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Modern Railway Information System for Gate Control and Information Display

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ABSTRACT: Now a day's Railway systems plays a key role in transportation in the world. The demands for the trains are increasing drastically. The demand also increases the update of technology day to day. The train journey should be more secure.

One of the problems in railway transportation is gate control system. Presently in railways the gate is controlled by manpower. Whenever the train arrives, that information will be sent to the gate man .Based on that information the gate will be closed and opened by that gate man. If there is any irresponsibility by the gate man, there be a big problem will occur. The second problem is displaying the current train information to the passengers in their respective coaches. Especially in night journeys the passenger could not get the information about next station which he has to get down. Every time they want to come nearer to the foot path or on to the platform to know the current station information. These problems we are facing in all domestic railway systems. The above problem can be eliminating by modern railway information system. By this system we can control the all the modules of the railway transportation. RF module, ARM7 microcontroller are used with some other hardware devices to control the gate and we can approach the displaying system easily. So this solution will provide a cost ineffective and accurate solution for above problem.

KEYWORDS: Gate control, LCD, RF module, ARM7 micro controller.

I.INTRODUCTION

A) Embedded Systems

An embedded system is a way of working, organizing or doing one or many tasks according to a fixed plan, Program, or set of rules. A system is also an arrangement in which all its units assemble and work together according to the plan or program. An embedded system is one that has computer-hardware with software embedded in it as one of its most important component. It is a dedicated computer-based system for an application(s) or product. It may be either an independent system or a part of a larger system. As its software usually embeds in ROM (Read Only Memory) it does not need secondary memories saving a computer. An embedded system has three main components:(a)It has hardware.(b)It has main application software. The application software may perform concurrently the series of tasks or multiple tasks.(c)It has a real time operating system (RTOS) that supervises the application software and provides a mechanism to let the processor run a process as per scheduling and do the context-switch between the various processes (tasks). RTOS defines the way the system works. It organizes access to a resource in sequence of the series of tasks of the system. It schedules their working and execution by following a plan to control the latencies and to meet the deadlines. An embedded system can be defined as a computing device that does a specific focused job.

B) Micro Controller

Microprocessors and microcontrollers are widely used in embedded systems products. Microcontroller is a programmable device. A microcontroller has a CPU in addition to a fixed amount of RAM, ROM, I/O ports and a timer embedded all on a single chip. The fixed amount of on-chip ROM, RAM and number of I/O ports in microcontrollers makes them ideal for many applications in which cost and space are critical.

The LPC2141/2/4/6/8 microcontrollers are based on a 32/16 bit ARM7TDMI-S CPU with real-time emulation and embedded trace support, that combines the microcontroller with embedded high speed flash memory ranging from 32 Kb to 512 Kb. A 128-bit wide memory interface and a unique accelerator architecture enable 32-bit code execution at the maximum clock rate. For critical code size applications, the alternative 16-bit Thumb mode reduces code by more than 30 % with minimal performance penalty.

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Due to their tiny size and low power consumption, LPC2141/2/4/6/8 are ideal for applications where miniaturization is a key requirement, such as access control and point-of-sale. A blend of serial communications interfaces ranging from a USB 2.0 Full Speed device, multiple UARTs, SPI, SSP to I2Cs, and on-chip SRAM of 8 Kb up to 40 Kb, make these devices very well suited for communication gateways and protocol converters, soft modems, voice recognition and low end imaging, providing both large buffer size and high processing power. Various 32-bit timers, single or dual 10-bit ADC(s),10-bit DAC, PWM channels and 45 fast GPIO lines with up to nine edge or level sensitive external interrupt pins make these microcontrollers particularly suitable for industrial control and medical systems.

II.SYSTEM MODEL

In this paper, we are doing two applications of 'Modern railway information system'
1. Automatic Railway gate control 2. Train information display and announcement at station as well as in train.

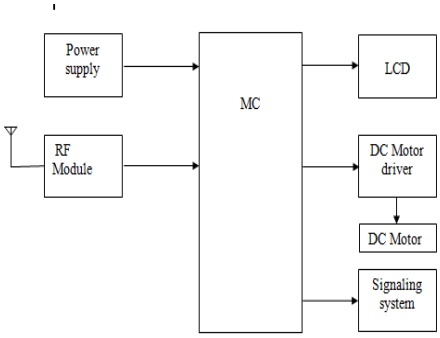

Fig.1. Block diagram of Railway Gate

2. Train information display system at station

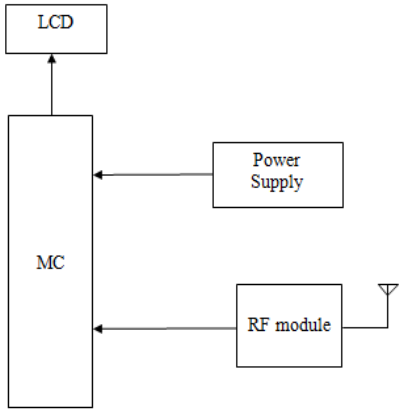

Fig.2. Block diagram of Railway station module

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3. Information system present in Train

