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Arduino Based Programmed Railway Track Crack Monitoring Vehicle

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Abstract*: Indian Railroad is one of the biggest railroad systems on earth. Despite the fact that there is an enormous development in the Indian railroads, but some of the accidents occurs due to cracks which occur in the railway track. In this paper we are thinking about the serious issues that result in accidents. To overcome this major problem we have proposed another monitoring train that uses an ultrasonic sensor which is used to detect the crack in the railway track and used to send SMS and call via GSM and GPRS module with the help of Arduino Uno. During different seasons the track is expanded or contrasted due to which splits may happen. This testing train is used to detect the crack, when detects, the train stops and sends the signals to the nearest station. This intelligent system provides protection and online monitoring system.

***Index Terms*: Arduino Uno, GSM GPRS, Ultrasonic Sensor, Intelligent Systems, online monitoring, protection**

I. INTRODUCTION

Railroads give the least expensive and most advantageous method of traveller for both separation and rural traffic. It likewise assumes an imperative job in the advancement and development of businesses. Railroads help in providing crude materials and different offices to the production line locales and completed merchandise to the market. In this way, wellbeing and dependability ought to be exceptionally considered on account of railroad. As it is assuming an imperative job in development of the economy, so the significance of having current and enhanced railroad framework is expanding step by step. Be that as it may, the present situation of the railroad is very unique. Railroad incident has turned into a typical issue now-a-days. This turn into an everyday news losing numerous lives by the train mishaps. Railroad support is difficult to oversee through any sort of manual framework. In this way, a computerized framework is an earnest need to stop a wide range of undesirable mishaps of railroad. This sort of mishap is fundamentally happens for the next to no obliviousness like little break on the rail track. Amid the advancement of this framework, essentially centres around some critical elements for example Unwavering quality, Accuracy, Efficiency and cost adequacy. Consistently, losing an immense measure of and the instability of physical work have advanced a requirement for a computerized framework to screen the nearness of split on the railroad lines. Attributable to the critical repercussions of this issue, this report shows an execution of a productive and savvy arrangement appropriate for substantial scale application by utilizing the operation based split discovery in railroad track utilizing GSM [5] framework. This thought additionally accommodating for another application where splitting issue is happen.

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II. PROBLEM STATEMENT

A broken rail speaks to one of the main sources of the most costly and perilous rail crashes that happen the world over. Considering crashes all in all, in the only us, all things considered, more than one noteworthy wrecking happens for every three-day time span, reliably over 10 years. The measurements accessible on the recurrence of broken rail crashes in different nations don't help appropriately understanding the financial, social and ecological effects. In the proposed framework, the framework is made to hurried back and forth along the track at uneven interims when the track is free. Furthermore, in the event that it distinguishes any split on the track it will send a mistake flag to the specialist utilizing a remote module. Splits are recognized utilizing IR sensors and the mistake flag is transmitted.

Fig 1: Railway Track Crack

III. COMPONENTS AND SPECIFICATIONS

1.ArduinoUNO
2.GSM GPRS module 800L
3. Sonic sensor
4.Motor Driver
5.12V DC Motor

A. Arduino UNO

The Aurdino UNO [4] is a free-source gadgets stage dependent on simple to-utilize equipment and programming. Arduino sheets can peruse inputs - light on a sensor, a finger on a catch, or a Twitter message - and transform it into a yield - actuating an engine, turning on a LED, distributing something on the web.

You can guide your board by sending a lot of directions to the microcontroller on the board. To do as such you utilize the Arduino programming language (in view of Wiring), and the Arduino Software (IDE), in view of Processing. It contains simple input/output (I/O) ports that might be connected to different circuits. The board has 14 Advanced pins, 6 Simple pins, and programmable with the Aurdino IDE (Coordinated Improvement Condition).

