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Obstacle Detection System for Railways

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***Abstract*—** Railways are one of the primary medium of transport in India. Everyday approximately 10.8 million passengers traveling by train. So, the safety of the passengers has to be ensured. The proposed railway system is fully automated using RFID, Bluetooth, GPS, Wi-Fi and Live Video Streaming. It can be operated only by an authorized user and the communication system will run before the train to detect the obstacle. The live streaming of video is transmitted from a smartphone app to cloud. All the information such as the operator of the engine, current location of the communication system, the distance values between the train and obstacle spot will be updated to THINGSPEAK API for every 15 seconds. Based on the received data, triggering actions will be performed. If it finds any obstacle, then the system will stop and there after using trigger and react option of thingspeak an automated message which consists of latitude and longitude of the system will be sent to the train. The train can be stopped to avoid accident.

Keywords*—Authorization, Automation, Bluetooth, Cloud, GPS, Live Streaming, Obstacle, ThingSpeak.*

I. INTRODUCTION

At present many accidents are occurring in railways due to which many people are losing their lives. The reason for accidents are obstacles on the railway track, broken railway tracks and sometimes human intervention. The obstacle detection system for railways to provide full safety to railway system by finding the barriers around railway tracks. The railway system is fully automated using RFID, Bluetooth, GPS and Wi-Fi. The proposed system can be operated only by an authorized user. The system will run in front of the train to communicate when it come across any obstacle. The distance between the train and the system can be set based on the speed of the train. All the information such as the operator of the engine, its current location and the distance values will be updated to THINGSPEAK API for every 15 seconds. MATLAB Analytics is being performed on the existing data to create meaningful insights out of it. Based on the data received, triggering actions will be performed. If the distance value is very less using trigger and react option of thingspeak, an automated message which consists of latitude, longitude of the system will be sent to the train. The train can be operated by a valid user using Bluetooth. The train can be started and stopped automatically using Bluetooth enabled Smartphone app. If the system finds any obstacle, then it will send an alert message to the concerned department. It can be automated to send the information to nearest railway station authorities. If the distance is more, then the train is allowed to travel for some more distance and then stop. The automation of starting or stopping the train is done through smartphone app using Bluetooth. The lane of the train is detected using IR Proximity Sensor and the obstacle is detected using Ultrasonic Sensor. The information is being updated on the cloud using Wi-Fi. Matlab Analytics and Visualization techniques are performed from the collected data. The data is fully secured with the private view of ThingSpeak API. The data analytics helps to understand the system in a better way. The controlling mechanism to find out the pitfalls in the system based on the speed of the train, length of the train and communication network.

II. RELATED WORK

In 2011, R. Passarella proposed design concept of the train obstacle detection system in Indonesia [1]. As many accidents occur the only way to prevent these accidents is to give the wider knowledge to the engine driver about the obstacle with the help of infrared system. In 2013, Nisha et al. proposed a improving railway safety with obstacle detection and tracking system using GPS-GSM model [2]. The project was built with GPS and GSM device. Three functions were implemented as collision detection, object detection and obstacle avoidance. In 2014, N. Ramasamy proposed automatic obstacle detection in railway network using an embedded system [3]. This project was built using a microcontroller which detects a barrier on the rail tracks and near to the level crossing. In 2014, Rajendra et al. proposed a detection and warning system for railway track using wireless with multi-sensor, GSM, GPS, ultrasonic sensor and Micro Electro Mechanical Switch (MEMS)[4]. GPS and GSM are quite important for navigating to find the location of the train. The condition of the bridge status is supervised by the sensor and wireless modules. If the sensor is not getting proper signal, immediately the wireless system notifies the current status of the train on track.

All these implemented methods are not based on Internet of Things (IoT) techniques to update the multiple information. Through these methods, it is not possible to keep track of complete information and non availability of live streaming to find a location. It is also not possible to understand the collected data and to perform data analytics to create meaningful insights out of it. The proposed system solves all these issues by fully automated obstacle detecting system for railways that ensures the passengers security and avoid railway accidents. The information getting updated on cloud and by providing data analytics the accuracy of the data getting improved.

III. PROPOSED SYSTEM

The proposed system is implemented using two microcontrollers such are Arduino Mega and Arduino Uno. Only authorized users allowed to start the machine. It is done using RFID reader. The distance is measured using ultrasonic sensor. The information is displayed using Liquid Crystal Display (LCD) module. The latitude and longitude are measured using GPS and it display live streaming of video. All the information such as GPS information, Distance Information, Login Credentials is getting updated in THINGSPEAK API for every 15 seconds. ESP8266 is used to establish an internet connection and transfer the data to THINGSPEAK. L293D motor driver is used to control the DC motors. The lane is detected using IR sensor. Based on the information getting updated on the cloud, the train can be started or stopped.

