Journal of Engineering and Applied Sciences 11 (9): 1921-1924, 2016
ISSN: 1816-949X

Automatic Speed Controlling of Vehicle and Detection and Notification of Potholes and Humps

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Abstract: Road maintenance is the major issue in the society. Due to load carrying vehicles and rains creates potholes and humps on roads. Recognition of the Pavements anguish such as humps and potholes is used for drivers to control the accidents. Automatic and detection and notification of potholes and humps is already done. Now in this study we are automatically controlling speed of vehicle when there is any pothole or humps to decrease accidents. Here, we calculate the distance of the pothole and humps and notify the driver to divert the direction of vehicle and also speed we control of the vehicle at that area. Here, we use Pulse Width Modulation to control the speed. Android device is used to get the alerts so that the driver can either slow down or divert the vehicle direction. We use DC motor to represent vehicle and MAX232 to connect DC motor to ARM7. Ultrasonic sensors are used to detect pothole or hump on roads.

Key words: Ultrasonic sensor, ARM7 microcontroller, GSM, GPS, LCD

INTRODUCTION

According to the Population and roads India is the second largest in the economy. India has <3.8 km of roads per 1000 people but it does not have enough resources to maintain the roads. most of the transportation is done using Roads as the way of transport. Almost all the roads are narrow and single way so frequently accidents occurs in each and every minute. Due to the lack of maintenance on the roads, roads are damaged either by rain or due to heavy loaded vehicles travel on roads regularly. These causes humps and potholes. Potholes are regularly seen on the highways which causes irritation and nuisance to the road users these reduces the quality of the ride and creates the danger in the driving.

The government has done the analysis in 2015 that almost 11,000 people are died in the road accidents. These accidents are caused due to humps, potholes and speedbreakers. Madhya pradesh takes the first place n the road accidents due to humps and potholes. In last 2 decades scale of vehicles increased abnormally. Researches are done to reduce the accidents by using the information of humps and potholes on the roads. (Fig. 1).

Firstly gather the information of the roads are done so that we can see the damage on the roads and then store the information of the road in the server (Madli *et al*., 2015). Second the driver can get the information of the humps and potholes in the road via text format to the android phone so that he can either change the route or escape from the humps.

Fig. 1: Roads condition with potholes

In order to eliminate the potholes on the roads several researches have been done. One of the researcher implied that by deploying Kinect sensor (Moazzam *et al*., 2013), we can obtain the pavement images. From the pavement images, the area and depth of potholes were calculated using trapezoidal rule. With the help of dimensions, potholes were filled with required filling material.

Vision approach is can also be used to detect potholes by using a camera and frame grabber (Murthy and Varaprasad, 2014). Camera is fixed on top of the autonomous vehicles and the images is can be taken. This can be only done in uniform lightening conditions. A robot (Hedge *et al*., 2014) that is capable tracing potholes on roads is build and it will detect the potholes between the range of 100 m and depth of 1 inch and share to nearby vehicles.

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Here, one more researcher is using physics based geometric framework to identify the pothole and its depth. Dry pothole depth can be calculated by optical deviation using simple ray optics. We use snells law of refraction to measure the depth of water filled pothole.

Here, we use a stereo camere images are used to identify the potholes which are associated with disproportion calculation algorithm (Zhang *et al*., 2014, 2015). A moving robot is taken and it is fixed with a servo meter (More *et al*., 2014). It rotates in 0-360° with the help of IR sharp sensors it identifies the pothole and takes the images of them.

A Three axis-accelero meter and GPS sensor is used to detect the potholes.GPS sensor is fixed in the vehicle to oversee the road condition. We examine power spectral density of road roughness to calculate the international roughness index (Chen *et al*., 2011). By integrating wireless sensor networks to internet of things (Li and Xiong, 2013) we come to know how to provide security for SMS.

Here, another researcher uses the ultrasonic sensor (Carullo and Parvis, 2001) for measuring the distance between the vehicle and road.