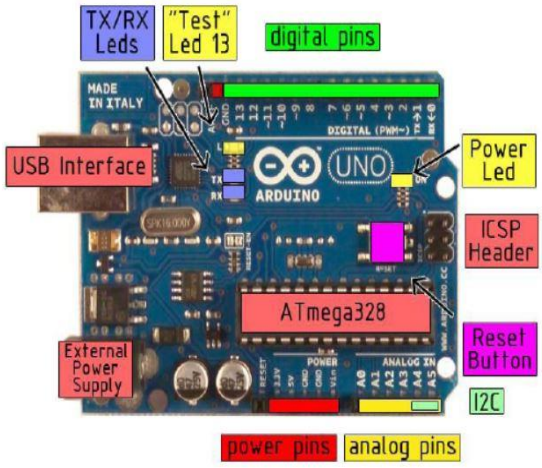

Fig 2: Arduino Uno

B. GSM Modern

The GSM module Aurdino is utilized to send/get messages and make/get considers simply like a cell phone by utilizing a SIM card by a system supplier. We can do this by connecting the GSM shield to the Aurdino board and afterward connecting a SIM card from an administrator that offers GPS inclusion. The shield utilizes a radio modem M10. It works under various frequencies. In GSM Shield it is conceivable to speak with the board utilizing AT directions. The GSM library has an enormous no. of techniques to speak with the shield. The shield utilizes advanced pins 2 and 3 for programming correspondence with the module. We need to associate the stick 2 with the TX and 3 with the RX. To interface with the cell arrange, the board required a SIM.

C. Sonic Sensor

Sonic sensor is a ultrasonic ranging module. It is comprises of transmitter, beneficiary and control circuit. It has four pins, for example, VCC, GND, Trigger and Echo. It can measure 2-400 cm utilizing sound waves in the scope of 40 kHz which is over the scope of human discern ability [3]. At whatever point the ultrasonic experience an impediment ahead it reflects back to the sensor. It utilizes IO trigger for in any

Event 10us signal. For this sensor Trigger is the beat input, Echo is the beat output.0V is for the ground. Its working voltage is 5v. Anybody can without much of a stretch interface it with microcontroller and Arduino board.

Fig 3: Ultrasonic Sensor

D. Motor Driver

Engine Driver [8] ICs are essentially used in independent mechanical innovation figuratively speaking. Furthermore most microchips work at low voltages and require a little proportion of current to work while and current. Dependent upon the estimations of the Input and Enable the engine will turn in either clockwise or anticlockwise heading with full speed (when Enable is HIGH) or with less speed (when Enable is given PWM). Allow us to acknowledge for Left Motor when Enable is HIGH and Input 1 and Input 2 are HIGH and LOW independently then the motor will move clockwise way.

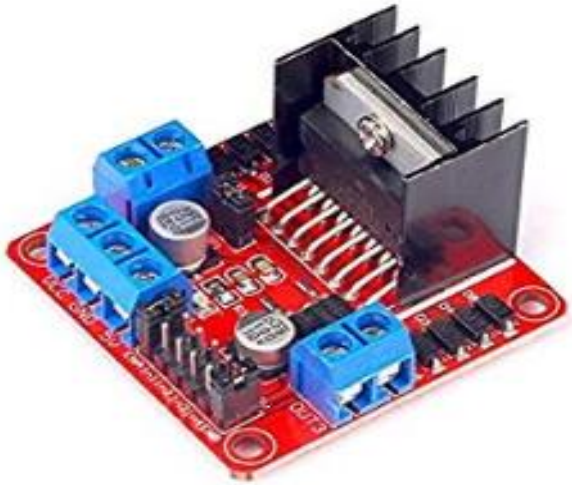

Fig 4: Motor Driver

The current frameworks are wasteful in checking the surface and close surface breaks decisively and it is unseemly in passages. The time delay in educating the railroad specialist about the break is vast. It has surprising expense and is less exact.

E. DC Motor

DC motors were the chief kind for the most part used, since they could be supply from existing direct-current lighting power scattering structures. A DC engine's speed can be controlled over a wide range, using either a variable supply voltage or by changing the nature of current in its field windings. Little DC engines are used in gadgets, toys, and devices. The general motor can chip away at direct current yet is a lightweight brushed motor used for conservative power devices and machines. Greater DC engine are used in force of electric vehicles, lift and raises, or in drives for steel moving plants.

