

Automatic Detection and Notification of Potholes on Roads to Aid Drivers

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ABSTRACT

India, the second most populous Country in the world and a fast growing economy, is known to have a gigantic net work of roads. Roads are the dominant means of transportation in India today. They carry almost 90percent of country's passenger traffic and 65percent of its freight. However, most of the roads in India are narrow and congested with poor surface quality and road maintenance needs are not satisfactorily met.

Roads in India normally have speed breakers so that the vehicle's speed can be controlled to avoid accidents. However, these speed breakers are unevenly distributed with uneven and unscientific heights. Potholes, formed due to heavy rains and movement of heavy vehicles, also become a major reason for traumatic accidents and loss of human lives. To address the above mentioned problems, a cost effective solution is needed that collects the information about the severity of potholes and humps and also helps drivers to drive safely. With the proposed system an attempt has been made to endorse drivers to ward off the accidents caused due to potholes and raised humps.

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1. INTRODUCTION

One of the major problems in developing countries is maintenance of roads. Well maintained roads contribute a major portion to the country's economy. Identification of pavement distress such as potholes and humps not only helps drivers to avoid accidents or vehicle damages, but also helps authorities to maintain roads. This paper discusses previous pothole detection methods that have been developed and proposes a cost-effective solution to identify the potholes and humps on roads and provide timely alerts to drivers to avoid accidents or vehicle damages. Ultrasonic sensors are used to identify the potholes and humps and also to measure their depth and height, respectively. The proposed system captures the location coordinates of the potholes and humps using a global positioning system receiver. The sensed-data includes pothole depth, height of hump, and location, which is send to Mobile. This serves as a valuable source of information to the government authorities and vehicle drivers. An application is used to alert drivers so that precautionary measures can be taken to evade accidents.

2. LITERATURE SURVEY:

Pavement distress and wear detection is of prime importance in transportation engineering. Due to degradation, potholes and different types of cracks are formed and they have to be detected and repaired in due course. Estimating the amount

offiller material that is need edto fillapotholeis of great interestto prevent any shortage or excess, thereby waste ago filler material that usually has to be transported from a different location. Metrological and visualization properties of a pothole play an important role in this regard. Using a low-cost Kinect sensor, the pavement depth images are collected from concrete and asphalt roads.

3. PROPOSED SYSTEM:

The architecture of the proposed system it consists of 3 parts; microcontroller module, GSM module and the mobile module. Microcontroller module is used to gather information about potholes and humps and their locations and this information is sent to the Mobile. Mobile receives information from the microcontroller module, processes and stores in the Mobile.

4. PROJECT DESIGN:

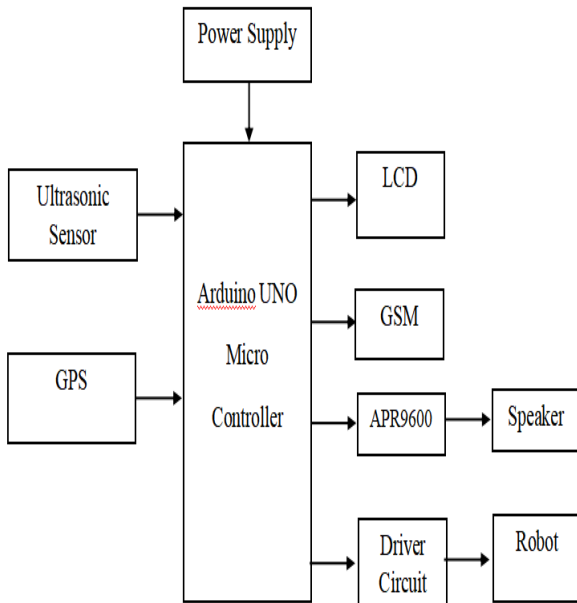


FIG: BLOCK DIAGRAM

A. MICROCONTROLLER:

A Microcontroller (or MCU) is a computer-on-a-chip used to control electronic devices. It is a type of microprocessor emphasizing self-sufficiency and cost-effectiveness, in contrast to a general-purpose microprocessor (the kind used in a PC). A typical microcontroller contains all the memory and interfaces needed for a simple application, whereas a general purpose microprocessor requires additional chips to provide these functions.

A microcontroller is a single integrated circuit with the following key features:

- central processing unit - ranging from small and simple 8-bit processors to sophisticated 32- or 64-bit processors
- input/output interfaces such as serial ports
- RAM for data storage
- ROM, EEPROM or Flash memory for program storage
- clock generator - often an oscillator for a quartz timing crystal, resonator or RC circuit

B. Arduino Uno:

Arduino/genuino uno is a microcontroller board based on the atmega328p (datasheet). It has 14 digital input/output pins (of which 6 can be used as pwm outputs), 6 analog inputs, a 16 mhz quartz crystal, a usb connection, a power jack, an icsp header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a usb cable or power it with a ac-to-dc adapter or battery to get started.. You can tinker with your uno without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

"Uno" means one in italian and was chosen to mark the release of arduino software (ide) 1.0. The uno board and version 1.0 of arduino software (ide) were the reference versions of arduino, now evolved to newer releases. The uno board is the first in a series of usb arduino boards, and the reference model for the arduino platform; for an extensive list of current, past or outdated boards see the arduino index of boards.

