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MONITORING SYSTEM FOR LARGE SCALE ADVERTISING BOARD

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ABSTRACT
With the increase of large outdoor advertising boards, the issues of public safety raised by the collapse of outdoor advertising boards have attracted great public concern. In this project, monitoring system is designed for the structural health monitoring of the large outdoor advertising boards. By using raspberry pi as main processor and 3 axis accelerometer, this system can judge the security of the outdoor advertising boards and give early warnings when the boards are being in danger.
This monitoring system consists of two sub systems- one is continuously checking whether the board is tilt or not and another is checking whether there is rust in pole or not (This rust may occurs due to environmental conditions). The experimental setup and results indicates that the monitoring system can be real timely and accurately monitor the state of the outdoor advertising boards.

Keywords:
Raspberry pi, 3 axis accelerometer, outdoor advertising board

I. INTRODUCTION

Now a day, large outdoor advertising boards are wide-spread in the prosperous area of a city, or along the main road and the highway. These outdoor advertising boards are liable to tilt or even collapse as time goes on due to their large size and long exposure in the complex outdoor environment (such as heavy rain, strong wind, earthquake and other factors), thereby posing a serious threat to the public safety. Therefore, it is important for the relevant departments to track, in real time, the condition of outdoor advertising boards. However, at present, monitoring outdoor advertising boards mainly relies on the common manual inspection and video surveillance carried out by the relevant government departments. It is evident that the tilt risk cannot be effectively identified at the earlier stage only by these visual inspection and simple physical measurements.
With over a decade of intensive research and development, wireless sensor network technology has been emerging as a feasible solution to many innovative applications. Wireless sensor network (WSN) is a low cost wireless network made up of thousands of smart sensor nodes which cooperatively monitor physical or environmental conditions, such as temperature, vibration, pressure, motion, moisture, light, or pollution at different location. These smart sensors constitute a network topology through self-organization. The sensors nodes can transmit the data detected by their own sensor and can also pass the data to the adjacent nodes. The data that detected by sensor nodes can be transmitted to base station using the way of multi-hop.

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- Motivation

I am developing a Monitoring System for advertising Board which will be very useful and helpful to users. Because there is no such system available.

- Problem Statement

Project is based on Raspberry Pi. This will monitor the condition of advertising board.

- Proposed system

In this system, we are trying to find the condition of board. In this system we are using Raspberry pi as processor. In this system we are also using 3 axis accelerometer to sense the change in angle. Along with that we are also able to find the condition of iron rod with the help of Electric Conductivity. We passing the electric current through iron rod, so that depends on current conductivity we can measure either it is Cast Iron or Rust Iron.

II. LITERATURE REVIEW

The review presented in this section includes a survey of commercial methods for the outdoor advertising board monitoring and the applications of WSN for structural health monitoring (SHM).

According to the field investigations and literature, there are three conventional methods for monitoring the outdoor advertising boards, i.e., video surveillance, radio frequency identification devices (RFID) based monitoring, and sensor-based monitoring. The video surveillance mainly uses front-end camera image acquisition system as well as the 4G networks for data trans-mission, image processing, and analysis by the server. Monitoring administrators can capture the state of advertising boards and its surrounding environment by a stationary camera. This approach is based on image matching contrast recognition algorithm, which is used to determine the anomalies and damage situation of boards identify billboard content. However, the camera method is highly susceptible to the weather. Low visibility will lead to a sharp decline in the ability of monitoring and identification. Moreover, it has high installation cost and requires large amount of data transmission, which makes it unsuitable for the applications in area with poor network connectivity. Last but most important, this method is insufficient to judge the internal safety in the billboardstructure just from the image information. Therefore, it is not a good scheme to pre-vent the security threats aroused from the steel structure of the outdoor advertising boards.

The monitoring system based on the RFID employs 2.4 GHz active radio frequency electronic tags to record the initial in-formation of the outdoor advertising device, such as the attribute and location information, through the handheld mobile query device to read the contents of the label and comparing with the actual situation on the scene. Although this method has a certain ability of safety monitoring, it requires daily patrol. Therefore, the RFID-based monitoring technique is also un-suitable for safety monitoring of outdoor advertising board. The monitoring system based on sensor obtains the characteristic parameters of the advertising board via the sensor data statistics analysis.

The sensors, such as tilt sensors installing on the surface of the large advertising boards, can collect real time vibration response data of the structure, thereby getting a lot of useful information by analyzing the sensor data. It is evident that the sensor-based monitoring technique is the best choice for safety monitoring of large

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outdoor advertising boards. However, the present sensor-based safety monitoring method only uses a fixed threshold as the basis of judgment. Both the early warning algorithm and the coverage of the single monitoring node are limited. As the overall movement trend of the advertising boards can be prognosticated by the information of key parts in the boards obtained by sensor nodes, it is reasonable to apply the WSNs for the outdoor advertising safety monitoring. The health monitoring system based
On WSNs is widely used in many fields. To date, many studies were reported on applications of WSN technology in SHM to obtain technical breakthrough

I. SYSTEM OUTLINE

In this paper, a safety monitoring system based on Raspberry pi is proposed for state monitoring and safety warning of outdoor large scale advertising board. The main monitoring parameter of the system is inclination or tilt in pole of advertising board.
Another part is it can monitor the condition of rod and can warn us by sending message and by displaying it on LCD screen.

