International Journal of Scientific & Engineering Research Volume 9, Issue 4, April-2018
ISSN 2229-5518

Automatic Detection of Potholes and Humps on Roads to Driver Using PIR Sensor

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Abstract— recently, vehicles accidents have been increasing. One of the causes is poor road maintenance because of its high costs. To overcome this accidents there been many exiting methods. Through the existing methods we can get knowledge about potholeocation using GPS and GSM. It detect the pothole and hump to alert the driver. The proposed method to detect road damage and curve using PIR sensor. This sensor can provides timely alerts to drivers through providing on signal to user monitor placed in between the meters. Because of this alert system the road accident can be reduced periodically.

Keywords—PIR Sensor, monitor and android application.

1 INTRODUCTION

The population of our country has been increasing rapidly which indirectly increases the vehicle density and leads to many road accidents. The aim of the project in to minimize the road accidents which causes the loss of invaluable human life and other valuable goods. Besides, the provision for the safety of the vehicle is also provided to avoid the theft action. In this fast moving world, new technologies have been evolved for every second for our human life style improvement. There have enormous advancement in automobile technologies already and still to come. Because of these technologies, now we are enjoying the necessary comfort-ness and safety. But there is lot of accidents happening now-a-days. It is because of increased vehicle density, violating rules and carelessness. The embedded technology is used to prevent accidents due to road damage, over speed driving; using mobile phones while driving etc, If accidents occurs in remote areas, the feature of auto-providing the accident area to the

2 PROBLEM STATEMENT

Road accidents are one of the biggest causes of deaths on Indian roads. As per media statistics, in India one person is killed in a road accident every four minutes. The causes for India's exceptionally high number of on road casualties include - bad road, careless user behavior, defective road design and engineering, poor enforcement of traffic rules and the lack of rapid trauma care. Most roads in the city are in a bad shape, as the recent spell of rain has rendered them hard to motor on. Motorists have to maneuver potholes on many stretches, especially on interior and small roads where no emergency repair works

emergency centers for help and support is also provided. On the other hand, the security for the vehicle is also enhanced. This is made possible because the theft vehicle area can be known to the user and the vehicle fuel can be cut off and center lock is enabled. By using these concepts, we hope that the road accidents due to violating rules and careless-ness will be minimized and this will be one of the project required for now-a-days and with the significance of low cost.

have been undertaken.

3 SENSOR

A device that detects the changes in electrical or physical or other quantities and thereby produces an output as an acknowledgement of change in the quantity is called as a Sensor. Generally, this sensor output will be in the form of electrical or optical signal.

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3.1 Different types of Sensors

The most frequently used different types of sensors are classified based on the quantities such as Electric current or Potential or Magnetic or Radio sensors, Humidity sensor, Fluid velocity or Flow sensors, Pressure sensors, Thermal or Heat or Temperature sensors, Proximity sensors, Optical sensors, Position sensors, Chemical sensor, Environment sensor, Magnetic switch sensor , etc.

3.2 Speed Sensor

Sensors used for detecting speed of an object or vehicle is called as Speed sensor. There are different types of sensors to detect the speed such as Wheel speed sensors, speedometers, LIDAR, ground speed radar, pito-meter logs, Doppler radar, air speed indicators, pilot tubes and so on.

3.3 Application of Speed Sensor

PIC microcontroller based project for speed synchronization of multiple motors in industries using wireless technology is a typical application of the speed sensor. One of the multiple motors in the industry is considered as a main motor which act as transmitter and remaining motors acting as receivers, will follow the speed of the main motor. The main motor and receiver motors used in this project are BLDC motors that are controlled using PWM control with the radio frequency wireless communication mode.

3.4 Temperature Sensor

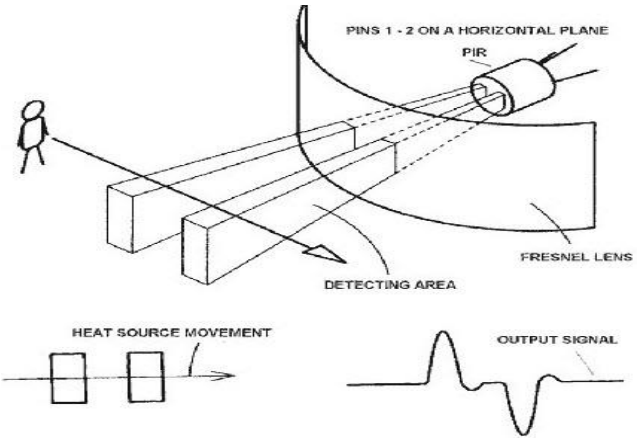
A device which gives temperature measurement as an electrical signal is called as Temperature sensor. This electrical signal will be in the form of electrical voltage and is proportional to the temperature measurement.