Microcontroller	ATmega328P
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limit)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
PWM Digital I/O Pins	6
Analog Input Pins	6
DC Current per I/O Pin	20 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328P) of which 0.5 KB used by bootloader
SRAM	2 KB (ATmega328P)
EEPROM	1 KB (ATmega328P)
Clock Speed	16 MHz
LED_BUILTIN	13
Length	68.6 mm
Width	53.4 mm
Weight	25 g

Fig: Arduino Specifications

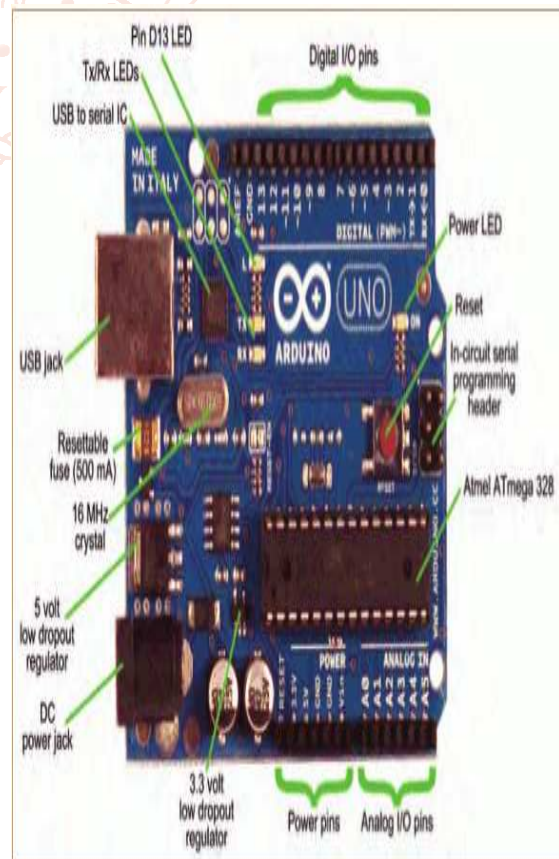


FIG: Arduino uno

C. APR 9600 VOICE IC:

The replayed sound exhibits high quality with a low noise level. Sampling rate for a 60 second recording period is 4.2 kHz that gives a sound record/replay bandwidth of 20Hz to 2.1 kHz. However, by changing an oscillation resistor, a sampling rate as high as 8.0 kHz can be achieved. This shortens the total length of sound recording to 32 seconds.

Total sound recording time can be varied from 32 seconds to 60 seconds by changing the value of a single resistor. The IC can operate in one of two modes: serial mode and parallel mode. In serial access mode, sound can be recorded in 256 sections. In parallel access mode, sound can be recorded in 2, 4 or 8 sections. The IC can be controlled simply using push button keys. It is also possible to control the IC using external digital circuitry such as micro-controllers and computers.

This APR9600 voice IC has 28 pin DIP package works in supply voltage between 4.5V & 6.5V. During recording and replaying, current consumption is 25 mA. In idle mode, the current drops to 1 mA. The APR9600 experimental board is an assembled PCB board consisting of an APR9600 IC, an electrets microphone, support components and necessary switches to allow users to explore all functions of the APR9600 chip. The oscillation resistor is chosen so that the total recording period is 60 seconds with a sampling rate of 4.2 kHz. The board measures 80mm by 55mm.

D. GLOBAL SYSTEM FOR MOBILE(GSM):

Global System for Mobile Communications (GSM) modems are specialized types of modems that operate over subscription based wireless networks, similar to a mobile phone. A GSM modem accepts a Subscriber Identity Module (SIM) card, and basically acts like a mobile phone for a computer. Such a modem can even be a dedicated mobile phone that the computer uses for GSM network capabilities. Traditional modems are attached to computers to allow dial-up connections to other computer systems. A GSM modem operates in a similar fashion, except that it sends and receives data through radio waves rather than a telephone line. This type of modem may be an external device connected via a Universal Serial Bus (USB) cable or a serial cable. More commonly, however, it is a small device that plugs directly into the USB port or card slot on a computer or laptop.

It is widely used mobile communication system in the world. GSM is an open and digital cellular technology used for transmitting mobile voice and data services operates at the 850MHz, 900MHz, 1800MHz and 1900MHz frequency bands.

E. GLOBAL POSITIONING SYSTEM:

The Global Positioning System (GPS) is a satellite based navigation system that can be used to locate positions anywhere on earth. Designed and operated by the U.S. Department of Defense, it consists of satellites, control and monitor stations, and receivers. GPS receivers take information transmitted from the satellites and uses triangulation to calculate a user's exact location.