For sending ambulance smoothly in traffic we use zigbee module and PIC microcontroller (Sundar *et al*., 2015) we get the messages to the traffic control room and clear the traffic.

A mobile application (Orhan and Eren, 2013) is developed to detect the potholes and humps on road and notify nearby users about them. This mobile application if detects any patches the takes video and image of it.

Here, we use binocular (Zhang *et al*., 2014, 2015) camera to detect the obstacles like animals and track them and speed control of vehicle speed.

After receiving the text message to the phone the driver can control the vehicle are it automatically reduces the speed of the vehicle so that accidents can be reduced.

Here, we use ultrasonic sensor detection to detect the damages on the road so that it can calculate the distance and height of the pothole and alerts the drivers by sending a message to them and now we are also controlling the speed of the vehicle by using pulse width modulation.

MATERIALS AND METHODS

System and description: In this project, we are using two communication technology based modules and one control unit with display unit. The communication modules are connected through serial data cable which is called rs232. In this the data transmission is done by bit by bit. The data which was received from these two modules was with TTL logic. So, we are converting that data into required digital format by using max232 ic. The received data will display in LCD section. Here we are using 4×16 LCD which specifies 4 rows and 16 columns where the data will be displayed in LCD by using data pins (Fig. 2).

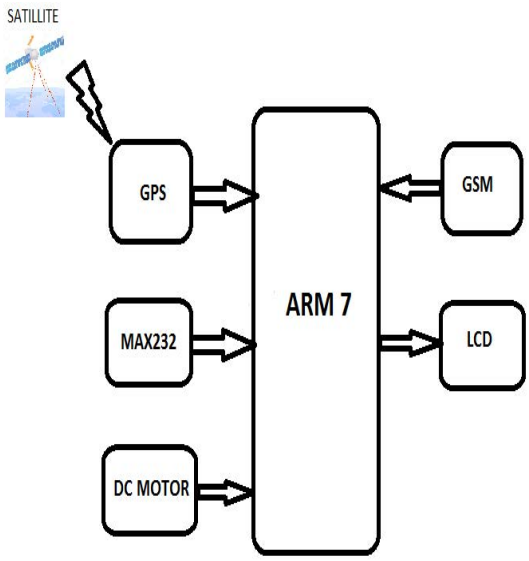

Fig. 2: Architecture of proposed system

The vehicle set speed can be automatically increased or decreased by using PWM technology. By using GSM module we send a message to driver when there is a pothole or hump on road. Finally this study provides a simple solution for automatic controlling the speed of the vehicle and notification to driver.

Components used

ARM 7: The microcontroller we have used in this project is of ARM7 core which is of 32 bit embedded RISC machine. The main advantages of using this board is that provides high performance in embedded applications with low power consumption and also occupies less space with tiny LQFP64 package.

The microcontroller unit has 40 kB of on-chip static RAM and 512 kB of on-chip flash memory where we can store the data as well as the code (Orhan and Eren, 2013). It will operate at 1-25 MHz with the help of external crystal oscillator.

GPS: By using UART the information which we have received from the satellite have been transferred to the microcontroller ARM7. The serial information is taken from the GPS module through MAX232 into the SBUF register of LPC2148 microcontroller. The co-ordinates of

the location have taken from the string called GPGGA. An example for the output string of the GPS is given below. $GPRMC, 092327.000, A, 1626.6107, N, 08037.2187, E, 0.20, 0.00, 211215, , , A*66. The above output string helps to provide the information of location co-ordinates.

GSM: The GSM is interfaced with ARM7 board for SMS communication. For communication we used only three signals transmitter, receiver and ground. To transmit the message from microcontroller the serial port of microcontroller is connected to the TXD of GSM while for receiving the signal from GSM we need to connect RXD of GSM to serial port of microcontroller. The GSM module uses AT commands to read, write, delete, send and receive the messages. To keep the GSM in text mode we use a command AT+CMGF = 1 where as to send the message we need a command AT+CMGS along with mobile number.