3.5 Application of Temperature Sensor

Design of Industrial Temperature Controller for controlling temperature of devices used in industrial applications is one of the frequently used practical applications of the temperature sensor. In this circuit IC DS1621, a digital thermometer is used as a temperature sensor, thermostat, which provides 9-bit temperature readings. The circuit mainly consists of 8051 microcontroller, EEPROM, temperature sensor, LCD display and other components.

3.6 PIR Sensor

An electronic sensor used for measuring the infrared light radiation emitted from objects in its field of view is called as a PIR sensor or photoelectric sensor. Every object that has a temperature above absolute zero emit heat energy in the form of radiation radiating at infrared wavelengths which is invisible to the human eye, but can be detected by special purpose electronic devices such as PIR motion detectors.



PIR sensor itself is split into two halves, which are sensitive to IR and whenever object comes in the field of view of the sensor, then positive differential change will be produced between two halves with the interception of the first half of the PIR sensor. Similarly, if the object leaves the field of view, then negative differential change will be produced. PIR or Passive Infrared sensor is named as passive because it doesn't emit

any energy or radiation for detecting the radiation. There are different types of sensors used for detecting the motion and these PIR sensors are classified based on angle (wide area) over which they can detect motion of the objects like110degrees, 180degrees and 360degress angles.

3.7 Degrees Of Freedom (DOF)

"Degrees Of Freedom" or "DOF" is a number of axis and sensors combined for balancing a plane, a helicopter or a robot.

- 3DOF : This could be a 3-axis accelerometer or it could be a 3-axis gyroscope.
- 6DOF : This is mostly a 3-axis accelerometer combined with a 3-axis gyroscope.

3.7.1 Examples

To control a remote control (RC) plane or helicopter or a self-balancing robot, both the information of the accelerometer and gyro are needed.

Another example of 6DOF is a combination of an accelerometer and a magnetometer for a tilt-compensated compass.

Many game controllers, phones and tablets contain a 6DOF sensor for motion information.

- 9DOF : This is mostly a 6DOF, combined with a magnetometer (compass).
- 10DOF : This could be a 9DOF, combined with a baromic pressure sensor. The baromic (or absolute pressure) sensor can be used as an indication for the height.
- 11DOF : This could be the 10DOF, combined with a GPS module.

3.8 Other Types of Sensor

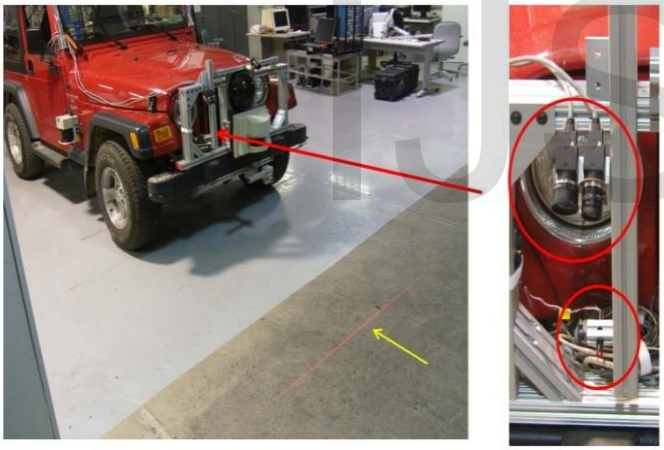
Series	MLV41	RL31	F225
Use	Switching sensor with several switchpoints up to 120 mm or up to500 mm	W3sSwitching sensor with several switch points up to 800 mm.	Measurement of height and width information.
Sensor principle	Diffuse mode sensor with measuring core	Diffuse mode sensor with measuring core	Laser line triangulation
Interface	IO-Link	IO-Link	Ethernet TCP/IP,
Operating modes	Background suppression Background evaluation Window mode Hysteresis mode	Background suppression Background evaluation Window mode Hysteresis mode	Single image capture Continuous capture Master/slave mode
Detection/measuring range	20 mm to 120 mm or 20 mm to 500 mm, adjustable	50 mm to 800 mm, adjustable	Z = 65 mm to 125 mmXmin = -15 mm to 15 mmXmax= -21mm to 21 mm
Measured value output	No (only as a diagnostic value via IO-Link)	No (only as a diagnostic value via IO-Link)	Digital measured values via Ethernet TCP/IP
Light type	Red LED, Power Beam	Red LED, Power Beam	Measuring laser: Infrared laser light, laser class 1 Alignment laser: Red laser light, laser class

