Railway Track Fault Detection Using RF Transreceiver

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***Abstract*- For the safety reason, railroad tracks need to be inspected on a regular basis for detecting physical defects. Inspection must happen twice weekly by human inspector to maintain safety standards, but in such type of manual inspection, there are many drawback that may result in the poor inspection of the track, due to which accident may cause in future, so to avoid such error and severe accident, this system is designed. It can help to avoid mishaps and severe accidents due to faults in the track .The importance of this project is applicable both day and night time detections purpose. The system designed here performs the function of identifying the broken track through wireless network. Detecting broken track through RF modules is the trend in such field and therefore this kind of system can be installed.**

I. INTRODUCTION

The Indian railway network today has a track length of 1, 13,167Km over a route of 63,97Km and 7,083 station. It is fourth largest railway networking in world. Transport is very important to carry the passengers and goods from one place to another. The better transport leads to more trade. so, safety and reliability should be highly considered in the case of the railway. The recent trend used by the Indian railway is manual inspection of this railway track which requires much of man power and consumes time.

Our project finds its main application here, This system/vehicle would run over the railway track inspecting the track and finding the fault if any. With the introduction of such and automated vehicle we are trying to reduce the human efforts, save time and provide a much accurate and precise output. In our project the fault detection on railway track is done by IR sensors mounted on the vehicles. The different faults which our project would encounter are:-

1.Obstacles on track

2 Crack on track

The different techniques used are interface with AT89C51 Microcontroller. When any of the fault is detected on the track for the detection of same are IR sensor used. Output of the IR sensors is made high and given to the microcontroller with this, the vehicle is made to stop there and the sensed fault is send to control room by RF module.

II.LITERATURE SURVEY

Firstly, we had a survey of existing technologies of automatic track security. In general there exist three main categories of techniques excitingly used for damage identification and condition monitoring of railway track. These include Graphical inspections, Non-destructive testing technologies such as acoustic emission or ultrasonic methods, magnetic field methods, radio graphic, Eddy existing techniques, thermal field methods, dye penetrate, fiber optic Sensor of various kinds. and shuddering- based global method. This survey helped us to understand which technologies are suitable for our system which will make more efficient and easy to use. from all the developed or established system worked only one or two parts of the whole system. Here, we give a short survey of the technologies which are already developed.

Obstacles detection is one of the important parts of railway security system. For detecting obstacle, system need to sense train arrival so system used vibration sensor. To sense the obstacle in the path of trains obstacle sensor is used and send signal to microcontroller. System divided the rails into several blocks and all blocks consisted of laser sensor an microcontroller. The laser sensor mainly sends signal to train either to stop or continue to run. Vision based on another method is used for automatic railroad track inspection. In this system, camera plays a vital role to capture and collect the images and videos. System used image processing and MUSIC algorithm in this system. Image processing helped to process

the frame image and MUSIC algorithm helped to detect number of signal in the presence of noise.

III. BLOCK DIAGRAM

3.1) TRANSMITTER SECTION:-

The proposed broken rail detection system consist of AT89C51 Microcontroller, RF module, Regulated power supply, IR sensor.

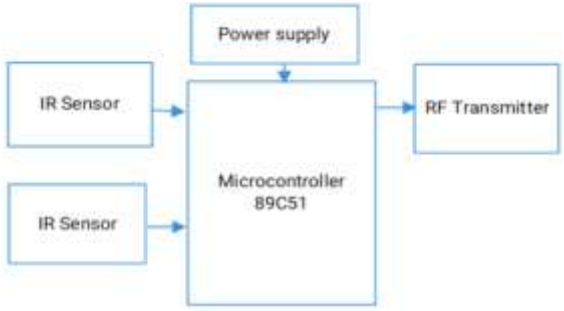

Fig3.1 Transmitter section

The main objective of this project is to design and develop an rail fault detection system to identify any discontinuity. in the railway track based on the line follower technology and also detect the obstacles such as trees ,animal etc. On the railway track using IR sensor .When the vehicle is powered on ,it moves along the model track. The IR sensor is used to detect the obstacles if present on the track. When the discontinuity or the obstacles is detected by the sensor, The vehicles stops and the signal is transmitted by RF transmitter to the controller.

3.2) RCEIVER SECTION: -

Receiver Section consist of AT89C51 microcontroller, RF receiver, LCD display,

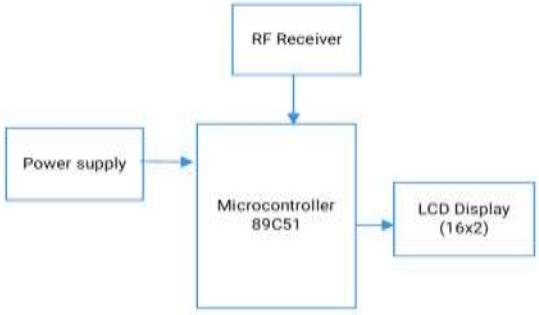

Fig 3.2) Receiver section

When the signal is transmitted by the RF transmitter toward the receiver side which is placed in control room of railway department, RF receiver receives the signal and displayed on the LDC display.

