RAILWAY TRACK INSPECTION SYSTEM"

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Abstract – Train accident is very serious issue and it should be prevented. Detecting cracks and obstacles is vitally essential nearby and on the railway to ensure the smooth running of the trains. Indian railway is relying on visual inspection to monitor the railway. Our project is focused on detecting and warning the railways so that it can increase safety of the trains. The project uses two mediums to collect and monitordataabout the detecting cracks and obstacles nearby and on the railway. The first medium usedinthis project is the sensor based system by usingArduino as a controller at the prototype for storing and monitoring data about the distance between obstacles and theprototype. Another medium used is a display by using Processing Software todisplay the distance between obstacles and the device in the range between 0 – 40 cm. Ultrasonic sensors are used to scan the track and to detect the obstacles nearby and on the railway, which placed at the front, right and left sides.Arduino IDE is used to program Arduino Nano, which acts as the brain of the system. The system with the help of three ultrasonic sensors detects the distance between obstacles or crack and the device and send the data. The prototype managed to collect data and send it for processing and take preventive measures.

Key Words: Arduino, Obstacle detection, Railway Ultrasonic sensor.

1. INTRODUCTION

Railway is one of the most prefered transportation modes of our country but it is a matter of great sorrow and concern that, railway tracks of our country are very prone. That's why, large number of accidents takes place every year due to this primitive type of railway tracks and as a result we lose huge number of lives every year. These incidents motivated us to think over the this issue

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2. As there is now a big considerable need for the use of railway network due to large proportion of the travel, road travel is expensive but the railway is cheaper, faster, safer and carrying more passengers. The combination

of these factors places significant pressure on existing infrastructure leading to increased demand for the inspection and maintenance of rail systems.

According to newspaper 90% of railway accidents areoccur due to railway track fault. Generally, railway trackfault is occurring due to natural climates or any othermechanical damage. This cause unnecessary railway.

The country's large and diverse region has been connected by the largest and busiest railway system in Asia, transporting more than 18 million passengers and more than 2 million tons of luggage daily. It is the world's largest commercial or utility employer which gives employment to more than 1.4 million employees. Indian Railways has become the lifeline for the country. There is no walk of life or sector of economy, which does not to depend heavily on its existence of the Indian Railways. Passengers and goods with equal importance and safety are carried everyday by Railways from one corner of the country to the other.

AIM:

The main aim of this study is to replace the manual method of crack detection of railway using robotic crack tracing system. The system simulation was done using Proteus software. The hardware was designed and implemented using simple components inclusive of an Arduino board interfaced to Ultrasonic543 sensor, motor. The system is robust and time efficient, it is convenient to regions where manual inspection is a hard and requires a lot of afford like in mountain areas, dense forest and a far regions.

OBJECTIVE:

Our main objective of this project is:

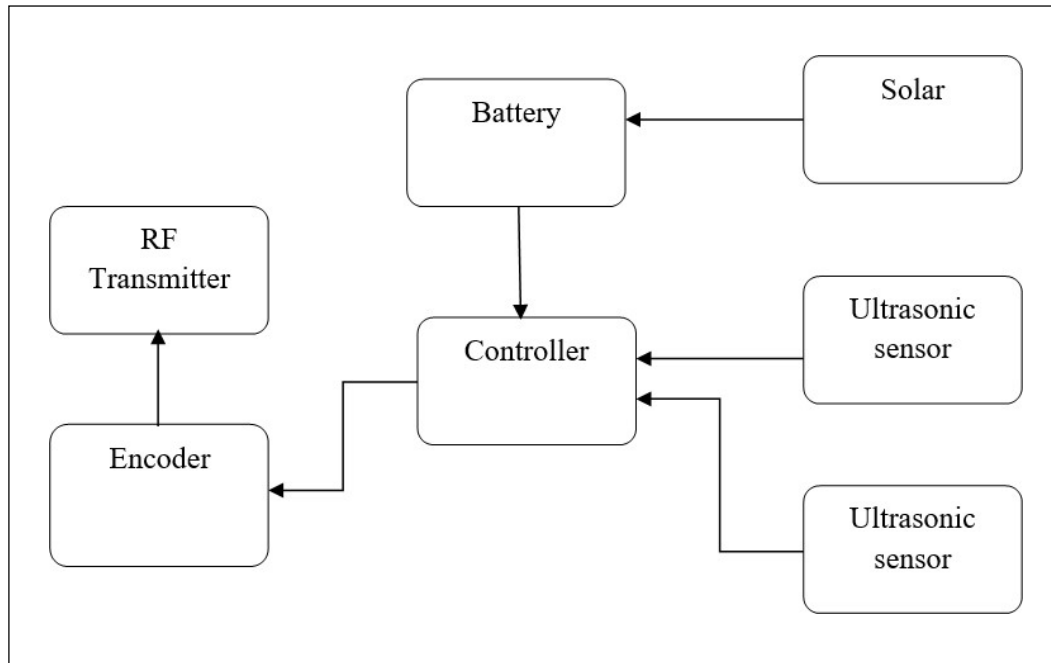Reduce labor cost and human efforts.

