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ZigBee and RFID Based Train Tracking System

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Abstract: **In nearby period, train collision at platform is occurring due to human error like wrong signalling but the cost of such error is lives of many people. We can avoid such accidents by adding automation in train tracking to control them via a central controller along with many sub-controllers. Trains are identified by unique RFID codes to each one. All the trains will be scanned to check the identity before they can reach the station and according to vacancy of the platform, train will be diverted to that particular platform. If any platform is not available then train will be ordered to hold till any platform gets vacated. Communication between train scanning system and central processing unit will be established by ZigBee modules. Such automation will be helpful to better security with high degree of accuracy.**

Keywords: **ZigBee, RFID reader, sub-controller, automation**

I. INTRODUCTION

Train transport is important mode of transport in India as well as over the land. India has large network of railways throughout the country. About 7800 trains carry near about 11 billion of passengers every day. Many times rail accidents take place due to wrong signaling, excessive speed, drivers' errors, track faults etc. In such accidents many people have to lose their lives. The recent examples of such rail accidents due to wrong signaling are as below:

1) On 15 October 2009 Rajdhani express collides with Sswaraj express due to signaling error at Jammu station.

2) On 19 July 2010 Uttar banga express collides with Vanachal express as it was leaving platform at Sainthia station in west Bengal.in this accident 66 people died and 165 were reported injured.

Such accidents can be stopped if we add automation in our railway systems. One of the easiest and cheaper automation system in railways is by using RFID and XBEE module. In this system a unique RFID code is given to each train. Every train is identified by this RFID code. When train enters platform this code gets scanned and according to scanned data and vacancy of platform train gets diverted to that particular platform. Communication between train scanning system and central processing unit will be established by using XBEE modules.

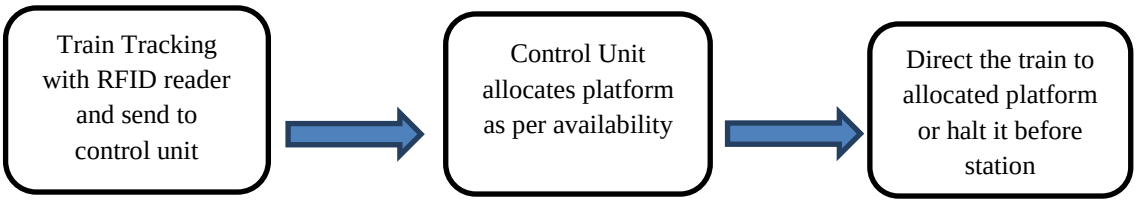

Fig 1. Block diagram explaining working of the project

II. DESIGN

Hardware:

Electronic hardware consists of interconnected electronic components which perform analog or logic operations on received and locally stored information to produce as output or store resulting new information. For communication between the systems, ZigBee modules are used.

Software:

The main processing of the data is done by the ATMEGA8 processor IC. In order to create program and convert it to .hex file we use WINAVR2010 version. This software will use make file information in order to create machine language program. Win Studio software will help us to understand the Register behaviour of our microcontroller and Zigbee status. The step-wise execution of our program and the effects of commands on the I/O ports can be visualized using this software WINSTUDIO2010.In order to test our hardware virtually Proteus so that there will be no mistake when the actual hardware is soldered on PCB PROTEUS is useful tool. It allows us to simulate the code in real time environment. The final hardware will be on PCB board. In order to create our own PCB board we will use PCB designing software EAGLE. This will give us the printed conducting tracks for our circuit which will then developed on copper track.

