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Smart Road Checking Vehicle

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***Abstract* – The proposed work is to create a robot using IOT through which it performs a routine check up on roads for damages. Especially in highway roads most of the accidents occur due to road damage and improper maintenance. Through this project road conditions can always be monitored and accidents can be avoided. Until now, Government uses costly methods like road rollers and tar laying machines to fix the roads. It is more time consuming and not cost efficient. The key idea of this project is to create a robot using Arduino and ultrasonic sensors. Sensors are placed at the bottom of the robot. When some road damage is detected it send information to the authority. Our prototype detects the potholes and pits on the road and fills them with the appropriate material .If the pits are too large to fill up ,the GSM module is activated and a SMS is sent to the concerned department. The Camera module is also activated which captures the images of the pits and sends via app. Google map is used to send the location of the concerned area.**

Keywords: Arduino Mega, Ultrasonic sensor, , Battery, Gsm, Relay, GSM.

1. INTRODUCTION

Information has always been in the primary focus of Potholes are the lowly annoyance that in fact cause billions of dollars in vehicle damages and a large portion of highway deaths.Potholes are formed by water, freezing and freeze-thaw cycles, excessive heat, wear and tear – and time.The areas most prone to pothole development are where drainage is poor (particularly where roads dip, such as the trough under viaducts), where vehicular traffic is greatest – especially heavy vehicle traffic – and where poor maintenance allows small fissures to deteriorate. Potholes sometimes referred to as chuckholes can be the cause of serious trip-and-fall accidents. It is not uncommon for lawsuits to arise from such accidents, even wrongful death lawsuits by head injuries. It is therefore extremely important for private and public property owners to repair any potholes and to maintain the condition of their pavement.

II. AVAILABLE TECHNOLOGY

A. Vibration Based Pothole Detection

Vibration based method uses acceleration meter inorder to detect potholes.As the advantage of vibration based system,this method require small storage and can be used in real time processing.However vibration methods could provide wrong results that the hinges and joints of road can be detected as potholes and potholes in the center of the lane cannot be detected using accelerometer due to no hit by any of the vehicles wheel.

B. 3D Reconstruction

3D Reconstruction method can be further classified into three categories.1.3D Laser Scanner Method,2.Stereo Vision Methods,3.Kinect Sensor.

C. Vision Based Pothole Detection

Vision based method includes 2D Image based approach and Video based approach.The resulting accuracy in 2D image based approach was 86% with 82% precision and 86% recall.2D image based approach have been only focused on based on only pothole detection,and it is limited to single frame.So it cannot determine magnitude of the pothole for assessment.To overcome the limitation of the above method,video based approach proposed to recognize the pothole and calculate number of potholes over a sequence of frames.

A Survey On Accidents due to potholes

According to the survey, bad roads killed over 10,727 people in the year 2015. It was caused by potholes, speed breakers and damaged roads. The common problems that are plaguing, poorly concrete speed breakers and bad riding quality caused by potholes.Taking note of almost 3,600 deaths reported last year alone due to potholes on roads across the country.In July, the apex court had taken cognizance of reports quoting official data showing that pothole-related accidents had claimed 3,597 lives in 2017, compared to 803 in all terror and extremist attacks that year.

III. PROPOSED TECHNOLOGY

The key idea of this project is to create a robot using Arduino and ultrasonic sensors. Sensors are placed at the

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bottom of the robot. When some road damage is detected it send information to the authority.

IV. COMPONENTS USED

A. Arduino Mega The Arduino Mega is a microcontroller board based on the ATmega1280 (datasheet). It has 54 digital input/output pins (of which 14 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button B. Ultrasonic Sensor Ultrasonic transducers or ultrasonic sensors are a type of acoustic sensor divided into three broad categories: transmitters, receivers, and transceivers. Transmitters convert electrical signals into ultrasound, receivers convert ultrasound into electrical signals, and transceivers can both transmit and receive ultrasound. C. 2 Way Relay The relay is the device that open or closes the contacts to cause the operation of the other electric control. It detects the intolerable or undesirable condition with an assigned area and gives the commands to the circuit breaker to disconnect the affected area. Thus protects the system from damage .It can be used to control various appliances, and other equipments with large current. It has a 1x4 (2.54mm pitch) pin header for connecting power (5V and 0V), and for controlling the2 relays. It works on the principle of an electromagnetic attraction. When the circuit of the relay senses the fault current, it energises the electromagnetic field which produces the temporary magnetic field. D. GPS The Global Positioning System, originally Navstar GPS, is a satellite-based radionavigation system owned by the United States government and operated by the United States Air Force.The GPS does not require the user to transmit any data, and it operates independently of any telephonic or internet reception, though these technologies can enhance the usefulness of the GPS positioning information. The GPS provides critical positioning capabilities to military, civil, and commercial users around the world. The United States government created the system, maintains it, and makes it freely accessible to anyone with a GPS receiver.

