

POTHOLE DETECTION USING IMAGE PROCESSING

Nilam Kumbhar¹, Dipali Mhetre², Amarina Mujawar³, S.T.Khot⁴

^{1,2,3}Project Student, Department of Electronics and Telecommunication,

²Professor and Project Faculty member, Department of Electronics and Telecommunication,
Bharati Vidyapeeth's College of Engineering for Women, Pune, Maharashtra, India-43.

Abstract: A lot of roads in India have been in very bad shape and the only thing worse than them is that the repair work followed for the same by the PMC moving at snail's pace and causing inconvenience to everyone. Often the road recover work isn't scheduled causing unending jams and inconvenience to commuters and road users. Sometimes, work that be completed fastly if done at a stretch is distributed over a number of days.

With the PMC planning a mega block for road repairs on the lines of ones undertaken by Railways, the matters are only expected to when the vehicular flow is minimum. When limited amount of work is involved, road repair should be taken up at night time to make smooth completion and least inconvenience to the citizens and road users. If a substantial amount of work is to be done, it should be done round the clock at a stretch rather than distributing the same over longer intervals.

Index Terms: Image Processing, GPS, GSM Module, ARM7-LPC 2138, Ultrasonic Sensor.

I. INTRODUCTION

Traffic is a common word, especially in a country like India. People in such countries count the amount of time spend over traffic too. After analysis of the road, one of the reasons for the traffic was the number of potholes on the road. Because of many reasons like rainfalls, road accidents or inevitable wear and tear make the road difficult to drive upon. Unexpected humps and ditches on road may cause more accidents. Also, Fuel consumption of the vehicle increases because of the bad road conditions, which will cause wastage of precious fuel. Thus the motivation for making a system is to detect such pothole and give its information.

However, many countries have roads with potholes, but no road monitoring system to watch the road condition before the damage and become very expensive to repair. Such a system can identify problem areas early and the particular authorities can be alerted in time to take preventive steps. Our system can be broken into 3 modules. The first is to sense the pothole on the surface with the amount of depth of the pothole. Secondly, to take a picture at the same time the pothole is being detected. Thirdly, to send the picture and the location of the pothole to the concerned authority.

II. SYSTEM DESIGN

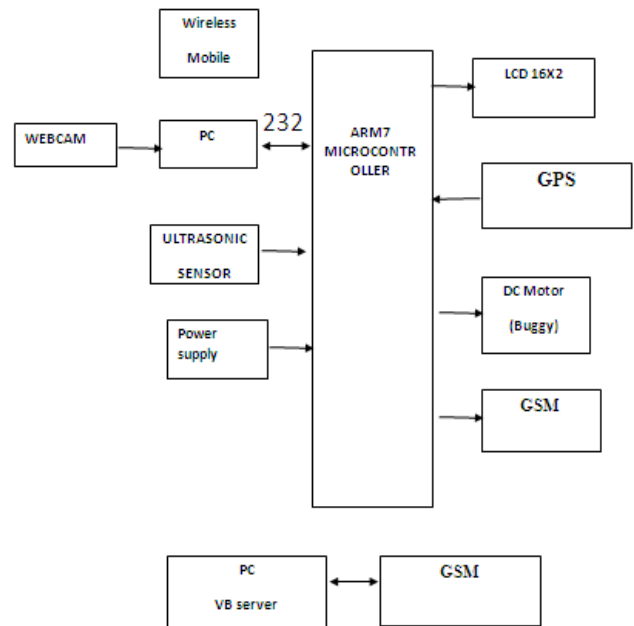


Fig.2. Block diagram of proposed system

III. DESCRIPTION

GPS:

The GPS modules incorporates high sensitivity, high performance chipset solution in a compact design. The GPS module tracks up to 20 satellites at a time. The module also offering fast time-to-first-fix and 1Hz navigation update. The unit is very suitable for many applications such as Handheld, PDA, PPC or other battery operated navigation system.

ULTRASONIC SENSOR:

The ultrasonic sensor provides the non-contact distance measurements from 2 cm to 3 meters. It is very easy to configure to microcontrollers like the BASIC Stamp, Propeller chip, requiring only one I/O pin. The sensor works by transmitting an ultrasonic signal and providing an output pulse that corresponds to the time required for the burst echo to return to the sensor. The distance to target can easily be calculated by measuring the echo pulse width.

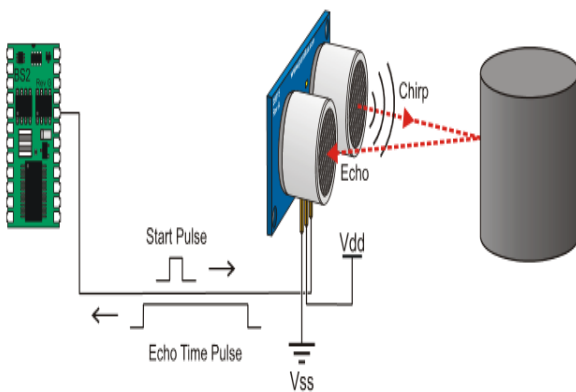


Fig.3. Working of ultrasonic sensor

GSM:

GSM RS232 Modem is built with SIMCOM Make SIM900 Quad-band GSM engine, works on frequencies 850 MHz, 900 MHz, 1800 MHz and 1900 MHz . It is very small in size and easy to use as plug in GSM Modem. The GSM Modem is designed with RS232 Level converter circuitry, which provides you to directly interface PC Serial port .The baud rate can be configurable from 9600-115200.Initially Modem is in Auto baud mode. This GSM RS232 Modem is having internal TCP/IP stack. It is suitable for SMS as well as DATA transfer application.

