ISSN (Print) : 0974-6846
Indian Journal of Science and Technology, *Vol 9(17), DOI: 10.17485/ijst/2016/v9i17/93020, May 2016* ISSN (Online) : 0974-5645

Implementation of IoT based Railway Calamity Avoidance System using Cloud Computing Technology

K. V. Daya Sagar*, Akella Pavan Kumar, Goli Sai Ankush, Thota Harika, Madireddy Saranya and Dasaraju Hemanth

Department of Electronics and Computer Engineering, K L University, Vaddeswaram, Guntur District - 522 501, Andhra Pradesh, India; Sagar.tadepalli@gmail.com, pvnkmr497@gmail.com, ankushanki1231@gmail.com, harikathota@gmail.com, saranya.madireddy@gmail.com, dsrhemanth@gmail.com

Abstract

Objectives: Cloud computing and Internet of Things (IoT) are two different emerging technologies that become part of our life. Their adaption and usages are expected to be more and more effective. Railways are providing Eco-Friendly transport system for the mankind. **Methods:** In this paper we proposed and implemented IoT based cloud computing model using RaspberryPi2.0, LM393 sensor signal conditioning units, Piezo electric buzzer components. Our working model was to integrate with cloud environment by using Linux RTOS, python language and 'smartliving.io' IoT platform via internet using WIFI. In cloud we are providing data of the railway authorities. If any track was damaged in certain point our system detects and transfer that message to cloud, then the cloud automatically sent SMS for concern railway authorities' mobiles. **Findings:** The railway system use sensors to improve rail transport safety and integrate with local (nearby) stations using wired network. In this scenario, we have two major problems in case of misshaping. First, the concerned railway local authorities doesn't have powers to take their own decisions they were intimate to higher authorities on the situation .It is a long time process to take the decision most of the time it will be late to receive the information. Second, in wired network it is a problem with climatic conditions and vulnerabilities, it has a limitation for integrating number of sensors to current system. **Improvements:** This system was successful tested and results are evaluated. In our system continuously monitors the status of track and updates it time to time into cloud by IoT platform using RaspberryPi[1].

Keywords: IoT, railway, cloud computing, RaspberryPi2.0, LM393, RTOS, Python, Wi-Fi.

1. Introduction

The Internet of Things (IoT) the system of physical articles - gadgets, vehicles, buildings and different things installed with hardware, programming, sensors, and network connectivity - that empowers these items to gather and exchange information[2]. The Internet of Things allows objects to be detected and controlled remotely over existing network, making open doors for more straightforward incorporation of the physical world into PC based frameworks, and bringing about enhanced system, exactness and economic advantage when IoT is expanded with sensors and actuators.

Safe transportation of travelers is the key business target of any transportation framework. Railroads are perceived as the most secure method of mass transportation and Safety has been perceived as the key issue for the rail lines and one of its exceptional qualities. All business methodologies exude from this subject and Endeavour to accomplish Accident Free System.

Wellbeing is, in this way, the key execution list which the top administrations need to screen and make preventive strides in light of patterns of mishaps. For detecting breakage of rails we are going to implement a new methodology for save the passengers from rail accidents and thereby increasing the growth of Indian

* *Author for correspondence*

railways. Here in this methodology, initially the railway tracks are integrated with modulated power supply, which transfers a specific encoded data through the railway tracks. we connect number of sensors in various distances to read that specific encoded data and then decode it, the decoded data then compared with encoded data to observe any data loses which further indicates the damaged tracks in between two junctions, so based on the comparison between encoded and decoded data, we can get the track status between two junctions. In this track status can be updated to the 'smartliving.io' IoT platform using RaspberryPi.

ZIGBI based automation also provides only a shorter range of communication. It performs the communication based on gate level signals. If the signals are not get transmitted correctly, then it unable to sense the trains in the same track. In[3] reported an automatic train protection that helps to forestall collisions with speed restriction and applying brakes. Safety analysis and analysis of automatic train protection with simulation is required to boost the system usability within the business space and offers a style of automatic train protection machine for radio-based train system. According to[4], Inferno package could be a radically simplified and revolutionary approach that can create the essential PDA applications in Inferno setting ported on ARM processor. In[5] introduced the ARM success attributable to its outstanding performance, power (MIPS/Watt) rating and this can seemingly still be its most important benchmark for future applications and architecture's high performance and low power operation. IR sensors have limitations due to the geographic nature of the tracks and also used along with Light Emitting Diode-Laser Dependent Resistor. The Anti Collision Device system (ACD) by Konkan Railway also lacks in communication capability between the trains and the control centers or stations, hence it has been later decommissioned.