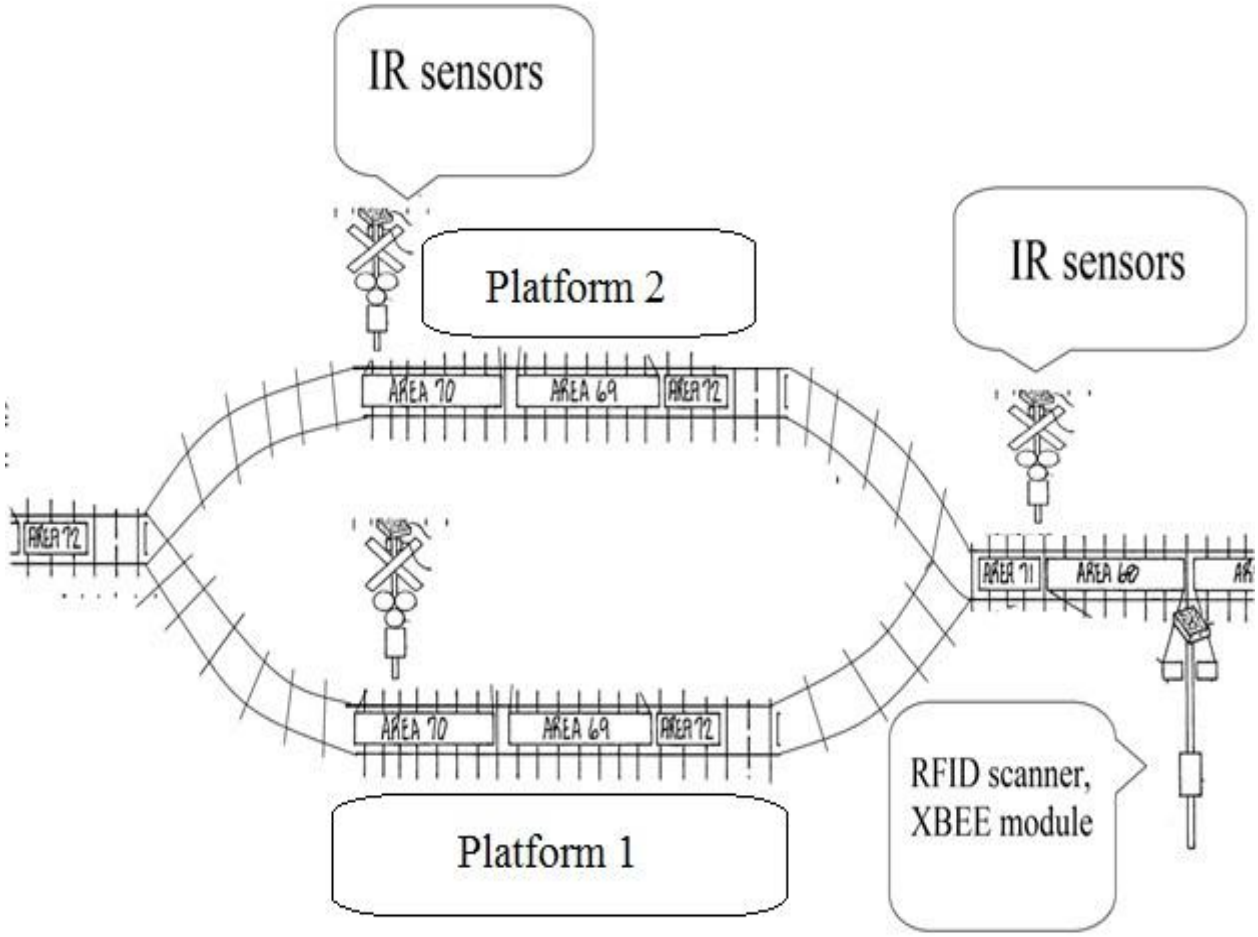

Fig 1: Principle of operation

III. PRINCIPLE OF OPERATION

1. Train detection:

When train crosses RFID scanner placed on pole before station at area 68, scanner will identify the train and its name as per given RFID tag and send this information to central unit via Zigbee module to take further decision. ZigBee module is placed at area 68. The bit stream received from RFID reader is sent to central ZigBee.

2. Central unit:

Central unit consists of At Mega 8, will check for the availability of platform. Platform vacancy is checked by checking the binary sensor placed at area 70 signal. If the train passes from front for defined time, it informs the central unit as At Mega will check for how much time the signal is available. Based on that information microcontroller will interpret platform is vacant or not. As per availability of platform, train will be directed to particular platform otherwise train will be halted before station at area 71 till any of the platform is get vacant.

3. Central unit will also display the processes going on. For example, if particular train occurred at RFID scanner will be informed to central unit and this unit will display the name of train. Name depends upon RFID tag number allotted to each train. The process of checking of platform will be done and allotted platform will be displayed on the LCD screen.

4. Whenever train leaves platform, binary sensors will again check that the train had completely left the platform. And inform the central unit that the platform is vacated. If some obstacles occurred in between binary sensor, controller will check the obstacle generated signal's availability period, if it is equal to defined time then it is train otherwise controller will skip the interrupt as false signalling.

5. If another train approaches at the same time on different tracks then priority will be decided as per type of train i.e. if passenger train and superfast express arrive at the same time then superfast express will get first priority.

IV. ALGORITHM

Step 1: Check the train arrival.

Step 2: Identify the train and inform central unit.

Step 3: Verify the platform vacancy.

Step 4: Decide platform for train as per platform availability, otherwise hold before station.

Step 5: Apply priority if two trains arrive at same time.

CONCLUSION

The automation discussed here are useful for reducing manpower and thereby increasing efficiency without compromising security constraint and helps to avoid human error. Further improvement is possible as for real life implementation, it is required to use more precise equipment and having more stability in all conditions.

ACKNOWLEDGEMENT

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