- Reduce rail accidents.

- Detection of railway track crack.

  - To reduce casualties with detection of crack which occurs due to failure and derailing of trains.
  - To design system to detect crack which is effective and time efficient in its operation and can also increase efficiency of the whole system.

- To detect animals and other obstacles which can collide with trains so that it can share instantaneous information on display immediately.

- To reduce errors and mistakes which may happens due to carelessness of humans While detecting crack.

- **Problem specification:**

Most common causes of accidents in train is because of track breakage and obstacles.This types of incidents motivate us to think over the above mentioned issue and take necessary steps to protect those lives. With our proposed system, we will establish more modern, efficient and secure railway system. There is no such type of technology or system in our country which can stop the collision between two trains coming from the opposite direction. Moreover natural disaster can throw some object on the rail track which is hard to remove very quickly in the remote area. We thought if our system can detect those object and cracks and inform to the control room then they can take necessary steps to avoid accident. Our system will also reduce the maintenance costs of railway system. Along with these things, as our railway system is too old, it does not have any modern system or way to make the level crossing automatic. We often see this thing is done manually by the authority of the rail tracks. We thought that, if we can make this thing, automatic it will make this job quite easier. Thus, we are motivated to do this job in our system.

Train derailment and accidents due to breaking of tracks and obstacles in the way of train. This happens due to natural or human error which leads to huge loss of lives and property. Most of the accidents in the train are caused due to cracks in the track. Finding of these cracks in railways tracks with the conventional methods takes time consumption due to manual checking. It reduces the accuracy too. Accidents occurs due to track breaking needs to be identified in real time before a train actually arrived near the broken track and get subjected to an accidents.

BLOCK DIGRAM:

3. Concept flow chart:

START

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SENSOR

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CRACK DETECTION

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PROCESS

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DETECTION ALERT

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IMPORTANT MEASURES

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STOP
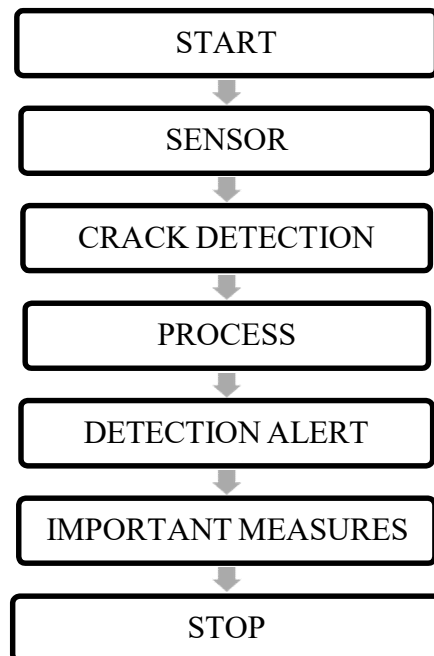
Fig-2: Flow chart of solar based railway track fault

DETECTION SYSTEM:

The proposed crack detection scheme can be clarified through the block diagram shown The Ultrasonic sensor is used to find out the crack in the rail and sends the value of its corresponding voltage to the microcontroller to drive the robot via the DC motors.

From this scheme the proposed system consists of many technologies such as RF technologies which have been described previously, also several specific components that need to be well defined and explained in a more details before explain how they work and connect them in the circuit. technique for crack detection is a track surveying with wireless sensor. Wireless networks can keep an eye on situations impossible to monitor, this is done by using sensors to gather data. Information is sent wirelessly across through web of these devices to a central location where it's collected and analyzed, else this sensors can detect current conditions in a rail, such as temperature, breakage, and track status or wheel imbalances. This information will be sent wirelessly to the locomotive engineer and even ahead to the next station or to headquarters.
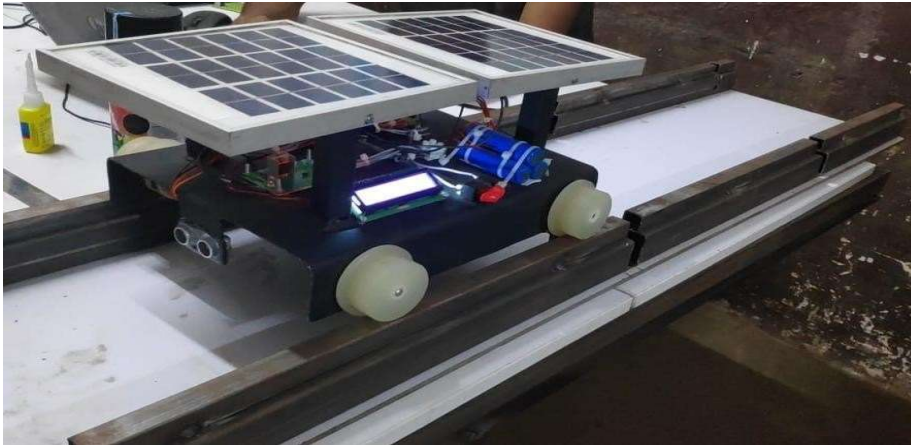
Fig-3: Model of railway track fault detection system
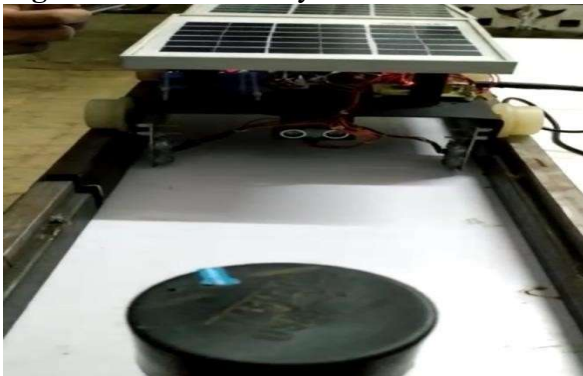
4. RESULTS

