is given in Table-1 and Table-2.

RPM Count	Output
Low	*"Normal"*
Medium	*"Medium"*
High	*"Over Speed"*

Table-1: Conditions for Speed Monitoring

MEMS Value	**HBS < 40**	**40 < HBS < 125**	**HBS > 125**
< Threshold	-	*"Medium Accident"*	*"Medium Accident"*
> Threshold	-	*"Medium Accident"*	*"Higher Accident"*

Table-2: Conditions for Collission Detection

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These coditions are checked and the status is updated for each reading and passed using serial communication to Wi-Fi module ESP8266. The entire process is explained in the flow chart given in Fig-3.

The system uses different components and their values determine the output. The components used can be interfaced as shown in schematic diagram given in Fig-4.

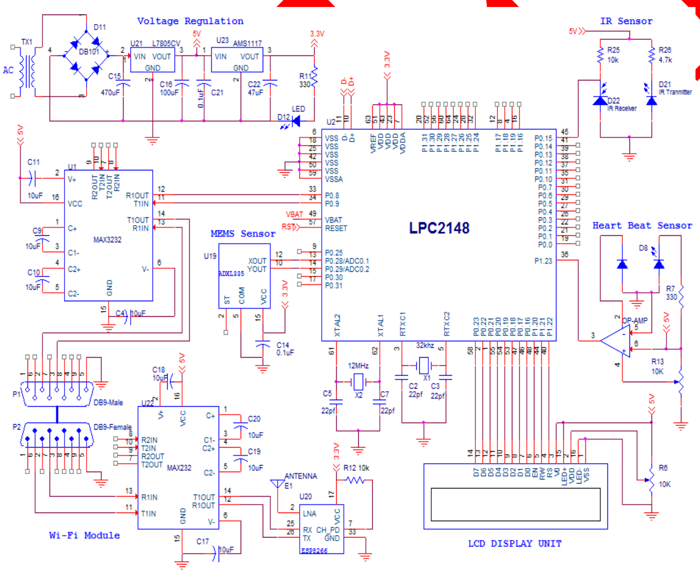


Fig-4: Proposed System Schematic Diagram

ESP8266 WI-FI MODULE

The ESP8266 modules are a high performance, high integration wireless SOCs, designed for space and power constrained mobile platform designers. They offer a complete and self-contained Wi-Fi networking solution. When it hosts the application, it boots up directly from an external flash. It has an integrated cache to improve the performance of the system. Alternately, while serving as a Wi-Fi adapter, wireless internet access can be added to any microcontroller based design with simple connectivity (SPI/SDIO or I2C/UART interface). They demonstrate sophisticated system-level features like fast sleep/wake context switching for energy-efficient VoIP, adaptive radio biasing for low-power operation, advance signal processing, and spur cancellation and radio co-existence features for common cellular, Bluetooth, DDR, LVDS, LCD interference mitigation. ESP8266 can operate in 802.11 g/b/n modes. It is comprised of 32bit processor Tensilica Xtensa LX106 running at 80 MHz, 512KB SPI Flash, 64KB SRAM, 96KB DRAM, 16 GPIO Pins, 2.4 GHz Wi-Fi that supports WPA/WPA2 and one 10 bit ADC. This helps to burn the program into it for its configuration. It can operate within a temperature range of -40C to 125C.

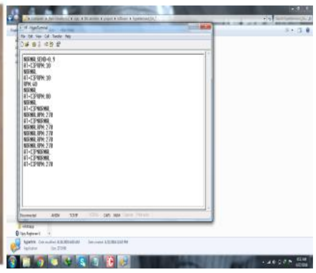
LPC2148 MICROCONTROLLER

The LPC2148 microcontroller is based on 32/16 bit ARM7TDMI-S CPU having real-time emulation with embedded trace support, that combines the microcontroller with embedded high speed flash memory which ranges from 32 KB to 512 KB. It has a 128-bit wide memory interface with unique accelerator architecture enabling 32-bit code execution at the optimum clock rate. The alternative 16-bit Thumb mode when used reduces code by more than 30 % with minimal performance, which can be used for critical code size applications. Their tiny size and low power consumption makes LPC2148 ideal for applications such as access control and point-of-sale. It has various serial communications interfaces like USB 2.0 Full Speed device, multiple UARTs, SPI, SSP to I2Cs, and on-chip SRAM ranging 8 KB to 40 KB. This makes the device very well suited for communication gateways. It has protocol converters, voice recognition, soft modems and low end imaging that provide both large buffer size and high processing power.

APPLICATIONS

- It can be used by traffic police to monitor and record all incidences of over speeding and accidents and take necessary actions.
- It can be used in commercial vehicles for surveillance.
- It can be used for defense purpose to monitor the vehicle and soldiers inside.

RESULT

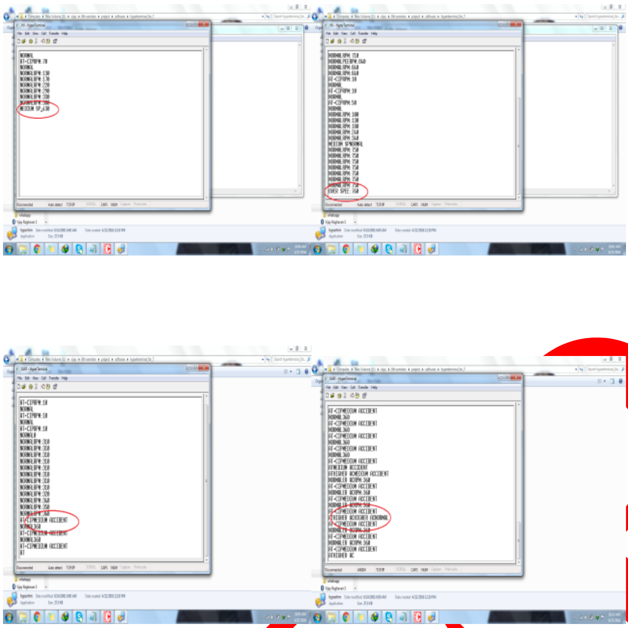


Fig-5: Developed System

CONCLUSION

This paper proposes an automatic surveillance of a vehicle. It can be installed in private automobiles so that their negligence in driving and accidents can be monitored at all times. This can result in a safer over watch with an immediate response to the road calamities. This process is done by using internet which is available and used by everyone.

Whenever a person over speeds the respective status is updated and the record is maintained. This can be reviewed on a regular basis and necessary action can be taken. When an accident occurs the same process takes place and is noted as major or minor based on its severity. This record can be maintained to know his/her history of accidents which can be used for future purpose. For fast response during major accidents the message received can be forwarded to the nearby hospital.

Thus, the status of a vehicle is automatically monitored. The maintained record can be used for making a person accountable for the mistakes and will motivate others not to do the same. This surveillance helps an individual to know his responsibility towards the society and country.

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