IJREAT International Journal of Research in Engineering & Advanced Technology, Volume 3, Issue 2, April-May, 2015
ISSN: 2320 – 8791 (Impact Factor: 2.317)
www.ijreat.org

Collision Avoidance And Data Broadcasting For Railways Using RFID And RTSU's (CADBRRR)

T. Kantharaju[1], B.L. Mamatha[2]

[1,2] Department of Electronics and Communication, BIT Institute of Technology, Andhrapradesh, India

Abstract

Railways are providing friendly transport system for Human Beings. As we are seeing nowadays train accidents happens very often due to safety violations which result due to the problem in the operating system, due to Human error or due to equipment Failure. In this paper we proposed a system CADBRRR, Collision Avoidance and Data Broadcasting for Railways using RFID and RTSU's and also we include Wi-Fi and VANET's .In this system RFID tags and RFID Readers both are used Passive RFID Tags are used for the proposed system. RFID Reader is attached to the Train Engine and RFID Reader is located in Railway Track. When Train Engine start the RFID reader detect the RFID tags and RFID Tags get power by electromagnetic waves send by RFID reader then Tags scatter the signal to RFID reader if RFID Reader detects the Correct Unique Code then train continue runs in same track. Train also contain Wi-Fi enabled Computer System and RTSU Railway Track side Unit located at the track side they act as a wireless base station and provide internet connection to trains. If RFID Reader not detect the correct Unique code then track path is wrong then signal is generated the same information is send to control room by using DSR Ad-hoc routing Protocol through RTSU's data is broadcasting to Control room and also other train and also when RFID reader detects wrong Unique code automatically speed of the train is slow and stop at minimum time in this way we can avoid train accidents. The simulation is done by using Network Simulator.

Keywords: *Collision Avoidance and Data Broadcasting for Railways using RFID and RTSU's(CADBRRR), Wireless Fidelity (Wi-Fi), Railway Track Side Unit (RTSU),Dedicated Short Range(DSR) Vehicular Ad-hoc Network (VANET's),Radio Frequency Identification and Detection(RFID)*

1. Introduction

The Railway Network is considering as an eco-friendly Transport system for Human Beings. But nowadays we are seeing often the train accident is happening, because of the Train Drivers not getting the proper information of the other trains on the same track. The Train accidents happen because of Human error, Machine Failure and Track Failures. This information will not reach correctly to train drivers on time.

Railways are working on many technologies to avoid these train accidents. The ACD (Anti Collision Device) [1] system was developed, GPS technology for tracking the train position updates, it will be quite helpful but still accident occurs. The ACD is embedded based system, so if any component failures in the system then also accidents occur.

In this Proposed System, we are using RFID Reader and RFID Tags. There are both Active and Passive RFID Tags. Active RFID [2] system use Self-powered RFID tags that continuously broadcast their own signal. Active RFID tags are commonly used to track the real-time locations. Active tags provide much longer read range. Passive RFID system use tags that are powered by the electromagnetic energy transmitted from an RFID reader. Passive RFID tags have application including tool tracking access control.

In our proposed system we use passive tags because it does not contain battery, so its life time is more and RFID reader is present in Train engine, the power is supplied to the RFID reader from power supply. Passive Radio frequencies are LF and HF, reading range is upto one meter and UHF RFID frequency varies from 8000MHz to 10000MHz and range upto 100 meters depending on the country. Tag's doesn't transmit anything but scatters the signal which is transmitted by reader. Tag operates as a mirror. The Tags operation is based on modulating the carrier frequency not in induction as in low and middle frequency system.

These passive RFID tags contains a chip is made up of silicon that contains data, chip is attached to an antenna by which the code is transmitted, chip and coil is mounted on the moulded plastic cover. These RFID tags are located at the Railway track according to the distance. The

track path source to destination location is loaded in the system according to the RFID tags. The train start running according to source and destination as loaded in the system. Thus RFID reader detect and reads the Passive Tag, tags get powered by electromagnetic wave sent by the RFID reader. When waves from the RFID reader falls on a Passive RFID tag, the coiled antenna within the tag starts to induce the magnetic field. The passive tags get power from reader and forward it to the circuits in the tag. The tag then sends the information encoded in the tags memory.

