Automatic Crack and Fire Detection in Train with Disaster Management using IoT

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Abstract - *A major share to the Indian economy is contributed by the industrial transport railway network. So, any issues of crack detection in railway network once encountered, is also controlled a strong and price effective answer, else, there is also a proportionate decrease within the nations economy. This paper makes an attempt to supply a viable answer by discussing the technical details and style aspects. The discussion continues with the reason of various criteria concerned in selecting straight forward parts like GPS module, PC ,IR-photo diode based mostly crack detector module, sculptural for effective implementation in India*

1. INTRODUCTION

After US, RUSSIA and CHINA ranking four in its place. The Indian railway network stretches across the world with a length of 113,617 kilometers (70,598 mi).over a route of sixty three,974 kilometers (39,752 mi) covering seven,083 stations. The network traverses each nook and cranny of the state carries over thirty million passengers and a couple of.8 million plenty of freight daily. It's a growing network with a speedy pace job the economic wants of our nation with spectacular statistics, yet, the associated infrastructural facilities of safety haven't been with the previous mention proliferation. Relevant to the international standards, the facilities are inadequate. thanks to mishap downside usually leading to injury to human lives and property. The survey in 2011 till the month of Gregorian calendar month comments that the frequency of accidents goes and there in year itself eleven accidents occurred. to clarify the crux of the matter, the accidents in railways are thanks to sixtieth derailments and ninetieth crack issues. No matter natural or anti social reason

2. LITERATURE SURVEY

In this paper, the system consists of a gauge that finds the number of stress that's being applied over the rail lines throughout the train passes through it. The strain on the wheels and rails are the first indicators. Strain gauges are utilized for activity the on top of aforesaid factors. Knowing the dynamic parameters of the rail (Young's modulus E, Poisson's magnitude relation ν) and its geometrical characteristics (web thickness t, geometrical moment of inertia I, first moment of area H) the theoretical price of the

strain will be calculated for a specific stress. By comparison the experimental values and therefore the on paper calculated values the chances of a rail fault will be simply learn .the number of strain developed on a conventional track and a broken track **are** going to be fully completely different. The utilization of measuring device on the track may facilitate to hunt out if there's any abnormal bending is caused once a train passes over through the track. Conjointly inaudible sensors are used together with this module, that are placed on each side of the tracks. If any changes within the breadth or length of the tracks, these sensors detects it and alert the operator. The temperature sensors are used sense the track temperatures. The sharp changes in temperature are a reason for buckling. The outputs of these sensors are coordinated and transmitted to the nearest station. Once a better degree deviation from the standard price happens the alerting system inside the station master's area may get activated and corrective measures will be taken during a timely manner.the ability demand for the planned system is extremely less and it will be even hopped-up with the help of star cells or by the utilization of electricity energy generation methodology.

$$\Delta R / R = K * \varepsilon$$

R : Initial resistance of the strain gage (Ω)

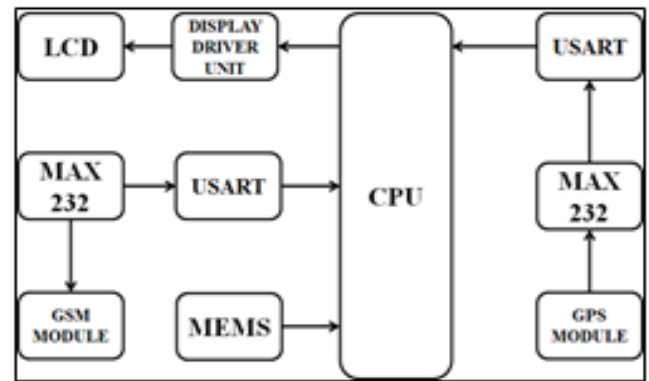ΔR: Resistance amendment caused by elongation or contraction (Ω)

K: Proportional constant (called the "gauge factor") ε: Strain

The gauge factor K varies according to the bimetal foil used. Temperature in millivolts= (value/1024.0)*5000

Temperature in celecius=Millivolts/10 Temperature in faranheat= (celecius*9)/5+32

