

Railway Track Crack Identification, Rectification and Explosive Detection Using autonomous vehicle

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Abstract— The principle issue about a railroad investigation is recognition of breaks in the structure. In the event that these inadequacies are not controlled at early stages they may bring about tremendous practical issues influencing the rail arrange (sudden order of extra parts, treatment of occurrence or potentially Accidents). Inside this structure, the early and nonstop utilization of Non Destructive Tests can be helpful. With a specific end goal to enhance fabricating quality and guarantee open security, parts and structures are usually reviewed for early identification of imperfections or shortcomings which may diminish their auxiliary respectability. There are such a large number of techniques to distinguish the break yet our venture is to amend the split by utilizing a robot. The break is recognized by utilizing the sensor and it is hinted to the controller. The controller works the gadget to give the wax or some material for joining and after some time it works the granulating gadget to level the upper level as same as the track level. This venture can be actualized by outlining a trolley like robot to head out over the track to recognize and amend the breaks display in the track. The ETD is utilized to examine for explosives along the track.

Index Terms— Micro controller (PIC16F877A), IR obstacle Sensor, Railway Cracks, GSM/GPRS, GPS Module, DC Motor (Engine).

I. INTRODUCTION

The Indian railroad organize today has a track length of 113,617 kilometers (70,598 mi).over a course of 63,974 kilometers (39,752 mi) and 7,083 stations. It is the fourth biggest railroad organize on the planet. Indian rail system is still on the development direction attempting to fuel the monetary needs of our country. Despite the fact that rail transport in India developing at a quick pace, the related wellbeing foundation offices have not stayed aware of the previously mentioned multiplication. Our offices are insufficient contrasted with the global measures and thus, there have been visit crashes that have brought about extreme loss of important human lives and property also. On further examination of the components that cause these rail mishances, late insights uncover that around 60% of all the rail mishaps have crashes as their cause, of which around 90% are because of breaks on the rails either because of common causes (like over the top development because of warmth) or because of withdrawn components. Thus these splits in

railroad lines have been a perpetual issue which must be tended to with most extreme consideration because of the recurrence of rail use in

India. These breaks and different issues with the rails by and large go unnoticed because of disgraceful upkeep and the at present unpredictable and manual track line observing that is being done. The high recurrence of trains and the lack of quality of physical work have advanced a requirement for a computerized framework to screen the nearness of split on the railroad lines. Inferable from the vital repercussions of this issue, this paper displays an execution of a productive and financially savvy arrangement appropriate for huge scale application. In beforehand existing framework, a similar idea is utilized utilizing LED and LDR sensor get together. The principle disadvantage of the framework is that LED and LDR should be precisely adjusted inverse to each other to identify the split, additionally the earth should be controlled to recognize the genuine qualities from LDR. Consequently, we have utilized IR Obstacle sensor, which has just a single module that has both transmitter and recipient and arrangement won't be an issue. The fundamental target of the venture is to recognize any split or distortion on the railroad track utilizing this setup, which can be executed in live by Railway experts. The proposed setup would make the review and upkeep of railroads tracks less demanding and help them to screen proficiently by supplanting the human investigation which is right now took after. The plan of the vehicle and programming identified with it are extremely basic and can be effectively received by the present framework.

II. HARDWARE COMPONENTS:

A. Power Supply

The power supply yield is given to small scale controller and other circuit additionally; the outline of the power supply is mostly on account of the smaller scale controller, the miniaturized scale controller work in Dc source with a voltage of +5v. As we are getting the line voltage VL has 230v in air conditioning source, so it is unrealistic. This power supply outlines a yield of +5v Dc to initiate the smaller scale controller.

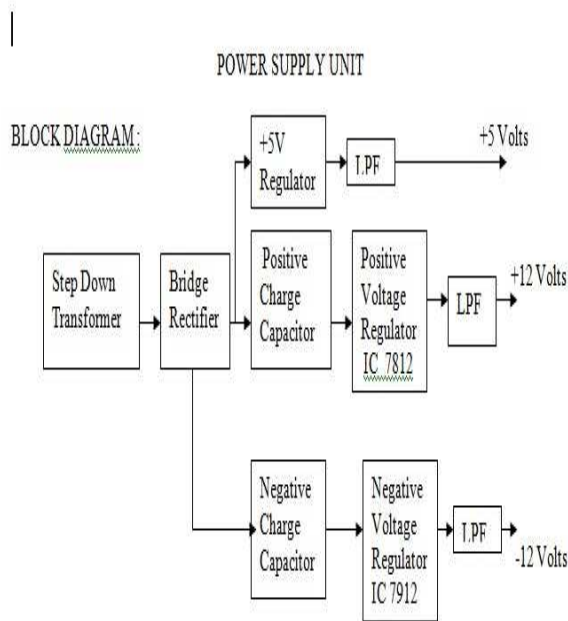


Fig 1: Power Supply Unit.