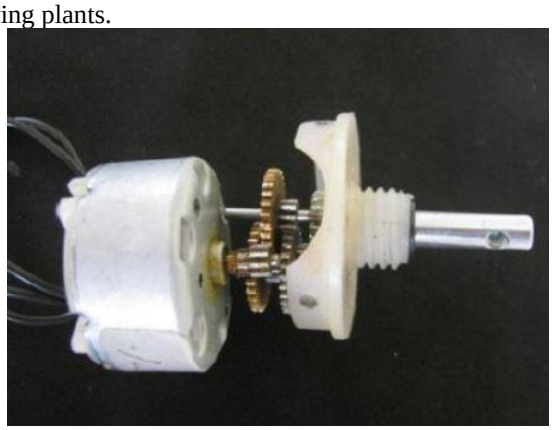

Fig 5: DC Geared Motor

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IV. WORKING PRINCIPLE

In our project, there are two arrangements of ultrasonic sensor units fitted to the opposite sides of the vehicle. This unit is utilized to initiate/deactivate GSM transmitter unit when there is any crack in the track.

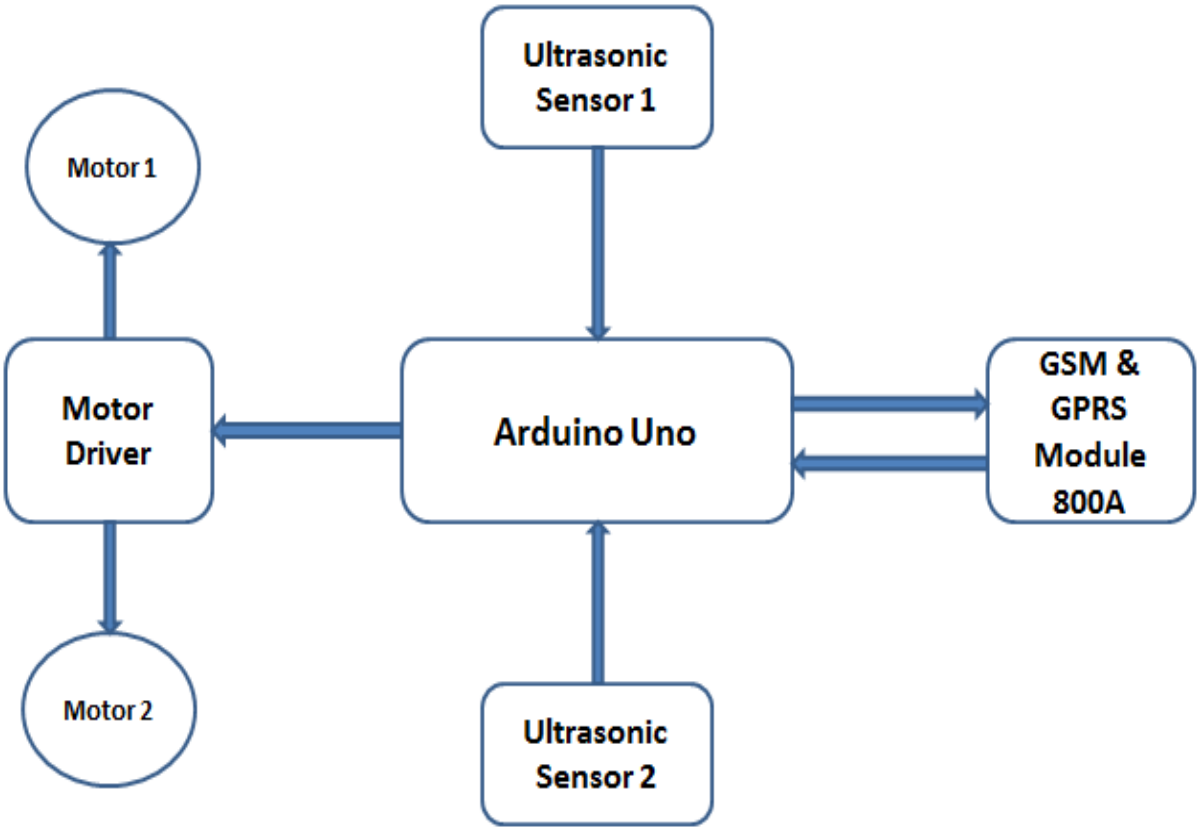

Fig 6: Block Diagram for monitoring vehicle