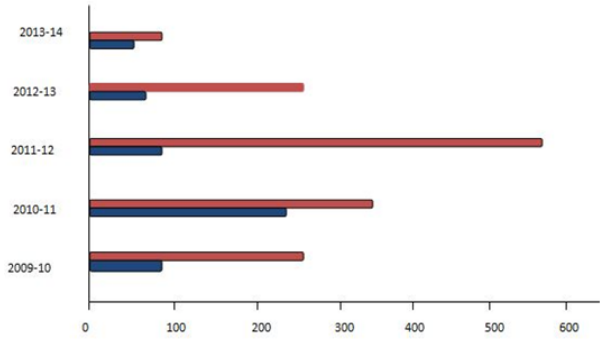

Figure 1. Number of Casualties.

These methods of identification of problems have taken more time to identify the problems as shown in Figure 1.

2. Existing Approach

Currently ZIGBI technology is being used for long range communication; it can only be used for local networks where distance limitations are present. This is only used to monitor tracks near to stations and it will indicate accordingly. The current system works through telephonic discussions for the choice of making track designation for trains. There is extensive degree for miscommunication of the data or correspondence crevice because of the higher human obstruction in the framework. This miscommunication might prompt wrong assignment of the track for trains, which eventually prompts the train impact. IR sensors are likewise used to recognize the splits in the railroad. IR sensors have constraints because of the geographic way of the tracks. Later land sensors have additionally been utilized which makes utilization of satellites for correspondence. Be that as it may, the framework is unreasonable and muddled to execute.

3. Proposed System

In this paper we are proposed IoT based railway calamity avoidance system using cloud computing technology. Figure 2 describes proposed architectural model how to connect sensors on tracks and integrate with Raspberry Pi.

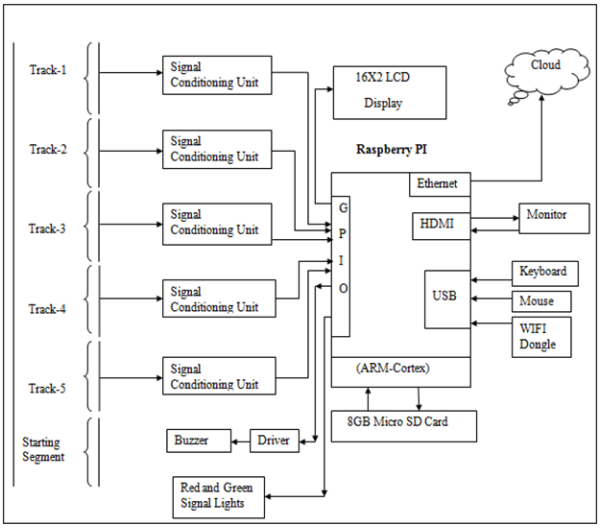

Figure 2. Proposed System Architecture.

In this system we are taken tracks (copper railings) and divided into five segments for prototyping purpose (Figure 3). Each segment is interconnected. Now modulated power supply through regulator is given to tracks via wires. At the end of each segment, voltage is passed. If given voltage is less than the comparator's reference voltage (modified according to given voltage), then it indicates some breakage in the track of ongoing segment as shown in Figure 4. Through signal conditioning unit it will be detected and sent to Raspberry Pi and time to time status is updated in 'smart living' IOT based cloud (Figure 5). Here, the cloud system automatically sends SMS to concerned railway authorities mobile via WAY2SMS (Figure 6). In addition to that red Led will glow, and Buzzer will be in on state. The Track status can be seen in LCD display for convenience.