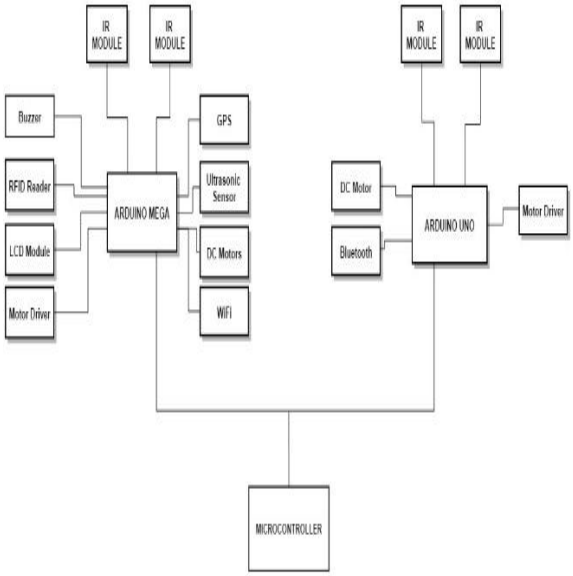

Figure 1: Block Diagram of the System

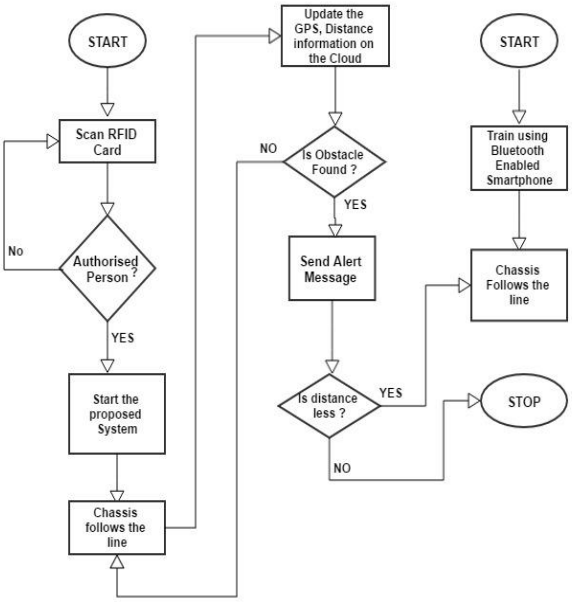

Figure 2: Flowchart of the System

IV. TEST RESULTS

The test results of the proposed system are shown below

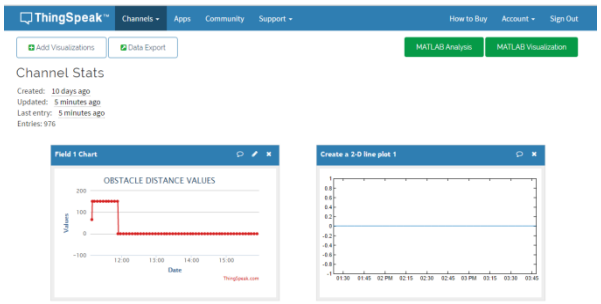

Figure 3: Information Update on ThingSpeak

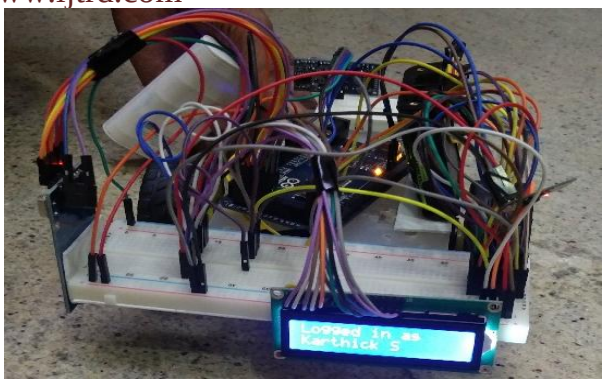

Figure 4: Proposed System with LCD, RFID, Arduino Mega

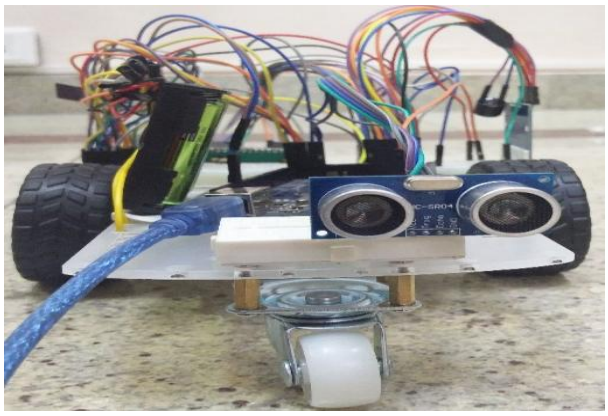

Figure 5: Proposed System with Ultrasonic Sensor

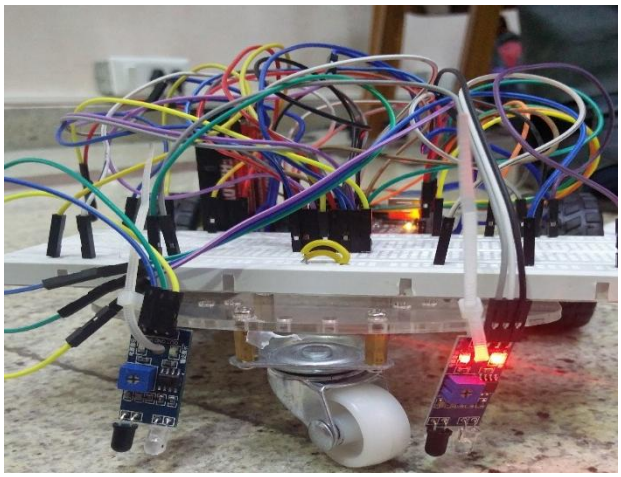

Figure 6: The actual train model with IR Line follower

CONCLUSION

It is the need of the hour to safeguard the people from railway accidents and ensuring the safety throughout the journey. There are many people are using trains as their mode of transportation and train can carry many passengers at a time. The growing population needs more trains for the transportation where in which safety is the main criteria. The developed communication system can pass reliable information to the train well in advance. The engine driver can control the train based on the information passed by the communication system. The Digitalization of railways and ensuring safety features using fast and reliable communication system makes railway a better mode of transport than the others.

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