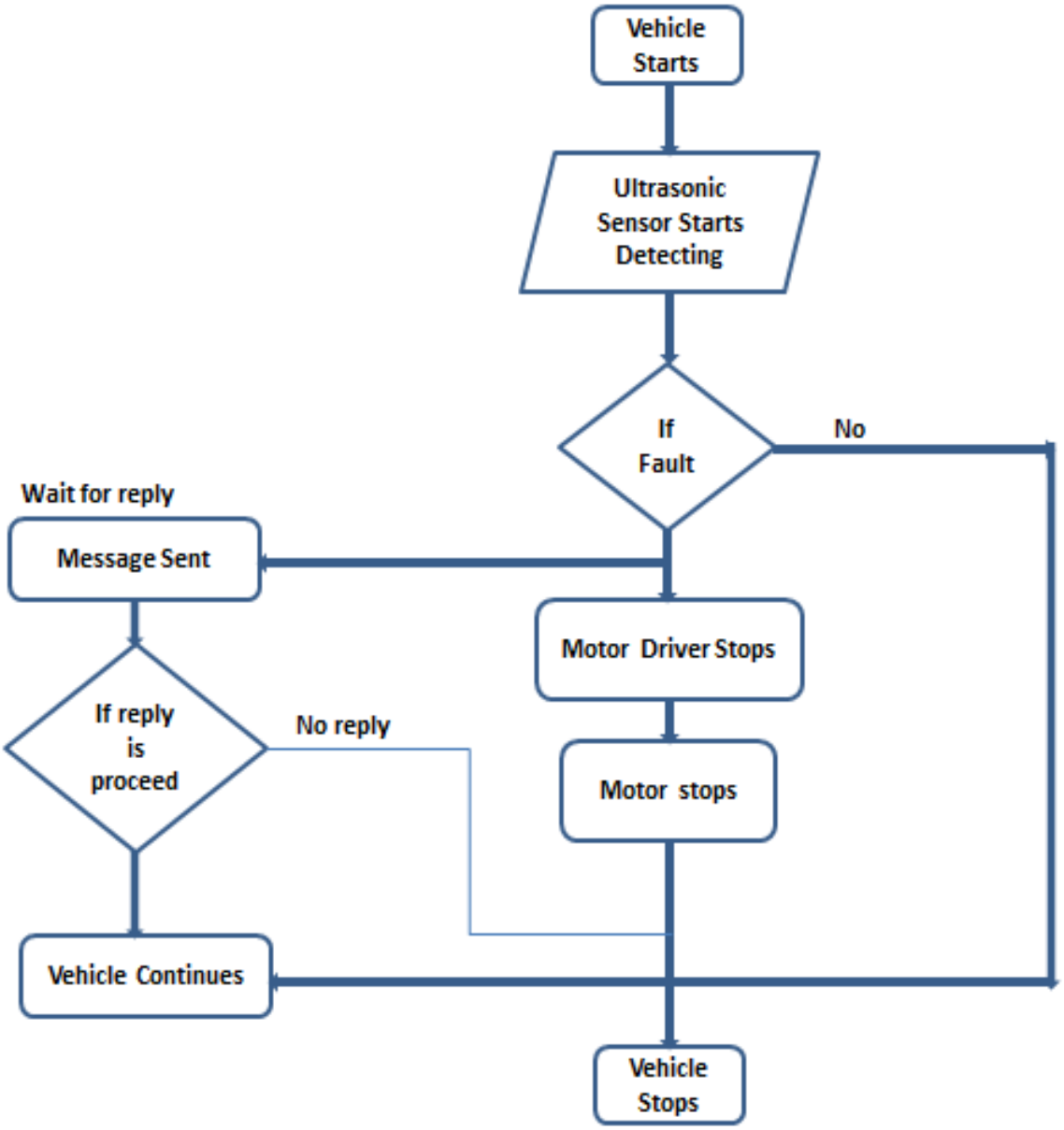

Fig 7: Flow Chart for monitoring vehicle

A. Normal Condition

The ultrasonic sensor has a transmitter and receiver, the transmitter sends the sonic rays of lower wave length which reflected away from the track. Under normal condition the reflection time is less than the fault condition (say < 4cm) time so the vehicle will run normally and the GSM will not be activated.