LCD: The LCD which we have used in this project is of 4×16 having 4 rows and 16 characters for each line. Here the LCD helps us to display information about latitudes and longitudes and also provides the speed of that particular path where the user is travelling. The data pins of LCD are connected to port pins 0 and 1. The read write pin have been connected to P0.12 and enable as well as select pin was connected to P0.11 and P0.13. Each character was displayed in LCD module directly by sending bit patterns.

Process and execution: Firstly, we will connect our project to a power supply. The power supply required for this project is 3.3 V but normally we are getting 230 V. So, we are converting the voltage to required voltage by using rectifier and capacitive filters and regulator circuits. After receiving the power supply we are enabling GPS circuit. Then it will get the signals from the satellite and reads the latitude and longitude values. The received values from satellite will display in LCD display. The GPS values will be received through serial communication. In ARM7 the serial communication will support 2 serial communication ports. In our project we are using 1 port for GPS and another port for GSM. Here we are using DC Motor to represent the vehicle. When there is a pothole or hump on road ultrasonic sensor will identify it and then LCD screen will display it as low speed and patches detected in it and the driver will also get a notification to their phone as patches detected as well as the speed of the vehicle will be automatically reduced. If there are no potholes or humps on road then we will get a display as normal in LCD screen and speed of the vehicle will be running in normal speed (Fig. 3-6).

Fig. 3: Proposed system

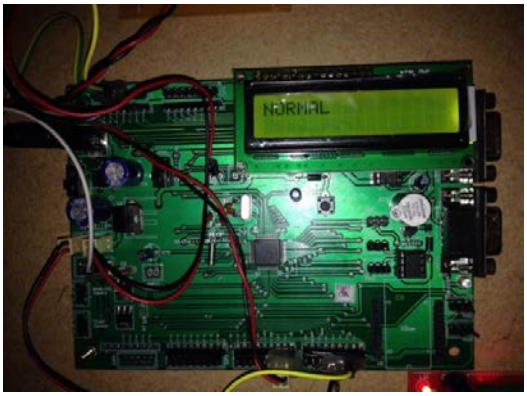

Fig. 4: Vehicle at normal speed

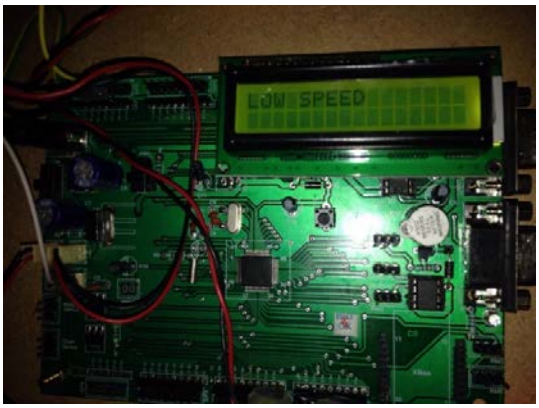

Fig. 5: Vehicle at low speed

RESULTS AND DISCUSSIN

Experimental results: Figure 3 shows the whole kit after giving the power supply and here after power supply if there are no potholes or humps then the vehicle runs in normal speed and it will shown on LCD screen as normal

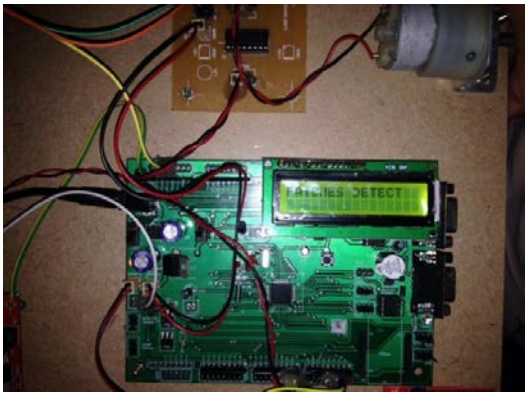

Fig. 6: When potholes are detected

in Fig. 4. If any pothole or hump is detected the GPS gets the latitude and Longitude of that location and sends a message to driver through android phone and automatically the LCD screen shows that low speed and patches are detected as shown in Fig. 5 and 6 and speed of the vehicle will be reduced.