Block Diagram

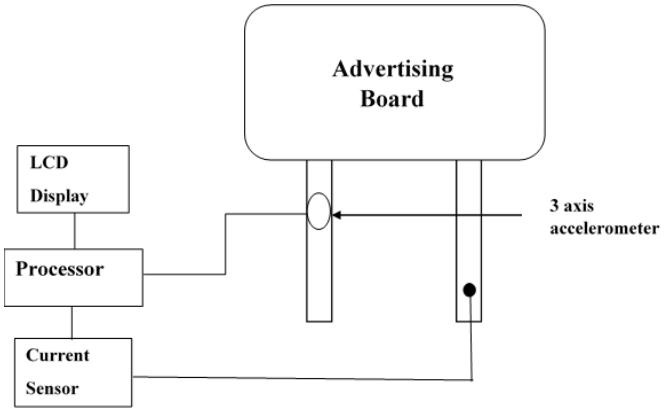

Fig 1. Block Diagram of Monitoring System

Hardware Used:
- Raspberry Pi 3 B+ model
- 16X2 LCD display
- ADC
- Current Sensor
- Accelerometer

Software Used:
Programming Language: Python

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Algorithm

Step 1: Prepare raspberry pi 3 b+ for operation
Step 2: Calibrate the accelerometer
Step 3: Connect mouse and keyboard to raspberry pi
Step 4: Power on Raspberry pi
Step 5: Start a loop
Step 6: read output of accelerometer
Step 7: check status of current flowing through rod
Step 8: Check message on LCD Screen
Step 9: Repeat step 6 to 8

Flow Chart

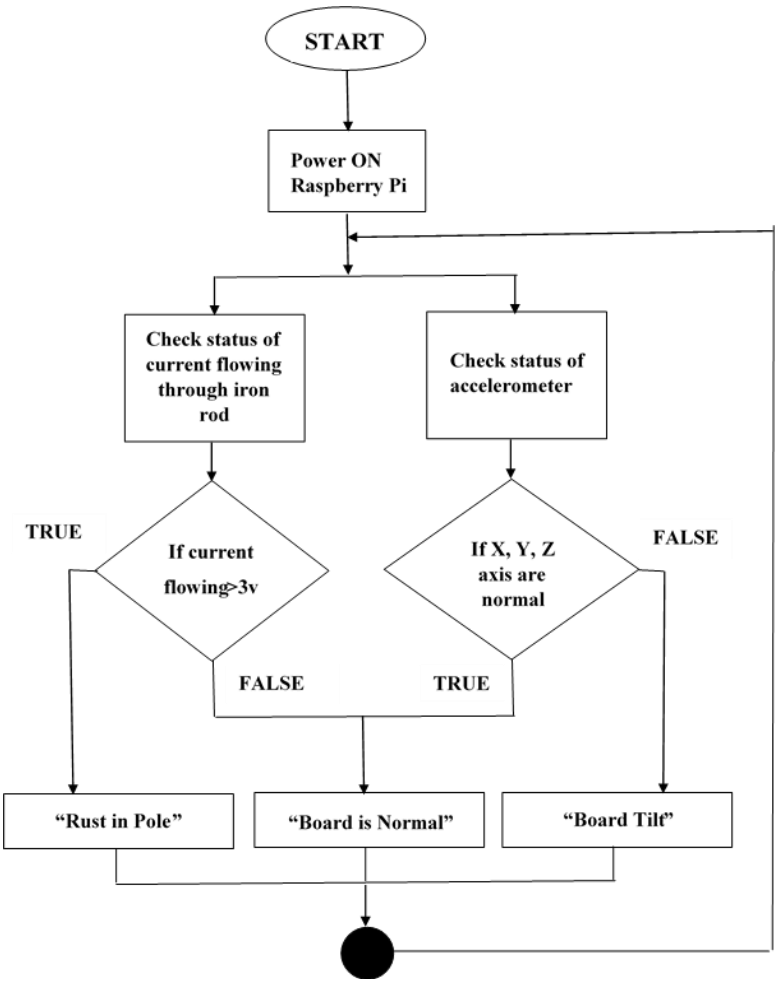

Fig 2. Flow Chart

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Working

Raspberry pi works on 5v. Analog to digital converter is used so it converts analog input into digital output. Output of ADC is given to the current sensor, 3 axis accelerometer and 16X2 LCD display. 3 axis accelerometer is placed on 1 pole of large scale advertising board. Accelerometer can measure the static acceleration of gravity in tilt-sensing applications, as well as dynamic acceleration resulting from motion, shock or vibration.