B. Fault Condition

Under fault condition the reflection time of sonic rays is more than normal condition (say> 4cm), then an error signal is sent to aurdino ,aurdino activates the GSM module and send and error message that includes the left or right track and GPRS location and stops the vehicle

V. EXPERIMENTAL RESULT

In normal conditions the vehicle will move forward on the track, when fault occurs it send a call to activate the service centre and sends a message that includes crack on left or right track and GPS location and wait for our reply.

When we give a return reply it will proceed according to given return instructions.

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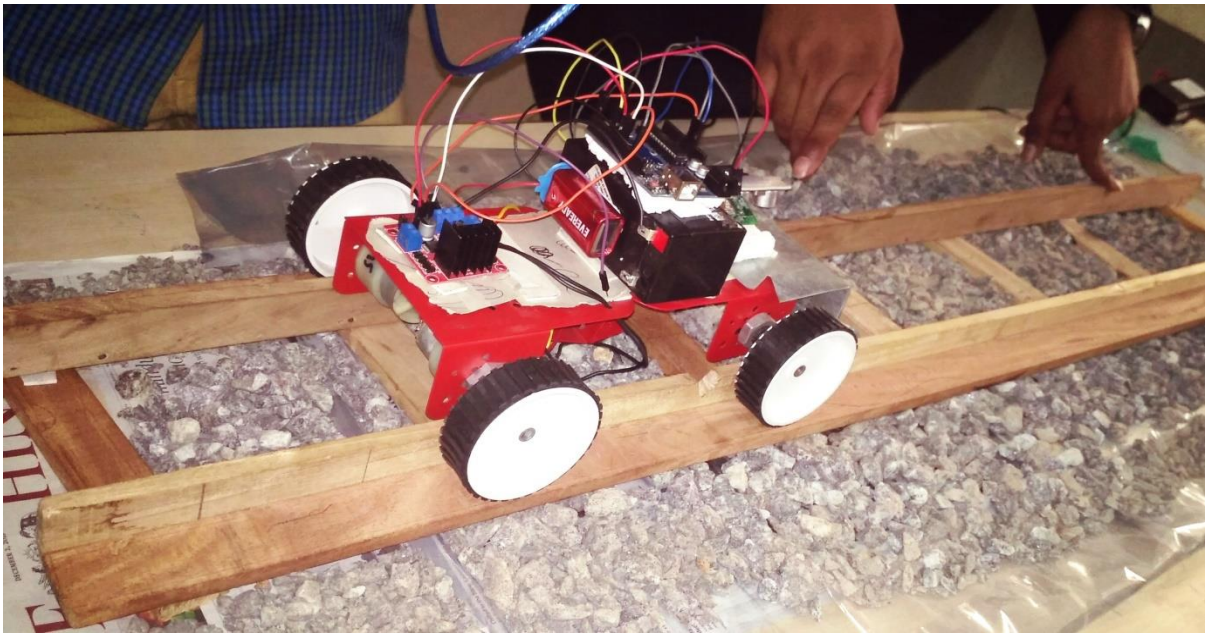

Fig 8: Hardware Model

VI. SCOPE FOR DEVELOPMENT

We can include vibration sensor to detect the train on the track and web cam to analyse the crack when it is detected.

VII. CONCLUSION

From this paper we can make cost efficient and automated vehicle to detect crack on the railway track. It will minimise the time and maximise the work speed and requires less human effort. Using this we can decrease the chances of railway track breakages and train accidents.

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Vasupalli Manoj received B.Tech degree in Electrical and Electronics Engineering from JNTU, Kakinada, India in 2010 and M.Tech degree from GITAM University in Power Systems and Automation, in 2012. Pursuing PhD from SSSUTMS, Bhopal. His research interest includes HVDC Transmission and Protection, Applications of Power Electronics to Power Systems, Power System Operation & Control, and Power System Stability & Analysis. Currently he is working as Assistant Professor in the Department of Power Engineering, GMR Institute of Technology, Rajam, Andhra Pradesh, India-532127.

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