FIG: GPS Module

F. Ultrasonic Sensor:

The sensor has a ceramic transducer that vibrates when electrical energy is applied to it. The vibrations compress and expand air molecules in waves from the sensor face to a target object. A transducer both transmits and receives sound. The ultrasonic sensor will measure distance by emitting a sound wave and then "listening" for a set period of time, allowing for the return echo of the sound wave bouncing off the target, before retransmitting. Microcontroller and the ultrasonic transducer module HC-SR04 forms the basis of this circuit. The ultrasonic module sends a signal to the object, then picks up its echo and outputs a wave form whose time period is proportional to the distance. The microcontroller accepts this signal, performs necessary processing and displays the corresponding distance on the 3 digit seven segment display. This circuit finds a lot of application in projects like automotive parking sensors, obstacle warning systems, terrain monitoring robots, industrial distance measurements etc.

It has a resolution of 0.3cm and the ranging distance is from 2cm to 500cm. It operates from a 5V DC supply and the standby current is less than 2mA. The module transmits an ultrasonic signal, picks up its echo, measures the time elapsed between the two events and outputs a waveform whose high time is modulated by the measured time which is proportional to the distance.

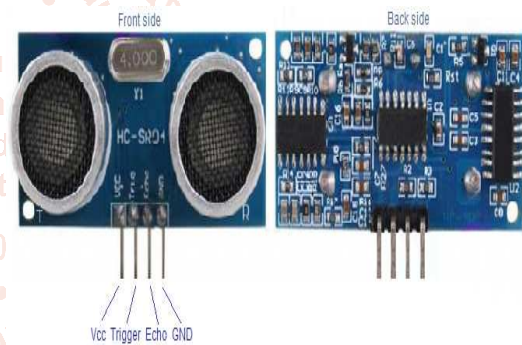


FIG: Ultrasonic Sensor

G. Driver Circuit (L293D):

L293D IC generally comes as a standard 16-pin DIP (dual-in line package). This motor driver IC can simultaneously control two small motors in either direction; forward and reverse with just 4 microcontroller pins (if you do not use enable pins).

H. DC MOTOR:

A DC motor in simple words is a device that converts direct current (electrical energy) into mechanical energy. It's of vital importance for the industry today.

A DC motor is designed to run on DC electric power. Two examples of pure DC designs are Michael Faraday's homopolar motor (which is uncommon), and the ball bearing motor, which is (so far) a novelty.

By far the most common DC motor types are the brushed and brushless types, which use internal and external commutation respectively to create an oscillating AC current from the DC source—so they are not purely DC machines in a strict sense.



FIG:DC Motor

5. PROJECT WORKING:

Now an afternoon's road facility rectangular measures a vast concern within the developed international. Recent research show that one 1/3 of the amount of fatal or serious injuries rectangular measure associated with immoderate or irrelevant pace, also as changes in the path (just like the presence of street-paintings or surprising limitations). Reduction of the quantity of accidents and mitigation in their consequences square measure an good sized situation for visitors government, the car business and transport analysis teams. One important line of motion consists inside the use of advanced motive force assist systems.

The evaluation goal unifying the global Positioning system with embedded wi-fi gadget is that the new approaches in wise automobile management for important faraway location utility victimization ARM. In typical machine they're designed to manipulate the velocity of vehicles altogether days. The maximum objective of the projected gadget is to manipulate the speed of auto at vital zones. The bottom station having the transmitter that is intended for modulation (FM), the receiver 1/2 is enforced in Vehicle. The ARM processor is enforced at receiver side, that gets the important frequency, and so it is activated in vital mode. Speed management Driver (SCD) is bespoke to fit into a car's dashboard, and displays records at the vehicle. Once the expertise is obtained, it mechanically alerts the purpose force, to reduce the velocity in step with the quarter. The novel gadget is enforced with the help of embedded processor and also the simulation is executed via Keil C code

and results rectangular measure referred to. By the use of this challenge we will reduce the velocity of the vehicle at the vital zones. The vehicle have the receiver and at the crucial zones it will have the transmitter on every occasion the receiver gets the transmitted sign from the essential zones the car velocity will reduces. That manner the car enters into the important sector, passing of important sector the car will moves normal speed. The pace of the vehicle will be reduces with the aid of the PWM technique.

6. RESULT:

Here the output of the project "Automatic Detection and Notification of Potholes on Roads to Aid Drivers" output was successfully implemented. The receiver fixed to the vehicle and transmitter at the critical zones whenever receiver received the transmitted signal from the critical zone the than vehicle will automatically reduce speed that implemented successfully.

7. CONCLUSION:

By using this project we can conclude that when vehicle was enters into the critical the speed of the vehicle will automatically reduce and after the critical zone the vehicle moves with normal speed. With this project we can reduces the accidents at the critical zonesand we can reduces the speed of the vehicle from rash driving.

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