E. Battery
An electric battery is a device consisting of one or more electrochemical cells with external connections provided to power electrical devices such as flashlights, smart phones, and electric cars. When a battery is supplying electric power, its positive terminal is the cathode and its negative terminal is the anode.

F. Camera Module A camera module is an image sensor integrated with a lens, control electronics, and an interface like CSI, Ethernet or plain raw low-voltage differential signalling.

G. GSM
GSM (Global System for Mobile communication) is a digital mobile network that is widely used by mobile phone users in Europe and other parts of the world. GSM uses a variation of time division multiple access (TDMA) and is the most widely used of the three digital wireless telephony technologies: TDMA, GSM and code-division multiple access (CDMA).

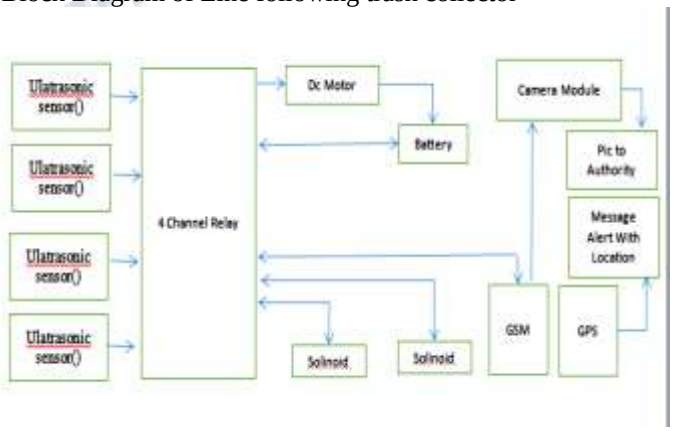
H. Motor Driver L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction.

V. WORKING PRINCIPLE

Our prototype detects the potholes and pits on the road and fills them with the appropriate material. If the pits are too large to fill up ,the GSM module is activated and a SMS is sent to the concerned department. The Camera module is also activated which captures the images of the pits and sends via app.

VI. BLOCK DIAGRAM

A. Block Diagram of Line following trash collector



B. Arduino Connection with GSM Module

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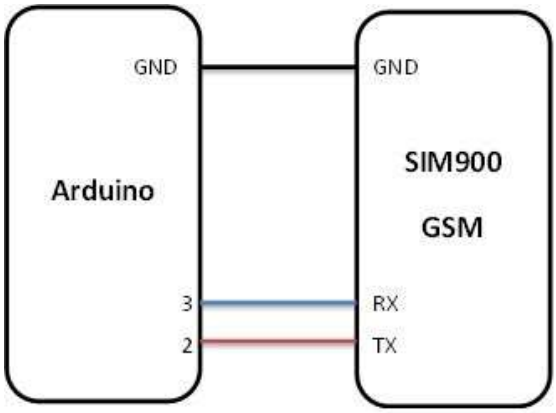

SIM900 GSM Module interfacing to ARDUINO module

VII. RESULT

A. Prototype Of Smart Road Checking Vehicle

VIII. ADVANTAGES

It gives a solution for damaged roads and provides regular maintenance. This project reduces the cost of repairing the roads considerably, as it indicates the exact location, so that the appropriate location can be rectified quickly. This method is economical and cost efficient.

IX. PROJECT IMPLEMENTATION SUMMARY

The vehicle is designed in such a way that the robot detects the potholes on the roads. The main focus of the proposed system is that it saves time for the concerned authorities. Our idea has the potential to be implemented in highways and runways. The use of cost-efficient components is of crucial importance to facilitate widespread adoption of such detection systems. Therefore this method uses high accuracy models such as Ultrasonic Sensors, GPS modules, GSM module, Arduino Mega and a 24V Battery which improves the reliability of the system.

X. CONCLUSION

This robot can decrease the death rate due to road accidents. It has more advantages than the existing system. And it prevents maximum number of accidents caused by road damage and improper maintenance. Solar panels can be added to power the vehicle and we can use heating elements and some addition heating sources to melt plastic for laying plastic as a remedial filling filing element on the roads, which indeed will increase the durability of the roads and reduce the cost estimation.

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