When there is any tilt in pole of large scale advertising board, message will display on LCD screen as "Board tilt" and mail will send to receiver's mail ID as well as it will send message on registered mobile number when system is connected to Wi-Fi.

Another part of system is, it should acknowledge us when there is rust in pole. This rust may occurs due to some environment changes or rain. But here practically for demo purpose it is impossible to implement it on actual rusted pole.

So, for this condition we passed some amount of current through current sensor to another pole of large scale advertising board and to implement it switch is connected serially for demo purpose.

When current flowing through pole of large scale advertising board is greater than 3v then message will display on LCD screen as "Rust in pole" and mail will send on receiver's mail ID. Again in this condition also it will send message on registered mobile number when system is connected to Wi-Fi.

So the total system will help to monitor large scale advertising board and then respective Municipal Corporation or advertising board companies can take proper and needed actions as soon as possible, hence this can prevent many dangerous accidents.

II. RESULTS AND DISCUSSION

Fig. 3 below shows the result on desktop at initial condition. When we power ON raspberry pi and runs the program there is no change in output of accelerometer and also the current flowing through pole is also less than or equal to 3v then raspberry pi terminal as well as LCD screen shows message as "Normal Condition".

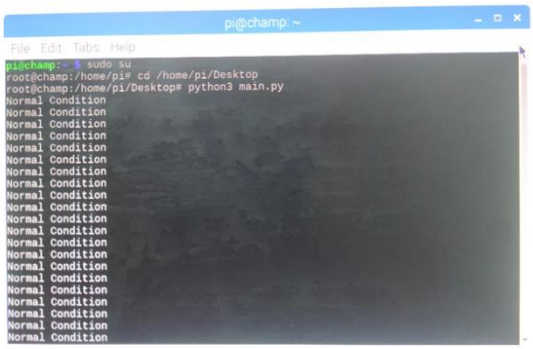

Fig 3. Board Condition on Desktop

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Fig. 4 below shows the demo model for monitoring system of large scale advertising board at initial stage when there is no tilt and current flowing through pole is also less than or equal to 3v.

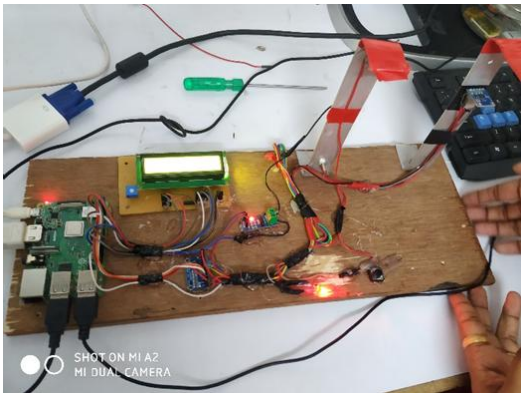

Fig 4. Demo Model

Fig. 5 below shows the output message as “Board tilt” on LCD screen when pole of advertising board is tilted in X, Y or Z direction. This tilt is measured with 3 axis accelerometer placed at one pole of advertising board.

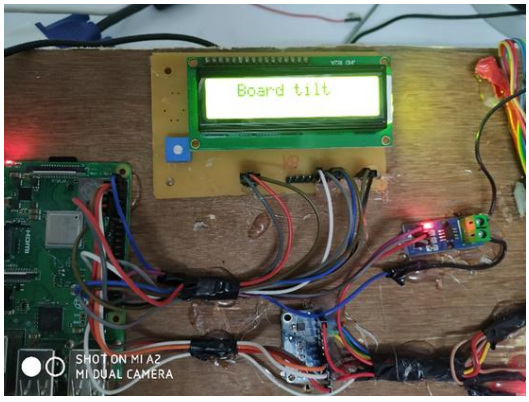

Fig 5. Board Status on LCD Screen

Fig. 6 below shows the output message as “Rust in pole” on LCD screen when current flowing through pole of advertising board is greater than 3v.

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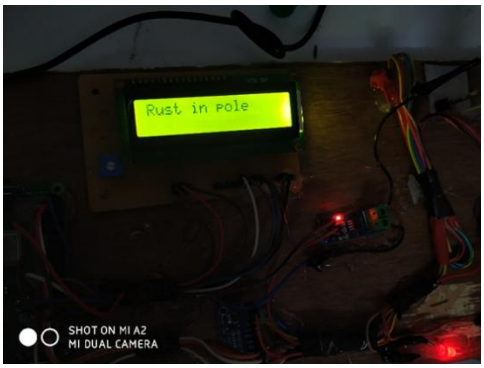

Fig 6. Pole Status on LCD Screen

CONCLUSION

In this project monitoring system for large scale advertising board is designed with the help of Raspberry pi 3 B+ model and 3 axis accelerometer as main component. Python is used as software language for this monitoring system. Monitoring system is designed so that we can monitor large scale advertising board with ease and can take respective action as soon as possible.

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