B. Arduino Micro Controller

The miniaturized scale controller, which we are utilizing here, is PIC 16F877 .It comprises of 5 ports, ADC, CLK& MCLR. These are inbuilt with in 40 pins. The miniaturized scale controller acknowledges and gives the o/p in computerized frame.



Fig 2: Arduino Micro Controller.

C. Relay

A transfer is an electrical switch that opens and closes under the control of another electrical circuit. In the first shape, the switch is worked by an electromagnet to open or close one or many arrangements of contacts. It was concocted by Joseph Henry in 1835. Since a transfer can control a yield circuit of higher power than the information circuit, it can be considered, in a wide sense, to be a type of an electrical speaker.

D. DC Motor

In any electric engine, operation depends on straightforward electromagnetism. A current-conveying conductor produces an attractive field; when this is then put in an outside attractive field, it will encounter a constrain relative to the current in the conductor, and to the quality of the outer attractive field. As you are very much aware of from playing with magnets as a child, inverse (North and South) polarities pull in, while like polarities (North and North, South and South) repulse. The inside arrangement of a DC

engine is intended to tackle the attractive communication between a current-conveying conductor and an outside attractive field to create rotational movement.

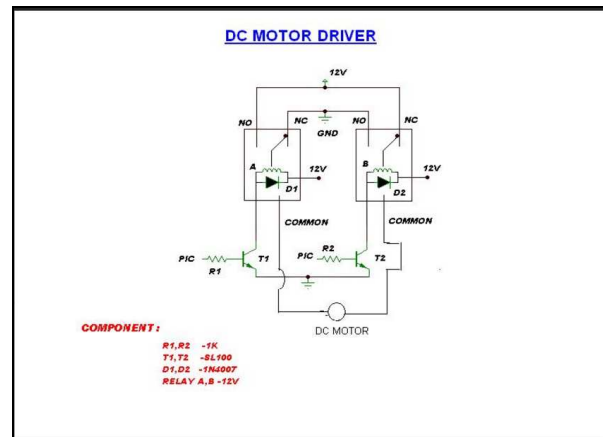


Fig 3: DC Motor Driver

E. Working:

The DC motors are used for moving the trolley like structure to identify the crack. The sensor identifies the crack and it is send to the micro controller and the analog input is converted into digital by using the Embedded C program in micro controller. According to the crack the relay opens the wax to apply over it for certain time period. After it closes, then it operates the grinding machine to make it level. By this way the crack is rectified.

F. METAL DETECTOR:

It generally conceivable that when impacted by dangerous metals, it might prompt extreme harms . For this reason we arrange a hardware for metal discovery in our venture where in every individual will be checked with the assistance of metal identifier before he makes a section into the business. We are making utilization of nearness sensors in our venture.

G. NEARNESS SENSORS:

Whenever ferous and non ferous materials came nearer to the nearness sensors it faculties and produces a yield flag . It has three terminals ,

- Supply
- Gnd
- Output Rule

The dc supply is utilized to work as an oscillator in the detecting head. The detecting head area is basic. The high recurrence flag created in the oscillator is sustained into the curl, that is likewise a piece of the detecting head .accordingly an attractive field is delivered in the range quickly nearby the detecting head . Ought to any material in which vortex current might be produced gone inside this attractive field, the oscillator circuit will be stacked and the abundancy of oscillator will drop. This drop in abundancy is the yield of the identifier. When all is said in done there are two sorts of nearness sensors

- Inductive closeness sensor
- Magnetic closeness sensor

Attractive closeness sensors are costly contrasted and inductive nearness sensors, so we are going in for the

utilization of inductive vicinity sensors. It works under any air conditions.

SORTS:

There are two sorts of inductive vicinity sensors.