Tags just scatter the signal which is transmitted by the reader. When RFID reader detects the correct Unique Code train run continues in the same track if the Unique code not matches then it is wrong path thus automatically train engine speed is slow down and stop at minimum time and information is broadcasted to Control Room through RTSU's using DSR Ad-hoc routing protocol and same information is broadcasted to other train which is in the same track.

The Train is equipped with Wi-Fi enabled On-Board computer system and the source to destination location is loaded in the system, it will be displayed on the LCD screen. RTSU's provide internet connection to trains. Dedicated short Range Ad-hoc routing protocol is to broadcast the information. Internet Service provider provides internet connection to all Railway Track Side Units. The data is transmitted and received using Wi-Fi.

2. Related Work

As many other methods included to Solve Problem of railway accidents occurrence, Zigbee based automation also provides it is only for a short range communication. It performs the communication based on the gate level signals. The Anti Collision Device it is completely embedded based system; it is based on GPS and Microprocessor. GPS also equipped for trains to track the train current position but because of weather conditions information gathering may be incorrect.

The ACD system is also found to be ineffective because it does not considering any active inputs from existing Railway sign system, Later Geographical sensors have additionally been used that makes use of satellite for communication, but system is very complicate to implement. The RF module also included to receiver or transmit the signal if any obstacle present in the track it will be observe by an Ultrasonic sensor, RF receiver signal from train section interface with µc. Here in this method GSM is used to send SMS to authorized person as guard, controller station and drivers.

.

3. Proposed System

In this proposed system, we used RFID, RTSU's and Wi-Fi for data broadcasting between Trains and also to the Control Room. RFID Reader and Passive Tags are used here RFID reader is located in Train engine and RFID tags are locates in railway track. RTSU's are act like wireless base station provides internet connection to trains. As in VANET's moving Vehicle is consider as a mobile nodes, in this proposed system moving train is consider as a mobile nodes and to broadcast the data Dedicated Short Range Ad-hoc routing protocol is used and in this proposed system we also use the Co-operative opportunistic data broadcasting for Railways using RTSU's Wi-Fi and VANET's [4] this technique also used along with RFID system it is also included.

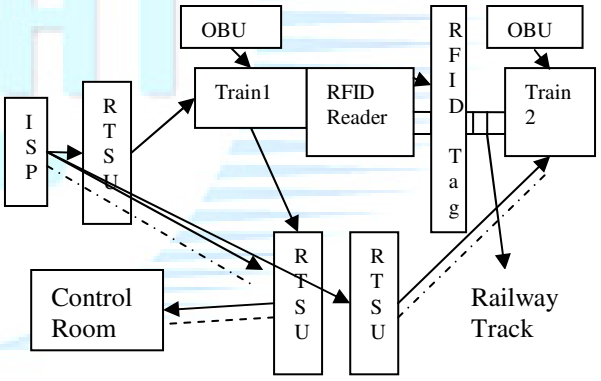

Fig.1 Block diagram of proposed system

As shown in the Block Diagram the first block ISP (Internet Service Provider) provides internet connection to all RTSU's through LAN. RTSU's are the Railway Track Side unit Located at the Railway track side; they are like base station which provides internet connection. The next block is train which contains the Wi-Fi enabled On-Board Computer system and LCD screen the loaded source to destination location in the system is displayed on the LCD screen. RFID reader is equipped in the Train engine power is supplied to RFID reader through power supply and in the Railway track passive RFID tags are placed according to the location loaded in the system. Once the train engine start the RFID reader detects the RFID passive tag the passive tags get power from the electromagnetic wave pass to the chip and it is forward to circuit and Chip is connected with antenna signal is generated the tags scatter

the signal to the reader, if reader get the correct Unique code train run continues in the same track if it is wrong Unique code that means it is a wrong path thus automatically train engine speed is slow down and stop at minimum time. At the time by using RTSU's and DSR Ad-hoc routing protocol is used to broadcast the information to Control Room and also same information is transferred to other train if it is in the same track. In this way we can avoid the accident of the trains.