			1
Diameter of the light spot	4 mm at 100 mm, 25 mm at 500 mm	25 mm at 800 mm	--
Response time	2.5 ms	2.5 ms	2.78 ms ... 11 ms, adjustable
Dimensions W x H x D	31 x 56.5 x 13.6 mm	35 x 62 x 18 mm	108 x 36 x 106 mm

4 PROPOSE SYSTEM

4.1 Methods for Detecting Road Conditions

The most common approach for detecting road condition is using sensors to recognize the Display patterns of the vehicle caused due to any deformity or obstacle on the road. A major part of work is done using the sensors deployed in the vehicles for collecting road roughness data to detect road anomalies. As the number of users is increasing, methods using sensors are also developing. Most of the methods use tri-axial accelerometer and to collect the data for analysis. This section provides the methods/systems/algorithms for detecting road anomalies like potholes. describes the methods that require dedicated sensors to be deployed on the vehicles. The methods that use present in vehicles as the source of collecting sensor



installed in vehicles to collect and process data and send it to Display on Monitor . It uses sensors like GPS for monitoring the movements of vehicles. CarTel includes, CafNet, a networking stack that uses opportunistic connection (e.g. Wi-Fi, Bluetooth) to transfer information between portal and remote nodes. These information can be used for various applications such as time of travel, route planning. CarTel currently does not offer a way to aggregate information gathered across different users and it does not include machine learning; it just replies to the queries based upon the data stored in relational database.

4.2 Methods using dedicated sensors

Proposed a distributed mobile sensor computing system, CarTel. This system includes a set of sensors

Most of the above described methods have used accelerometer and Sensor for collecting the data. Some of these methods have also used machine learning algorithms to include self-calibration functionality in the system. Table 1 summarizes the above methods based upon these parameters.

These signals are then passed through a series of signal processing filters, where each filter is designed in such a way that it Challenges Ahead

4.3 Challenges Ahead

Although a lot of effort has been done to detect road conditions, alot of methods/systems have been developed using sensors, a highly reliable method is yet to be built. Real time road anomalies detection is so challenging that none of the methods using Smartphone sensors can address it alone completely. Although some of the methods using dedicated sensors are

able to detect potholes with higher accuracy. Several research areas are discussed in this section.

4.4 Display Pattern of sensor data

A given pothole or any other road anomaly may not necessarily give the same pattern during each drive over it. The sensors readings depend upon the Potholes of the road, how it approached the road anomaly and the position of the sensor i.e. its orientation. It also depends upon the suspension system of the vehicle, if the suspension system is not in normal condition, sensors will show more deviation based on the large vibration experienced by the vehicle. A system is needed that considers all situations.

4.5 Benign events

There are many events that are not considered as road anomalies such as expansion joints, railroad crossings, door slams etc. These events are to be differentiated from the potholes. An efficient system is to be developed that is able to classify different events effectively.

Gain more importance in recent future. There are several research issues, listed in section, that can be explored for improvement in existing methods and develop a highly reliable method.

4.6 Machine learning technique

Machine learning techniques can be implemented instead of threshold based classification as different vehicles may yield different sensor data for same pothole. It will make the system more efficient and introduce self-calibration functionality.

5 CONCLUSION

Roads are needed to be monitored continuously for roughness and other anomalies to avoid inconvenience to the road users. Road monitoring can also help to predict the estimated arrival time from one place to another. This paper presents a detailed survey of methods for detecting road conditions. Form the survey, it is noted that the most commonly used sensors accelerometer and Capture sensors are gaining importance in this field as they are cost effective and also increase scalability. Analyzing form the research activities, it is certain that this area will

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