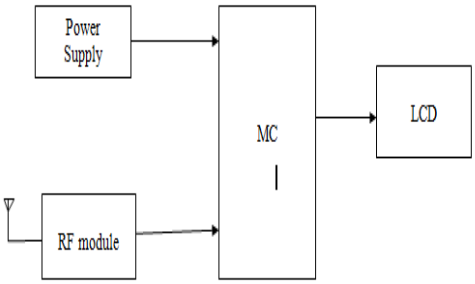

Fig.3. Block diagram of Train module

The explanation of the above block diagrams are given in the next section.

A)RF Module

An RF module (Radio Frequency Module) is (usually) a small electronic circuit used to transmit and/or receive radio signals on one of a number of carrier frequencies. RF Modules are widely used in electronic design owing to the difficulty of designing radio circuitry. Good electronic radio design is notoriously complex because of the sensitivity of radio circuits and the accuracy of components and layouts required to achieve operation on a specific frequency. Design engineers will design a circuit for an application which requires radio communication and then "drop in" a radio module rather than attempt a discrete design, saving time and money on development.

B) Working Procedure

In this paper we are discussing two applications

- Automatic Railway gate control
- Train information Display and Announcement system

In some cases at gate control room, because of the irresponsibility of gateman the gate will closed or opened with some time delays. This may lead to so many problems. Railway information system also very necessary to display the current position of the train to the passengers while travelling. To overcome these problems we have to automate the Railway system. In this paper we are using ARM7 micro controller along with some specified modules and connect them, programmed them as per the logic and requirement. This paper develops in order to help the Indian railways in making its present working system a better one, by eliminating some of the loopholes existing in it.

C) Automatic Railway Gate Control

Railways being the cheapest mode of transportation are preferred over all the other means .When we go through the daily newspapers we come across many railway accidents occurring at unmanned railway crossings. This is mainly due to the carelessness in manual operations or lack of workers. We, in this project has come up with a solution for the same. Using simple electronic components we have tried to automate the control of railway gates. As a train approaches the railway crossing from either side, the sensors placed at a certain distance from the gate detects the approaching train and accordingly controls the operation of the gate. Also an indicator light has been provided to alert the motorists about the approaching train.

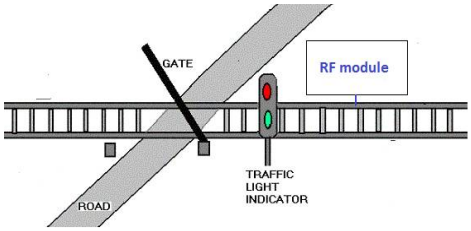

Fig.4.Railway gate control system

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By using RF signal protocol, we can control the railway gate operation .The RF signal detection is the main principle going here. The RF module in the station always check for the signal to detect by transmitting into surroundings .At the same time the train also checking for the RF signal to detect within the range .The range of the signal is based on our requirement .

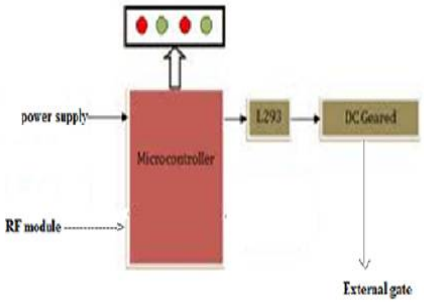

Fig.5. Hardware modules of gate control system

Once the train comes into the range of the station RF signal, immediately the detected information will send to the Equipment placed at the gate. After that based on the command provided by the MC, the motor will react and close the gate .When train pass from the gate, the RF signal detection will end and then automatically gate will open. By providing some delay also, we can close the gate automatically, after passing the train. Based on the density of the traffic at the gate, we can decide the closing and opening time of the gate.

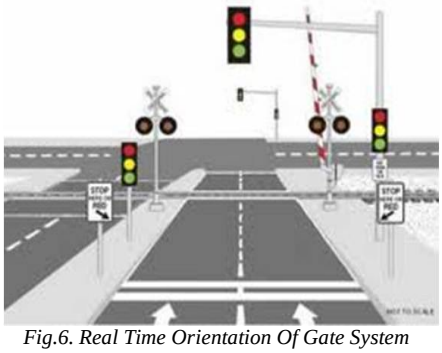

Fig.6. Real Time Orientation Of Gate System

D)Train Information Display And Alert System

In this paper, we used RF Module for communication control.