MICROCONTROLLER:

The LPC2138 microcontroller are based on 16/32 bit arm 7 TDMI –S CPU with real time emulation and tress support that combine the microcontroller with 32kB,64kB,128kB,256kB,512kB of embedded flash memory. The 128bit wide memory interface and unit accelerator architecture enable 32bit code execution at maximum clock rate. For the applications having critical code size, the alternative 16bit Thumb mode reduces code size by more than 30% with minimum performance penalty.

WEBCAM:

Webcam is generally connected by a USB cable, similar cable or built into computer hardware, such as laptops. Their most popular use is the establishment of video links, allowing computers to act as videophones or videoconference stations. Other popular application include security surveillance, computer vision, video broadcasting and for recording social videos. Webcams are known for their low manufacturing cost and reliability, making them the lowest cost form of video telephony. They have also become a source of privacy and security issues, as some built-in webcams can be remotely activated.

IV. ALGORITHM

1. Start
2. Initialize LCD
3. Display Project name
"A"
4. Move Vehicle forward by 10 cm
5. Is serial interrupt1 (From GPS) detected? N→"B"
6. Store and display the latitude and longitude reading on

LCD

"B"

7. Is serial interrupt2 (From MATLAB for pothole detection) detected? N→"A"

8. Read the ultrasonic distance

Is distance greater than set point? N→"B"

Y→ Display the pothole reading and GPS co-ordinates to PC using GSM modem

"A"

MATLAB flow

1. start GUI
2. Wait for serial interrupt
3. init webcam
4. Take snapshot
5. Do image processing
6. Segmentation
7. Image thresh holding
8. Edge detect
9. Calculate pixel area
10. Is pothole area> Min →N→"B"
- Y→ Send indication small pothole to μC →"A"
- "B"
11. Is pothole area>Medium →N→"C"
- Y→ Send indication Medium size pothole to μC →"A"
12. Is pothole area>Max →N→"A"
- Y→ Send indication Maximum size pothole to μC →"A"

V. RESULTS

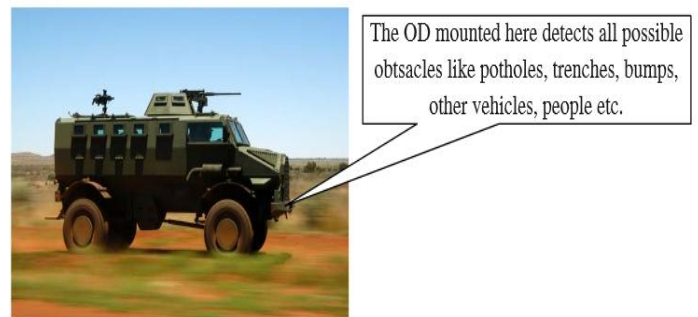


Fig.4. Mounting of proposed system on the vehical

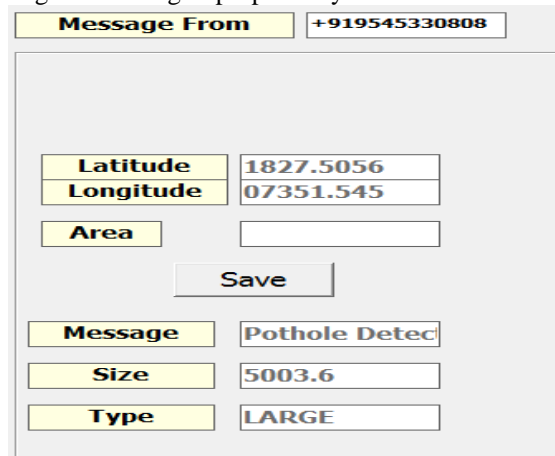


Fig.5. Notification of the proposed system

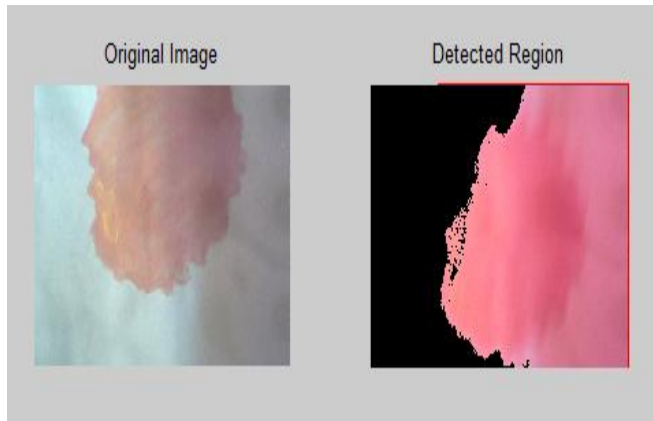


Fig.6. Detection of pothole using image processing in
MATLAB

VI. CONCLUSION

We designed the system which will detect the potholes on the road. Ultrasonic sensor is used to measure the depth of pothole. Using image processing we capture the image of that pothole which will provide the size of pothole such as large, medium, small. GSM will send the sms having information about the pothole.

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