IV. DISCRIPTION OF COMPONENT

4.1) Microcontroller (AT89C51):-

AT89C51 is an 8-bit microcontroller and belongs to Atmel's 8051 family.ATMEL89C51 has 4KB of flash programmable and erasable read only memory and 128bytes of RAM.t can be erasable and program to a maximum of 1000 times. In 40 pin AT89C51, there are four ports designated as P1, P2, P3 and P0.All these are 8-bit bidirectional ports, i.e.thet can be used as both input and output ports. Port P0 and P2 are also used to provide low byte and high byte address, respectively, when connected to an external memory. Port P3 has multiplexed pins for special function like serial communication, hardware interrupts, timer inputs and read/write operation from external memory.

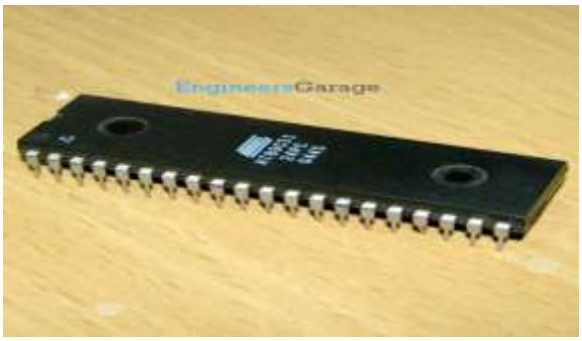

Fig4.1) AT89C51 microcontroller

4.2) RF Transmitter:-

The RF module, as the name suggests, operates at Radio Frequency. The corresponding frequency range varies between 30 kHz & 300 GHz. On- off keying modulation is a binary form of amplitude modulation, When a logical'0' is being sent, the transmitter is off, fully suppressing the carrier. In this state, the transmitter current is very low ,less than 1mA.When the logical'1' is begin send , the carrier is fully ON. In this state, the module current consumption is its highest about 11 mA with a 3V power supply.

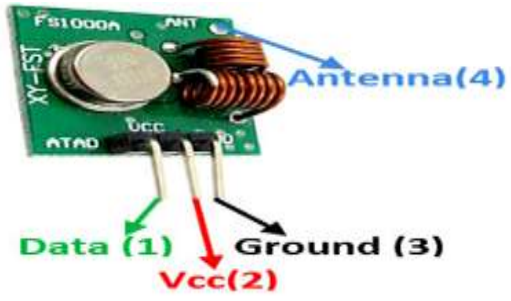

Fig 4.2) RF Transmitter

4.3) RF Receiver:-

The STR-433 uses a super regenerative AM Detector to demodulated the incoming AM Carrier. A super regenerative Detector is a gain stage with positive feedback greater than unity so that it Oscillates. An RC- time constant is included in the gain stage so that when the gain oscillates, the gain will be lowered over time proportional to the RC constant until the oscillation eventually Dies.

Any RF input signal at the frequency of the main oscillation in restarting.

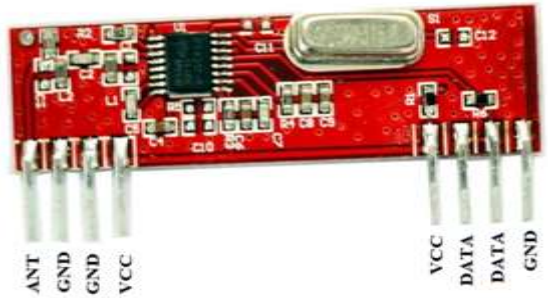

Fig 4.3) RF Receiver

4.4) IR Sensor:

- Extra high radiant power and radiant intensity
- High reliability
- Low forward voltage
- Suitable for high pulse current operation
- Standard T-1¾ (Ø 5 mm) package
- Angle of half intensity $\phi = \pm 17°$
- Peak wavelength $\lambda p = 940$ nm
- Good spectral matching to Si photo detectors

Fig 4.4) IR Sensor

IR obstacle sensors: This sensor is fitted in front of train engine to detect any obstacle present on track with in the line of sight. It sends appropriate signal to train control system, which in-turn stops train immediately if an obstacle is detected. IR curve detection sensors: This sensor is fitted to left side of train engine. An obstacle is placed near the curves to the left of the track. When train nearer a curve, obstacle is detected by this sensor and curve detection signal is sent to the train control block which in-turn controls the train speed in curve

4.5) LCD Display:-

A liquid crystal display (LCD) is a thin, flat panel used for electronically displaying information such as text, images, and moving pictures. Its uses include monitors for computers, televisions, instrument panels, and other devices ranging from aircraft cockpit displays, to every-day consumer devices such as gaming devices, clocks, watches, calculators, and telephones Among its major features are its lightweight construction, its portability, and its ability to be produced in much larger screen sizes than are practical for the construction of cathode ray tube (CRT) display technology.

Fig 4.5) LCD Display

V. CONCLUSION

The proposed method for railway track fault detection automatically detects the fault track without any human intervention. There are many advantages with the proposed system when compared to traditional system. The advantages included low cost, low power consumption and less time analysis. By this method we can easily detect the discontinuity and obstacles on the track which help in saving lives.

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