- NPN Proximity Sensors
- PNP Proximity Sensors

NPN PROXIMITY SENSORS :

At the point when no metal is moving toward the sensors its yield will be high. At the point when a metal methodologies the sensor its yield will be low.

OPERATION :

Enlistment of the curl will be changed when current goes through it. At the point when low yield flag is given to the base of Q1, it doesn't direct. Henceforth the voltage at point An is high. It is trailed by a schmitt trigger which gives low. It is given to the NPN transistor Q2, does not direct which gives low.

So the yield of the closeness sensor detecting circuit will be rationale 0, at whatever point a metal methodologies the sensor. In the event that its yield is high, no metal is recognized.

PNP PROXIMITY SENSORS

At the point when no metal is moving toward the sensor its yield will be low. at the point when a metal methodologies the sensor its yield will be high.

OPERATION

At the point when the high yield is given to the base of Q1, it conducts. Thus the voltage at point An is low. Schmitt trigger believes it to high. The voltage at point B is additionally high when the yield of the schmitt trigger is given to Q2. So the yield of this closeness sensor detecting circuit will beat logic1, whenever a metal methodologies the sensor.

Determination: Detecting separation 10mm, Inside 10mm, it gives high yield, else it gives low yield.

Detecting speed : 200Hz (it faculties 200 times in 1 sec)

In this venture, there are two tracks; each track will be checked by one IR hindrance sensor. At whatever point there is a split on the track, the metal detector sensor detects the break and initiates GPS. The area Latitude and Longitude directions of the break is sent to the pre-characterized number with the assistance of SIM embedded into GMS module. Once the break has been effectively distinguished and message is sent, the vehicle moves encourage on the model way till next split is recognized. The total setup is controlled by 5W Solar board

The outlined Railways Track Crack Detection Autonomous Vehicle has been effectively tried on the model track and the recognized area has been sent to the telephone number which is 4km far from the model. This vehicle can be utilized to identify the track and send GPS facilitates in SMS shape to much longer separation gave the GSM signs are in place.

- Crack identification is done .
- Crack is identified and rectified automatically by the autonomous vehicle

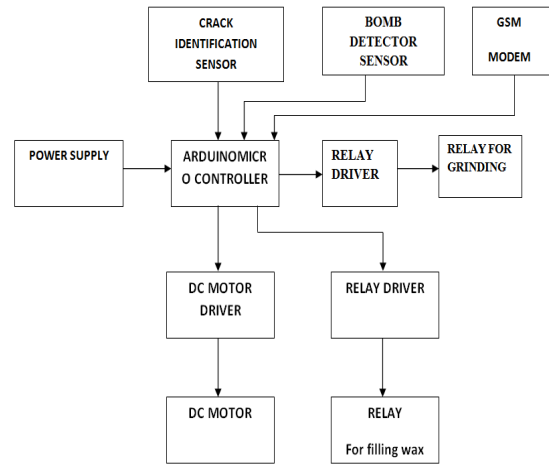


Fig 4: Working Block Diagram.

III. RELATED WORK:

There have been a few distinctive ways to deal with surface break discovery in auxiliary designing. For example, Zhang et.al have built up a shrewd film to identify the nearness and area of surface splits [6]. Their procedure comprises of inserting a work of conductive wires in a texture that is attached to the surface of a structure.

Surface breaking spreads to the shrewd film and disjoins the comparing wires in the work. The length and area of the split can then be controlled by recognizing which wires have been disjoined.

The creators tentatively check that the brilliant film can be dependably used to distinguish break length and position. In an expansion to their work [7], the creators likewise examine how the keen film innovation can be manufactured utilizing ease materials subsequently empowering unavoidable sensor arrangement. Comparable work utilizing capacitance changes [8] and the piezoresistive impact of carbon nanotube impregnated composites [9] have been accounted for inescapable break location in the writing. Be that as it may, these break detecting procedures make utilization of lead wiring for information extraction.

The situation and support of huge lengths of cabling wire is unwieldy and costly. As of late, there has been enthusiasm for creating inescapable sensors utilizing RFID labels. RFID labels have seen vast scale, exceedingly incorporated arrangement for question identification especially in the store network and attire industry. Subsequently, RFID labels today can be mass created at low expenses.

