A NOVEL IOT BASED RAILWAY TRACK CONDITION MONITORING SYSTEM USING CLOUD

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Abstract

Rail transport system of passenger and cargo plays an important role in our daily life. The building of rail infrastructure has experienced a sustainable growth in the past decade especially in some developing countries. In this project we are monitoring different parameters such as temperature, humidity and tilt which are crucial in a railway system. The proposed hardware prototype consists of a raspberry pi controller and sensors such as Accelerometer, temperature sensor, humidity sensor.

I.INTRODUCTION

In all railways system, particularly in the case of railways, safety and reliability are highly considered depending on some developments in railway systems, high speed trains are being extensively used, and rail transportation is being increased. Reasons for this increase are high speed, economical, environment friendly, safety; characteristics can be continued by periodical maintenance and control measurements.

Rail transport, as a means of conveyance of passengerand cargo, plays an important role in our daily life. The building of rail infrastructure has experienced a sustainable growth in the past decade, especially in some developing countries. So to maintain safety in the railway system we developing a project which will provide some parameters related to the environmental conditions. By taking the corresponding action according to the sensors data we can reduce the accidents and can improve the more safety in railway system

II.PROPOSED METHOD:

In Proposed system we are using different sensors to read parameters such as temperature,humidity and railway track position and also we using IR pair to detect the track whether it is cracked or not. These parameters received by controller and transmit to the authorized person using wireless communication network using GPRS concept.

Hardware Components used:

1. Raspberry pi
2. GSM module
3. Humidity Sensor
4. Temperature Sensor
5. IR Pair
6. Accelerometer
7. Power Supply

Block Diagram of Proposed System

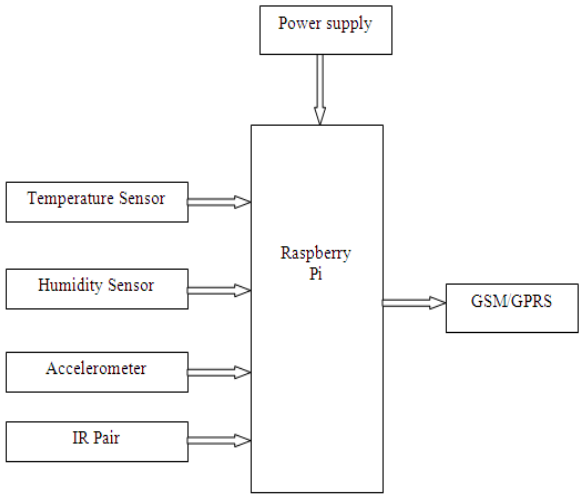

Fig 1:Transmitter unit

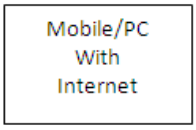

Fig 2:Receiver unit

III.HARDWARE DESCRIPTION:

a.Raspberry pi

The Raspberry Pi is a series of small single-board computers developed in the United Kingdom by the Raspberry Pi foundation. Raspberry Pi-3 Model B released in February 2016 is bundled with on-board Wifi, Bluetooth and USB Boot capabilities. As of January 2017, Raspberry Pi 3 Model B is the newest mainline Raspberry Pi.

Raspberry Pi boards are priced between US$5-35. It includes various features such as ARM compatible central processing unit (CPU) and an on-chip graphics processing unit (GPU, a videocore IV). CPU speed ranges from 700MHz to 1.2GHz for the Pi 3 and on board memory range from 256 MB to 1 GB RAM. Secure Digital (SD) cards are used to store the operating system and program memory in either the SDHC or MicroSDHC sizes.

Most boards have between one and four USB slots, HDMI and composite video output, and a 3.5mm phone jack for audio, Lower level of output is provided by a number of GPIO pins which support common protocols like PC. The model B have an 8P8C Ethernet port and the Pi 3 and Pi Zero W have on board Wifi 802.11n and Bluetooth

Fig.3.Raspberry Pi 3

b.GSM

GSM is a mobile communication modem; it is stands for global system for mobile communication (GSM)[2]. The idea of GSM was developed at Bell Laboratories in 1970. It is widely used mobile communication system in the world. GSM is an open and digital cellular technology used for transmitting mobile voice and data services operates at the 850MHz, 900MHz, 1800MHz and 1900MHz frequency bands.

GSM system was developed as a digital system using time division multiple access (TDMA) technique for communication purpose. A GSM digitizes and reduces the data, then sends it down through a channel with two different streams of client data, each in its own particular time slot. The digital system has an ability to carry 64 kbps to 120 Mbps of data rates.The GSM modem is shown in Fig.4

Fig 4.GSM Modem

c.Humidity Sensor

The DHT11 is a small-size (32 mm×14 mm) digital temperature/humidity sensor. It includes a resistive humidity sensor and a Negative Temperature Coefficient (NCT) thermometer. The DHT11 has a measurement range of 20% – 90% relative humidity and 0 – 50 degC. The measurement accuracy is ±5% RH and ±2 degC with resolution of 1.

