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Alarm System of Railway Gate Crossing based on GPS and GSM

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Abstract: ***In the rapidly flourishing country like ours, it appears that railway safety, particularly safety at intersections between roads & railway lines is perhaps not accorded the priority it deserves. This is due to lack of manpower needed to fulfill the demand. Since, no one to takes care of the functioning of railway gate when a train approaches the crossing. The objective of this paper is to overcome this problem by assuring railway safety and improves the passing efficiency in railway crossing; here we design a new railway crossing warning system based on GPS & GSM. The performance come together by positioning of GPS and efficient transmission rate of GSM and computer control technology are used in this system, which in turns provide safety in railway system.***

Keywords: GPS, GSM, train section, railway crossing, control section.

1. Introduction

India is the country which is having world's largest railway network. So railway safety is a critical aspect, if anything goes wrong in the rail operation it results loss in terms of human life, injury, damage to railway property. To overcome with this system a variety of alarm systems are proposed, but they are successful only up to some extent. The reasons for their failure are poor system stability & sensors performance. Sensors life cycle is very less they should be replaced for every two years which is cost ineffective and not convenient for work. The main serious problem is alarm failure due to vibration & displacement loose caused by car. To avoid all these things some automatic & independent system is needed in [3], [6]. This is possible by using satellite communication to locate the position of train and to measure their speeds. By using wireless data communication link will provide the details like train location & speed to train control center and by this it controls speed of train & displays signal. This is achieved by using GPS [2], GSM in [1] and many other components.

2. Overall Frame work

The fundamental process in our system is obtaining train location using GPS technology and transmitting the data via GSM network [5] to the control section for data processing and information analysis. The train locator unit planted in the train is designed and implemented, considering the cost factor, size of the module, durability and low power consumption. The power supply unit of the module is a main factor which decides the feasibility of the unit, as it should sustain a seamless supply of electricity at a low voltage for the locator module to function properly. The GPS receiver of the unit is capable of identifying the latitudinal and longitudinal position and ground speed of the specific train by receiving information from the GPS satellites. The position data is periodically sent to the remote server through the GSM transmitter of the module.

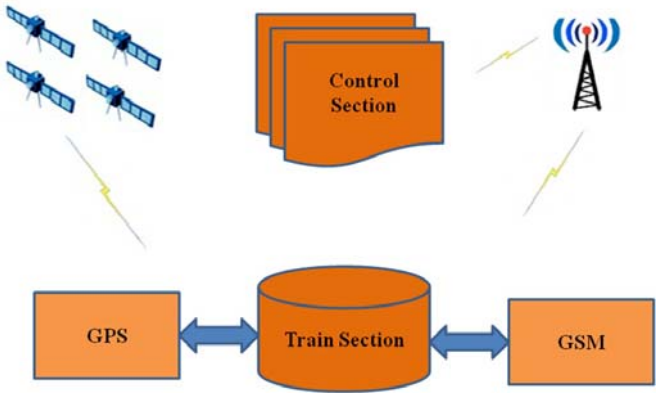

Figure 1: Overall Frame work

We have chosen GSM as the communication medium between the train locator and the remote server to improve availability of our system by utilizing the existing GSM network which covers the whole country. The central control system includes a server for handling and processing all the position information received from train locators via the GSM network. The server automatically updates the database with latest position, speed and direction information of each train.

Over the years, many road accidents have occurred at railway crossings imposing a critical safety threat to both train commuters and passengers in vehicles. Such accidents are caused mainly by the unreliability of the safety mechanisms such as blocking arms and signal lights used at the crossing point from [3] ,[7]. Thus our system is to improve the reliability of such safety mechanisms by synchronizing the railway crossing control process with the incoming train's position. We can provide accurate real time information on train position, speed and length of the train to synchronize the functions of rail crossing with the train

movements. The productivity of t he servi ce can be significantly improved by provi ding accurate predictions on approaching t rain at t he rai l-road crossi ng and displaying amount of rem aining t ime t o cl ear t he crossi ng from train traffic. Alarm triggers to aler t road vehi cles approaching too close to the rail-road crossing at a point of train approaching, can also are incorpor ated to improve the effectiveness of our solution. Thus the system is instrumental in improving safety of people crossing rail-road cross points.

3. System Structure and Prototype Design

3.1 Analysis of hardware Structure

3.1.1 Microprocessor

The microprocessor ARM7 TDMI performs signal analysis, command execution, and l ogical judgment. One of t he most important logical judgments is determination of a theft event. ARM7 TDMI first reco rds the original manifest and original GPS coordinates and t hen updat es t hem every preset t ime. Once an i nvalid unl oaded aut horization i s detected, the monitoring system raises th e alarm . Then the system will report t he det ailed product descri ption and current l ocation to the monitoring centre.