In this paper[2] the traditional operation, once there aren't any cracks, the IR light-weight doesn't fall on the image diode and therefore the photo diode resistance is high. later, once the IR light-weight falls on the image diode, the resistance of the image diode gets reduced and also the quantity of reduction are going to be some proportional to the intensity of the incident light-weight. Therefore, once
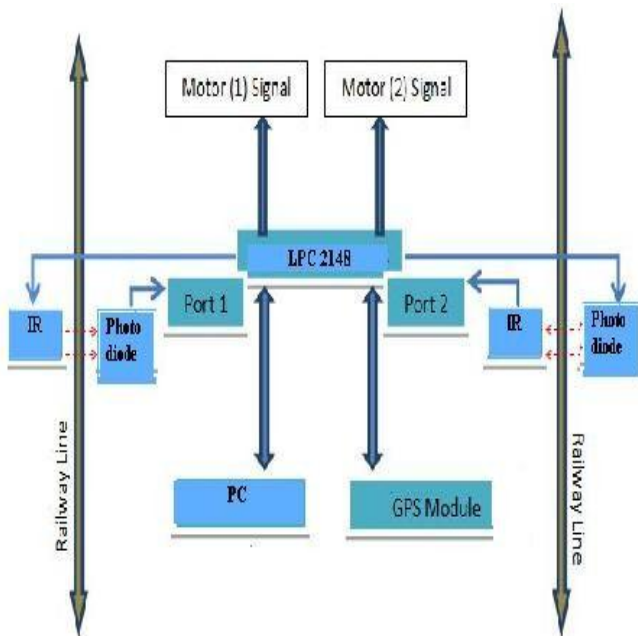
light-weight from the IR deviates from its path thanks to the presence of a crack or a clear stage, a sudden decrease within the resistance price of the image diode ensues. This variation in resistance indicates the presence of a crack or another similar structural defect within the rails. In order to observe the present location of the device just in case of detection of a crack, a GPS receiver whose operate is to receive the present latitude and meridian information is employed. To speak the received data, a computer has been utilised. The operate of the computer getting used is to transfer the present latitude and meridian information to the relevant authority. The aforesaid practicality has been achieved by interfacing the computer, GPS module and IR-Photo diode arrangement with a microcontroller. DC motors drive the automaton and relays were wont to management the motors.

Block diagram

In this paper[3] the micro-controller monitors the undulation from the measuring system sensing element. The sensing element includes circuit that uses the foremost advanced MEMS technology. Micro-Electro-Mechanical Systems (MEMS) is that the integration of mechanical components, sensors, actuators, and physical science on typical semiconductor substrate through small fabrication technology. Whereas the physical science are fictitious victimization computer circuit (IC) method sequences (e.g., CMOS, Bipolar, or BICMOS processes), the micromechanical elements are fictitious victimization compatible "micromachining" processes that by selection print away components of the semiconductor wafer or add new structural layers to make the mechanical and mechanical device devices.

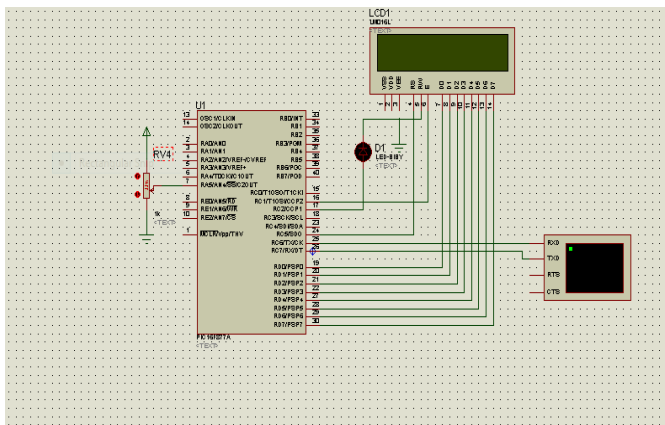**Block diagram of station receiver module**

The entire system consists of associate degree In-vehicle module. 2) a bearing station receiver (PC) module. The module within the train consists of a MEMS sensor; vibration detector and a GSM for alert electronic communication. MEMS output signals are unendingly monitored by the Central process Unit. The analog output from sensing element are fed to the filters for filtering purpose and when signal process this outputs are given to the processor. Processor unendingly compares the output worth with a predefined vary (normal vibration). If there's a fault in railway track, the vibration will increase quite the traditional vary. Once a high vibration is detected, MEMS output voltage will increase from the traditional vary of voltage. If it's found eruption of voltage from the traditional vary of values processor notes it and sends alert messages to the management station straightaway. The messagesis viewed within the management station laptop with net property with latitude and line of longitude fault detected space. The fault and wish not need to check the complete track to find and cure the fault

This simulation diagram shown contains a pot that represents the measuring system, PIC16F877, LED, digital display and GSM module. The pot contains a planned traditional vary of concerning 270-330, the worth of measuring system varies once it's subjected to vibrations and once it crosses the brink value, that is on the far side 330 the semiconductor diode glows indicating crack detection. As before long as semiconductor diode glows, the digital display can display "the crack is detected". The GPS module can trace the precise location of crack and also the message is send to the involved authority by the GSM module. The GSM module sends the angular distance and longitudinal location to the involved authorities

Simulation of railway track crack detection using MEMS technology

3. CONCLUSIONS

This paper makes a trial in providing a viable resolution in creating the railway tracks crack free with IR-photo diode based mostly railway detection theme. The most plan of the project are often enforced on an outsized scale so as to possess safe with sound infrastructural facilities for higher ends up in future

The projected system will have a wonderful impact on the safety and maintenance of tracks. To form positive the tactic straight forward and economical the principle set up has been created really easy. Accidents occurring in railway transportation systems value associate degree outsize vary of lives. Many of us die and several other others get physically and mentally wounded. Accidents are the key causes for traumatic injuries. There's a necessity of advanced and durable techniques which is able to only stop these accidents together with eradicate all potentialities of their incidence. Wireless device network that ceaselessly monitors the railway track through the sensors and observe any abnormality among the track. The device nodes are equipped with sensors which is able to sense the vibration among the railway track once the train passes. Improved communication protocols and real time operation

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