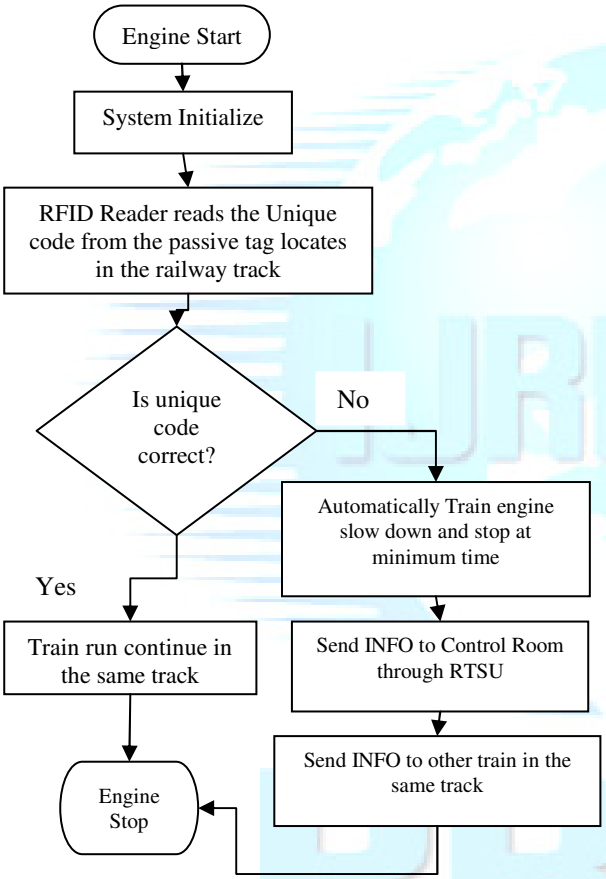

Fig. 2 Flow Diagram of Proposed System

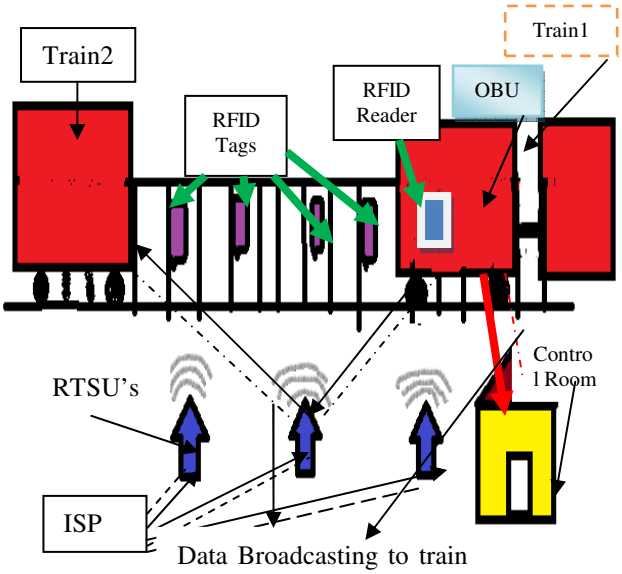

Fig. 3 Data Broadc ng RTSU's and RFID System

4. Simulation Process and Result Analysis

The Network simulator [5] NS2.35 version is the software used for proposed system. Network simulator is a discrete event driven simulator. It is suitable for design new protocol and to compare the performance of different ad-hoc routing protocols. Network Simulator is built using Object oriented methods in OTCL and C++ and for programming Tool Command Language is used To View the trace and trace annotate of the proposed system Network Animator (NAM) is used.

Table -1: Simulation Parameters

Parameters	Values
Simulator	NS2.35
Protocol	AODV
Antenna	Omni Antenna
Traffic Source	TCP,UDP
Application Agent	CBR
Mobility Model	Random Waypoint
Simulation area	1000*1000
Packet size	512
Channel	Wireless Channel
MAC	802.11
Number of Nodes	18