CONCLUSION

By using this method when there is a pothole or hump on roads we will get a notification to phone. Vehicle speed also will be automatically reduced. By this we can avoid speed accidents and vehicle damage. It is a cost effective. The GSM helps in sending and receiving the messages. GPS helps in getting the latitude and longitude of the location. The proposed system is done in prototype for further implementation it can be done in real time applications for better improvements.

REFERENCES

Carullo, A. and M. Parvis, 2001. An ultrasonic sensor for distance measurement in automotive applications. IEEE. Sens. J., 1: 143-147.

Chen, K., M. Lu, X. Fan, M. Wei and J. Wu, 2011. Road condition monitoring using on-board three-axis accelerometer and GPS sensor. Proceedings of the 6th International ICST Conference on Communications and Networking in China, August 17-19, 2011, Harbin, pp: 1032-1037.

Hegde, S., H.V. Mekali and G. Varaprasad, 2014. Pothole detection and inter vehicular communication. Proceedings of the 2014 IEEE International Conference on Vehicular Electronics and Safety (ICVES.), December 16-17, 2014, IEEE, New York, USA., ISBN:978-1-4799-1882-9, pp: 84-87.

Li, F. and P. Xiong, 2013. Practical secure communication for integrating wireless sensor networks into the internet of things. IEEE. Sens. J., 13: 3677-3684.

Madli, R., S. Hebbar, P. Pattar and V. Golla, 2015. Automatic detection and notification of potholes and humps on roads to aid drivers. IEEE. Sens. J., 15: 4313-4318.

Moazzam, I., K. Kamal, S. Mathavan, S. Usman and M. Rahman, 2013. Metrology and visualization of potholes using the microsoft kinect sensor. Proceedings of the 16th International IEEE Conference on Intelligent Transportation Systems (ITSC 2013), October 6-9, 2013, IEEE, New York, USA., ISBN:978-1-4799-2914-6, pp: 1284-1291.

More, P., S. Surendran, S. Mahajan and S.K. Dubey, 2014. Potholes and pitfalls spotter. IMPACT. Int. J. Res. Eng. Technol. (IMPACT: IJRET.), 4: 69-74.

Murthy, S.B.S. and G. Varaprasad, 2014. Detection of potholes in autonomous vehicle. IET. Intell. Transp. Syst., 8: 543-549.

Orhan, F. and P.E. Eren, 2013. Road hazard detection and sharing with multimodal sensor analysis on smartphones. Proceedings of the 2013 7th International Conference on Next Generation Mobile Apps, Services and Technologies, September 25-27, 2013, IEEE, Prague, Czech Republic, ISBN:978-1-4799-2010-5, pp: 56-61.

Sundar, R., S. Hebbar and V. Golla, 2015. Implementing intelligent traffic control system for congestion control, ambulance clearance and stolen vehicle detection. IEEE. Sens. J., 15: 1109-1113.

Zhang, Z., H. Xu, Z. Chao, X. Li and C. Wang, 2015. A novel vehicle reversing speed control based on obstacle detection and sparse representation. IEEE. Trans. Intell. Transp. Syst., 16: 1321-1334.

Zhang, Z., X. Ai, C.K. Chan and N. Dahnoun, 2014. An efficient algorithm for pothole detection using stereo vision. Proceedings of the 2014 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP.), May 4-9, 2014, IEEE, New York, USA., ISBN:978-1-4799-2893-4, pp: 564-568.