We are implementing simple autonomous vehicle for detection of railway tracks crack. But here we can see the sensing speed of sensors is less accurate. So, some time it will be failing to detect the crack. Overall speed of our autonomous vehicle is also less. In rainy season and any different atmosphere is not working properly and fail to detect the crack. The design is expected to be robust . effective and will also function efficiently. This method willbe helpful in regular track checking as it is more convenientthan the handheld checking system. Also, chances of error are less as Global Positioning Satellites are used todetermine the exact location of the crack. The robot will move over the rail sleeper beds lay at the center of the rail track. Robot consists of two arms like structure on either side of the system. On that arm we are connecting IR sensorfor detection of track crack. In this system we are also usinga solar panel for power supply. So, it is very energy efficientsystem.

Power required for carrying 4kg weight is product of weight of our vehicle and force of gravity acting in it.

CALCULATIONS:

- Power = 4 * 9.81

    = **39.24 watt** (This much power will be required to operate our vehiclePower of motorP = VI
    = 12 * 2

    = **24 watt** (This is power of motor.)

- But we will require 39.24 watt power for operation of our vehicle. So as 1 motor gives 24 watt power we will require 2 motors. Hence total power will be,

Total power= 24 * 2

    = **48 wattt**

We are using DC motor to carry load of 4-5 kg that Motor's Speed is 10 RPM. Considering type of motor used, to get desired speed we have taken wheel of Diameter 50mm.

- Vehicle speed = RPM * Circumference

    = 25 rev/min * 2π* r

    = 25 * 2 * 3.14 * 25

    = 3925 mm/min

    = 65 mm/sec

    = **6.5 cm/sec**

This will be the speed of our vehicle.This speed is suitable for sensor we are using. Also it will be easy for demonstration of our prototype.

CONCLUSION:

The main aim of this study is to replace the manual method of crack detection of railway using robotic crack tracing system. The system simulation was done using Proteus software. The hardware was designed and implemented using simple components inclusive of an Arduino board interfaced to Ultrasonic543 sensor, motor. The system is robust and time efficient, it is convenient to regions where manual inspection is a hard and requires a lot of afford like in mountain areas, dense forest and a far regions.

The system with its both software and hardware sides has been studied and it performed well. Thus, considering the results that achieved it has remained projected that if the system is applied in railways it savesa lot of time compared with the traditional detection techniques, since it is completely automated monitoring the condition of tracks are done with fewer chances for error to occur, hence it will preventing train accidentsto very large extent.

We have designed an innovative technology for collision objects detection and technique that can prevent any

kind of collision of train efficiently. We are confident that incorporating our Anti Collision System with Railway system, it is possible to improve the safety of Railway.

The objective of the project was to design an ultrasonic distance meter. The device described here can detect and calculate the distance of the target. The ultrasonic distance meter is a low cost and simple device for distance measurement. The device calculates the distance with good accuracy and resolution. It is a compact system for non-contact measurement of distance. Hence the orientation of the object is a limitation of the system. The ultrasonic detection range also depends on the size and position of the object. The bigger is the target, stronger will be the reflected signal and accurate will be the distance calculated. Hence the ultrasonic distance meter is an very useful device.

ACKNOWLEDGEMENT:

Moreover, we have future plan to implement the other features to our projects. Such as, vehicle will automatically fold inside the tracks so that train can pass and no interruption should be there in schedule of trains. In future we will do the hardware implementations of this feature, so that we can give a proper package system, for a new improved and secure railway track monitoring system, which will reduce the sufferings of manual monitoring of the railway tracks. As in future trains may be driverless our system will be able to work with train network efficiently.

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