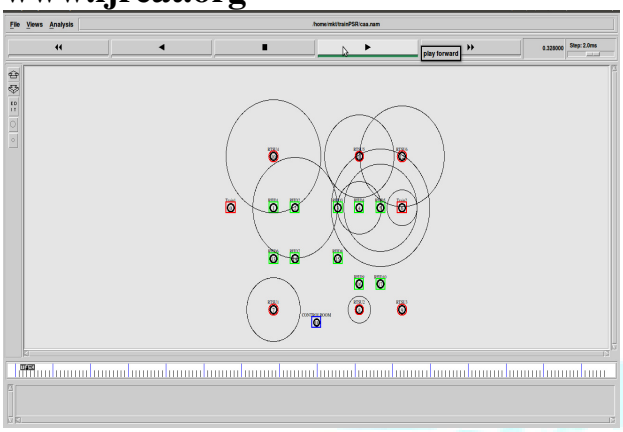

Fig .4 NAM result of Proposed System

The Fig-3 shows the NAM result of the proposed system, and the network area is 1000X1000 it includes two trains and 6 RTSU's and one Control Room and RFID passive Tags. DSR Ad-hoc routing protocol is used to broadcast the information from train to other trains and to control room. To Analysis the performance of the data broadcasting of Ad-hoc routing protocol we measures the parameter like Packet Delivery Ratio, End-to End Delay and Throughput.

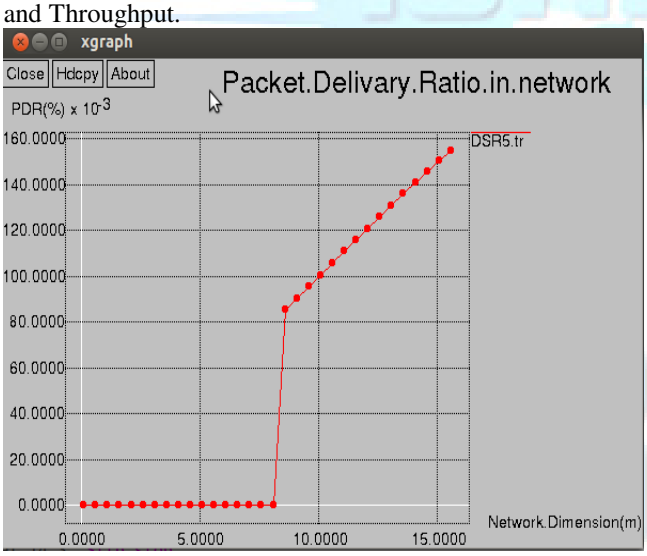

Fig. 5 Packet Delivery Ratio

The Fig.5 shows the Packet delivery Ratio of Proposed system in y-axis PDR (%), X-axis Network dimension (m) and in for each network dimension PDR (%) increases the performance result of PDR is 69.74%. The Fig-6 shows the Throughput X-axis Network Dimension and y-axis Throughput for each network dimension Throughput increases the performance result of Throughput is 216.50Mbps. The Fig.6 shows End-to-End Delay in X-axis Network Dimension (m) and Y-axis delay (ms) the performance result of the delay is 72.96ms.