Moreover, the correspondence conventions between the RFID tag and the peruser are institutionalized and efficient [10], making RFID a perfect remote correspondence framework for inescapable detecting. In past work, we've exhibited how a RFID label's reception apparatus can be utilized as a sensor and related changes in some physical parameter important to a change in RFID label reaction flag quality and recurrence. Applications in uprooting, temperature limit and fluid level detecting were shown [11], [12].

Additionally, different scientists have exhibited how a RFID label's radio wire can be utilized to detect dampness [13] and unpredictable organics [14]. Occhiuzzi et.al exhibited the outline of a wind line UHF RFID label radio wire that could

be dependably used to gauge hub strain. The hub strain changed the geometry of the radio wire and this could be identified with an adjustment in the backscatter force of the RFID tag [15].

The creators exhibited the plan of three label reception apparatuses offering exchange offs between element range and affectability. While the sensor is appropriate for pivotal strain estimations, the immediate utilization of this sensor to screen splitting or bowing strains in auxiliary individuals is not promptly obvious.

So also, Yi et. al exhibited the outline of a RFID fix radio wire that relates strain to an adjustment in tag working recurrence [16]. The writers exhibited that the sensor can be dependably used to screen strain up to 50 small scale strain accuracy and over a read separation of a couple of feet. In any case, the sensor depends on a microstrip fix reception apparatus outline that makes utilization of vias to interface the receiving wire copper follow to the ground plane.

This would expand the creation cost of the sensor when contrasted with a planar dipole like structure. Our approach utilizes the RFID label's receiving wire as a split identifier. We display the plan of a lattice made up of RFID labels. As a break creates it disjoins a portion of the receiving wires in the lattice for all time changing their impedance and radiation attributes. This shows itself as a drop in the backscatter flag reactions of the influenced labels. By recognizing which labels enroll a sudden drop in execution, we can induce the length and introduction of the split. In the accompanying areas, we talk about the outline of such a network. We likewise inspect the heartiness of the network in various situations and for various read ranges.

IV. DETAILS OF PROPOSED WORK:

- Both Intimation and rectification is performed by the robot.
- Auto - Rectification is done as per the original standard.
- Severe accidents can be avoided.
- No need of labour to rectify the cracks.
- Cost efficient as one robot is enough to identify and rectify a large number of cracks.

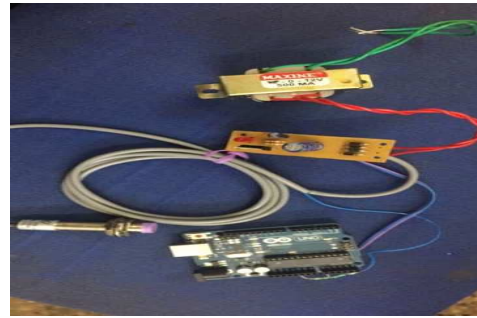
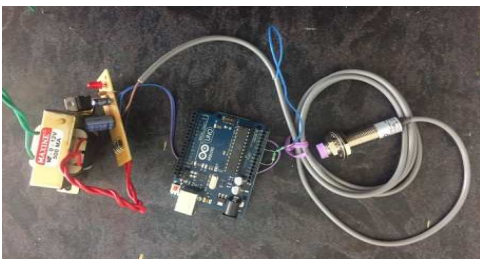


Fig 5: Hardware components.

V. CONCLUSION:

By utilizing this Autonomous vehicle for motivation behind railroad track assessment and break recognition, it will have an incredible effect in the support of the tracks which will help in counteracting train mishaps to a substantial degree. The areas where manual investigation is unrealistic, as in profound coal mines, mountain districts and thick woodland locales can be effectively done utilizing this vehicle. By utilizing this vehicle with the end goal of Railway track review and split identification and mechanized SMS will be sent to pre-characterized telephone number at whatever point the vehicle sensors recognize any break or misshapening. This will help in support and observing the state of railroad tracks with no blunders and accordingly keeping up the tracks in great condition, forestalling train mischances to vast degree. Railway track break location independent vehicle is composed such that it identifies the splits or deformations on the track which when redressed in time will diminish prepare mishaps. The option of sunlight based board is an additional favorable position, which likewise helps monitoring the power asset.

- Automated Identification
- Automated Rectification
- Detection of explosive
- Reduced labour
- Location sharing of explosive and cracks.

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