The HC-SR501 is a high sensitivity and ultralow power (325 μW) human infrared sensor module. It includes a LHI778 probe and has two trigger modes. The HC-SR501 has feature of automatic induction with sensing range of less than 120 degree cone angle at a detect distance less than 7 m.

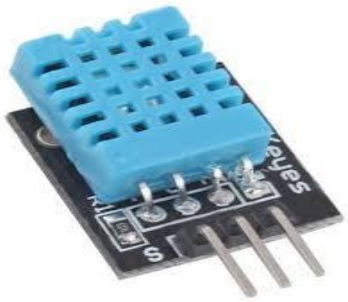

Fig 5:Humidity sensor

d. MEMS Accelerometer MMA7660

Accelerometers are devices that measure acceleration, which is the rate of change of the velocity of an object. It is measured in meters per second squared (m/s^2) or in G-forces (g). A single G-force for us here on planet Earth is equivalent to 9.8 m/s^2, but this does vary slightly with elevation (and will be a different value on different planets due to variations in gravitational pull). Accelerometers are useful for

sensing vibrations in systems or for orientation applications.

MMA7660 is a very low power, low profile capacitive MEMS sensor featuring a low pass filter, compensation for 0g offset and gain errors, and conversion to 6-bit digital values at user configurable samples per second. The device can be used for sensor data changes, product orientation, and gesture detection through an interrupt pin (INT). The module is extremely suitable for robotic application and tilt sensing.

The MMA7660 sensor employs both analog and digital filtering to ensure low noise and accurate output when using the part for Shake, Tap, or Orientation Detection. During Active Mode, the data is filtered and stored for each of the 3 axis at the specified measurementintervals.

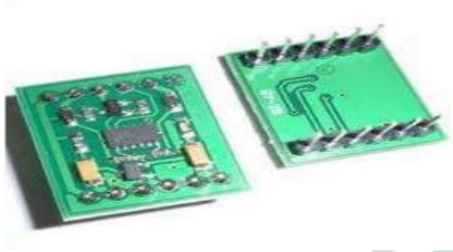

Fig 6:MMA7660 sensor

IV.SOFTWARE DESCRIPTION

The user interface is a combination of HTML, JavaScript, and CSS. The user interface(UI) is everythingdesigned into an information device with which a human being may interact including display
screen, keyboard, mouse, light pen, the appearance of a desktop, illuminated characters, help messages, and how an application program.

The Raspbian Linux distribution is installed via the NOOBS with the prescribed configuration settings.The python script for each GPIO is written in the text editor available in the Raspbian. The python scripts are stored in the folder /var/www/html/ with an extension .py . Before linking the scripts in PHP, it is necessary to make them executable by using the following command sudo chmod +x scriptname.py

V. RESULTS

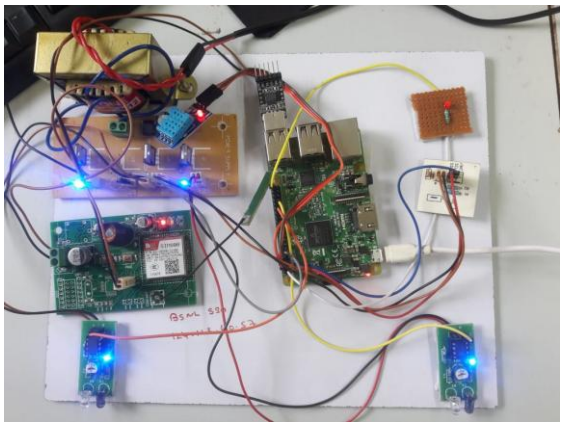

Fig 8:Hardware kit

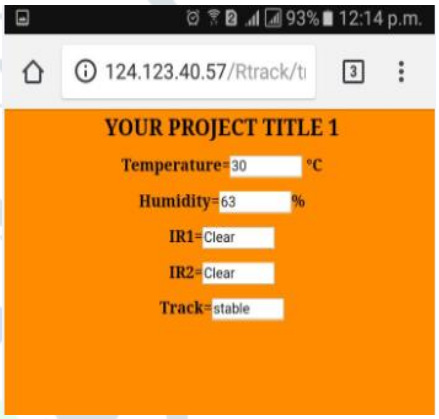

Fig 9:Output

VI. CONCLUSION

By using this proposed system in which we used different sensors to read parameters such as temperature,humidity and railway track position and using IR pair to detect the track whether it is cracked or not. These parameters received by controller and transmit to the authorized person using wireless communication network using IOT concept.

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