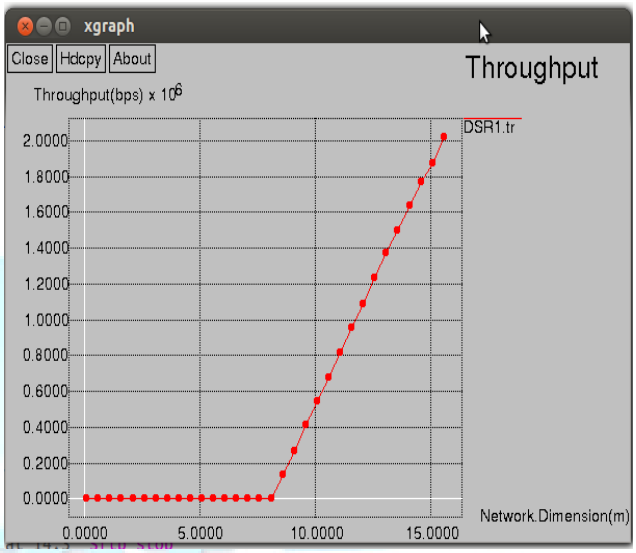

Fig. 6 Throughput

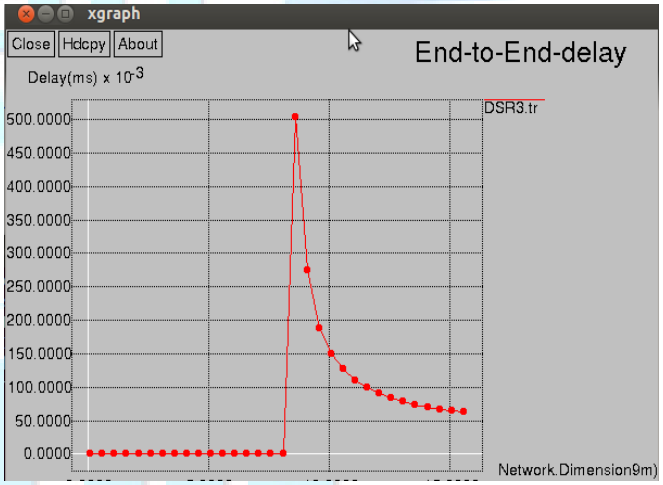

Fig. 6 End-to-End Delay

```
mkt@mkt-Lenovo-G50-45:~/trainPSR$ awk -f packet.awk caa.tr


GeneratedPackets = 1345
ReceivedPackets = 938
Packet Delivery Ratio = 69.7398
Total Dropped Packets = 406
Average End-to-End Delay = 72.9604 ms
```

Fig.7 Result Performance of DSR protocol

Table -2: Performance Result Analysis of Proposed System

Parameters	Values
Generated packets	1345
Received packets	938
Total packet dropped	486
Packet delivery Ratio	69.74
End-to End Delay	72.96ms
Throughput	216.50Mbps

5. CONCLUSIONS

This paper presents Collision Avoidance and Data Broadcasting for Railways using RFID and RTSU's (CADBRRR).This system is composed of using Wi-Fi technology and RTSU's it is a base station provide internet connection to Trains. RFID system is used to know the correct track path and same location will be display in LCD screen if wrong track path is identified then automatically train engine is stop and information is passed to Control room and same information is send to another train for data broadcasting DSR Ad-hoc routing protocol is used. By using all this technique we can avoid the train's accidents.

In Future we can implement to use Wi-Max technology by this we can cover upto 50Km transmission range by using this Wi-Max we can reduce the number of RTSU's we can place for 50Km one RTSU.

References

[1] Object Collision Avoidance With Train Using Android Based Kit (OAK) IJRET: International Journal of Research in Engineering and Technology eISSN: 2319-1163 | pISSN: 2321-7308

[2] *International Journal of Computer Applications (0975 – 8887) Volume 83 – No 7,24 December 2013* Railway Track Finding System with RFID Application

[3] Vehicular Ad-hoc Network VANET's Status, result and Challenges Network System Laboratory.

[4] IJREAT, Volume 3, Issue 2, April-May, 2015
ISSN: 2320 – 8791 (Impact Factor: 2.317)
Co-Operative Opportunistic Data Broadcasting For Railways Using Rtsu's, Wi-Fi And VANET's

[5]The Network Simulator – ns-2," *http://www.isi.edu/nsnam/ns/*
http://www.isi.edu/nsnam/ns/tutotial

[6] IJREAT, Volume 2, Issue 2, Apr-May, 2014ISSN: 2320 – 8791 Co-operative opportunistic routing in VANETS using PSR (Proactive Source Routing Protocol).

BIOGRAPHIES

Mr. T Kantharaju is currently working as an Associate Professor in ECE department, BIT Institute of Technology, Hindupur. He received B.Tech degree from Sri Venkateswara University, Tirupati, A.P. and M.E degree from University Visvesvaraya College of Engineering, Bangalore University, Bangalore, India. He is pursuing Ph.D in Wireless Networks from NWMD-IU. His research areas in Wireless Communication & Networking, Satellite Communication, Microwave Engineering, Embedded Systems, Image & Signal Processing, MANET's and VANET's. He is a life time member of ISTE, New Delhi, India.

Mrs. Mamatha B.L. is currently working as an Assistant Professor in ECE department, BIT Institute of Technology, Hindupur, India. She received Bachelor's Degree in Electronics and Communication Engineering from VTU, Belgaum, Karnataka and she received Master's degree in Digital Systems and Computer Electronics from JNTUA, Anantapur. Her research areas are Wireless Networking, MANET's, VANET's and Embedded Systems.