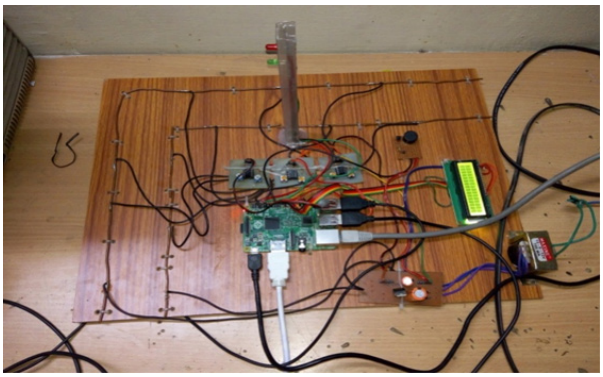

Figure 3. Hardware Kit.

Figure 4. Initial track status.

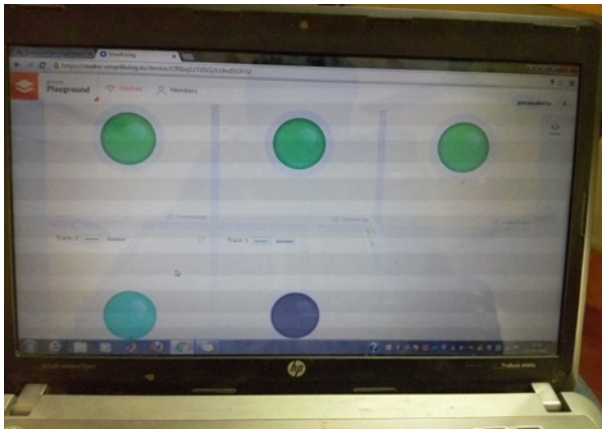

Figure 5. Checking status of track breakage on 'smartliving' cloud.

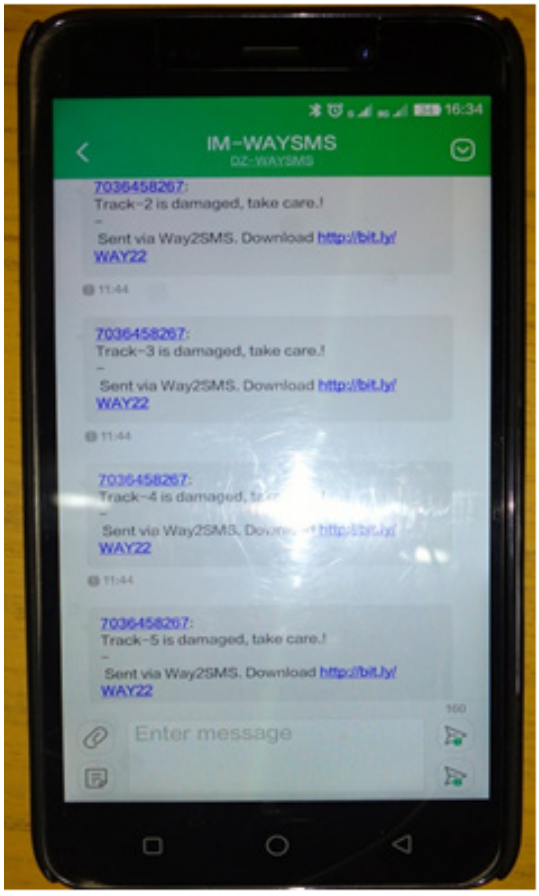

Figure 6. Screenshots of message alerts to mobile.

4. Implementation

This IoT based railway calamity avoidance system using cloud computing technology consists of the following modules.

4.1 Raspberrypi

We use centre tapped step down transformer to convert 230v AC to 12v AC and full wave rectifier to convert into DC(16V-18V),5V regulation is maintained to give to components using IC7805, dual comparator output's is given to Raspberry Pi through GPIO's (general purpose input output pins),it consists of ARM cortex-Quad core processor, 1GB RAM, 40 GPIO'S, Camera Serial Interface (CSI), Digital Serial Interface (DSI), 3.5Mh audio I/O 4USB ports, one 10/100 Ethernet, one HDMI, one micro SD card slot extendable up to 32GB. In this memory card Raspberry an OS is loaded and python code is dumped.

4.2 Dual Comparator

Coming to comparator (LM393) unit, comparator will compare the voltage of track with reference voltage, it will produce analog output, so signal conditioning unit is used to convert into pure digital value, and it is given to Raspberry Pi 2.0.