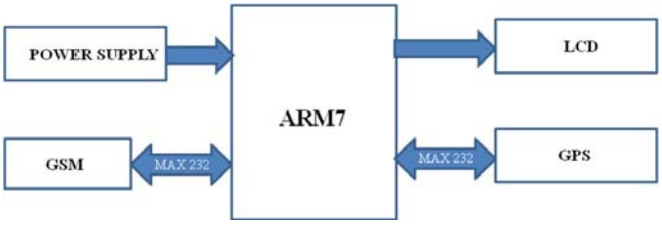

Figure 2: Block diagram of Train section

3.1.2 GPS Module

It is u sed to p rovide satellite lo calization in formation to trace, locate and find the speed of the train (latitude, longitude and altitude).

3.1.3 GSM Module

It provi des a com munication channel t o t ransmit GPS coordinates, l ike geography l ocation and speed messages or emergency rescue messages, and receives com mands from the transport company or the remote monitor centre.

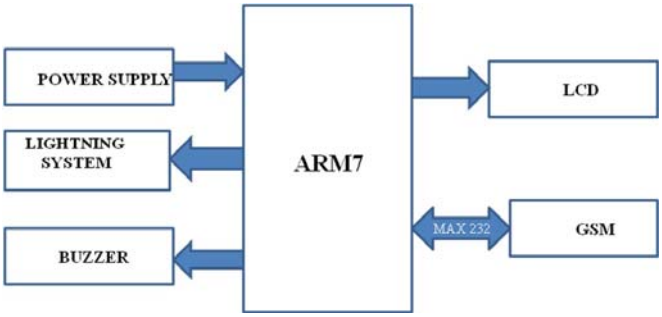

Figure 3: Block diagram of Control section

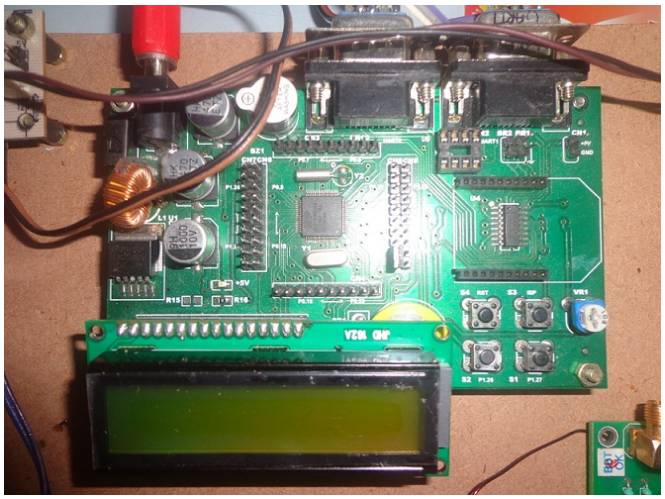

Figure 4: Prototype of the Train section

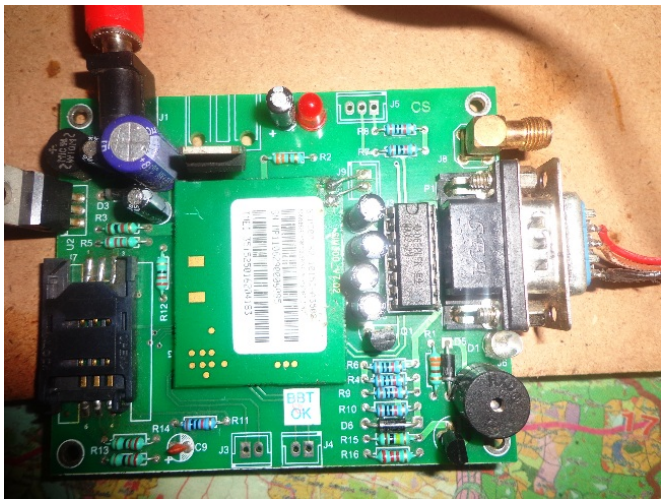

Figure 5: Prototype of the control section

3.2 Building the Prototype System

The Train section consi sts of m icrocontroller [4] LPC2148, GSM module, GPS m odule power bl ock. GSM m odule i s connected to the microcontroller using the serial communication using the serial port UART0. GPS module is connected to the microcontroller using the serial communication usi ng t he seri al port UAR T1. The GPS module i n t his sect ion reads t he area information like longitude and latitude using the tracked satellite information. The position information of t he Trai n i s di splayed on t he LCD. The information is passing to the control section using the GSM technology. The param eter value of t emperature is monitored and displayed on the LCD.

The Remote m onitoring sect ion consi sts of t he GSM module, LEDS and buzzer with the LPC2148 microcontroller. The GSM is connected to the microcontroller usi ng t he seri al communication using UART0. The i nformation of t he l ocation and t rain information is displayed on the LCD display. Continuously 5 times GPS values receive from the train section after that it will indicate the green signal the train is arriv al at th at time buzzer is buzz.

4. Conclusions

From this system we can improve reliability of communication to great extent and also we can know exact position of train even in caves, mountains, high raised areas irrespective of distance, by this control center can monitor the train like controlling speed and displaying signals. This is done by using GPS & GSM technologies.

5. Acknowledgments

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