4.3 WIFI Module

Here we use python coding to connect to IoT account. This is done through internet (WIFI or LAN).

4.4 LCD, Buzzer, LED

Status of track can be seen on seven segment LCD display. Buzzer is on in case of any breakage detection, Red LED will glow in such case as shown in Figure 7. It will be done by using python tool.

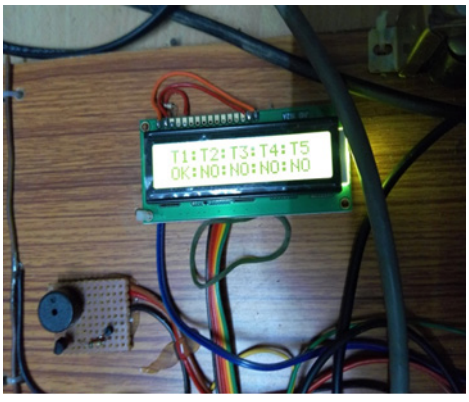

Figure 7. LCD shows track breakage status.

4.5 Smart Living Cloud

In smartliving.io we will create an account and add RaspberryPi device and add required assets (sensing input information). It will generate device id, client id, client key for the device and asset id, asset name for each asset to know whether the input coming is from particular device and sensing information from particular track among all. Here we add 5 assets for five segments of tracks which generates separate asset id and asset name for all five sensing tracks. We will mention this generated information in our python code.

Here each module is interconnected to raspberry pi module. In this module it sends the sensing information to smart living cloud then the cloud automatically sends SMS to concerned authorities mobile nos.

5. Results

Smart living cloud is a platform for automate Raspberry Pi and other Internet of things. It will check and monitor the status of the tracks. If any track was damaged (Figure 8.) or break, it automatically sends SMS for concerned authorities' to their mobile.

Figure 8. Broken track.

6. Conclusion

In this paper[6], a configuration for naturally turning away prepares impacts and mishaps at level intersection door have been outlined, reproduced and tried. It utilizes the propelled elements of track damage with raspberry pi device and IoT correspondence strategy, turns out to be viable in accomplishing the damage. It is relevant at each part of the railroads for uninterruptible administration. Saving human life, security against mishaps and the transmittable electronic frameworks are the notable elements and the additional point of interest

of this venture. From the above exchange and data of this framework we, up to now doubtlessly comes to realize that it is exceptionally solid successful and practical at thick activity zone, sub urban zone and the course where recurrence of trains is more. As it spares some assistant structure and in addition the consumption on chaperon it is more prudent at aforementioned spots than customary railroad crossing entryway framework. We realize that however it is extremely advantageous yet it is additionally difficult to introduce such framework at every single spot, yet it gives positively an impressive advantage to us, in this way to our country.

7. Future Scope

By linking track status to the signaling network, the train approaching to the signal can be made alert in case of breakage of track and message alerts can be sent more to the concerned persons to avoid any misshaping. Also we can provide cloud security in further implementations.

8. References

1. ben Upton. Gareth Halfacree: Raspberry Pi® User Guide. 1st ed. United Kingdom: John Wiley & Sons Ltd., Publication; 2012 Sep.
2. John Livingston J, Umamakeswari A. Internet of Things Application using IP-enabled Sensor Node and Web Server. Indian Journal of Science and Technology. 2015 May; 8(S9):207–12.
3. Senthil Kumar P, Nadira Banu Kamal AR. Optimal Integrity Policy for Encrypted Data in Secure Storage using Cloud Computing. Indian Journal of Science and Technology. 2016 Mar; 9(11):1–10.
4. Visu1 P, Varunkumar KA, Srinivasan R, Vinoth Kumar R. Brainwave based Accident Avoidance System for Drowsy Drivers. Indian Journal of Science and Technology. 2016 Jan; 9(3):1–5.
5. Ben Brown H, Podnar G, Jr., Siegel M. A concept for reducing railway accidents. 2005 Feb:1–4.
6. Gautam S, Nemade S, Sakla T. Simulation of an anti-collision system on same track for railways. International Journal of Engineering and Technology. 2010; 2(9):4832–37.