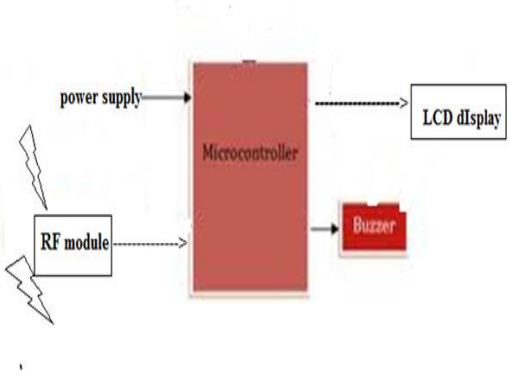

Fig.7. Hardware Module Displaying System

The main difference from previous is here we consider two output devices one at station and another in the train.As same as previous whenever the signal detect from both train and station the information will send to both the RF

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modules. The Principle using here is same as the gate control logic except that the output module. Here the information consisting of the station ID and train ID which necessary to display their respective information on display devices.

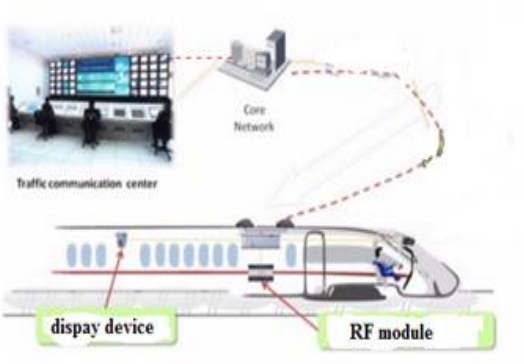

Fig 7. Real time orientation

III. RESULTS

A) Gate Control Module

Gate control system is shown in Fig.8, Here we are using ARM7 micro controller along with some specified modules and programmed them as per the logic and requirement.

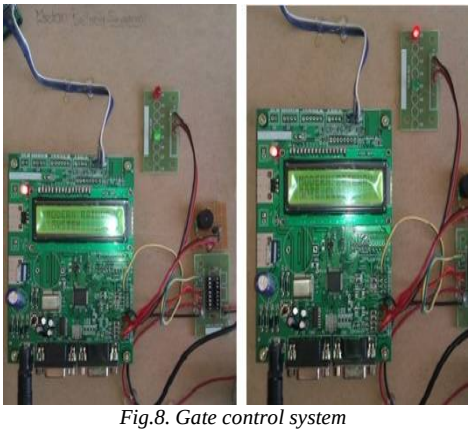

Fig.8. Gate control system

As a train approaches the railway crossing from either side, the sensors placed at a certain distance from the gate detects the approaching train and accordingly controls the operation of the gate. Also an indicator light has been provided to alert the motorists about the approaching train. The RF module in the station always check for the signal to detect by transmitting into surroundings .At the same time the train also checks for the RF signal to detect within the range .The range of the signal is based on our requirement . Once the train comes into the range of the station RF signal, immediately the detected information will send to the Equipment placed at the gate. After that based on the command provided by the MC, the motor will react and close the gate .When train pass from the gate, the RF signal detection will end and then automatically gate will open.

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B) Initial Status Of Station Module

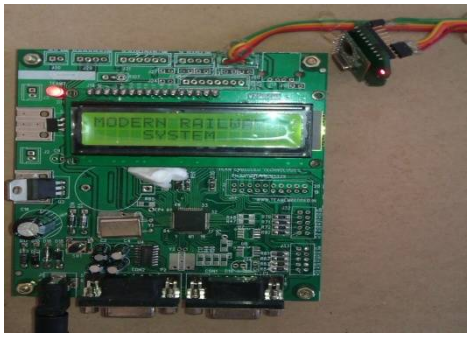

Fig..9. Module for Station information in platform of railway station

We consider two output devices one at station and another in the train as shown in Fig.9 & 10.As same as previous whenever the signal detect from both train and station the information will send to both the RF modules.

C) Station Information Module In Train

Fig.10. Module For Station Information In Railway Coaches

The Principle used here is same as the gate control logic except that the output module. Here the information consisting of the station ID and train ID which necessary to display their respective information on display devices.

IV. ADVANTAGES

Because of the autonomous of gate control system, it will completely eliminate the man power, which is presently going in railway systems. Presently, because of manpower sometimes error may occur which leads to a problem for the passengers. This error will be eliminated by using automatic control system. The information display system is the major flexible one for the passengers in the train. It will display the next station information to the passengers with in the train while journey.

V. CONCLUSION

A new approach for improving safety at railway gates, wireless module is suggested (RF). Formats have been given to maintain records of gate inventories, accident/incident reports. Each line crossing should be assigned a hazard rating and the priority of safety enhancement works be decided accordingly. A regular assessment of safety performance should be done. This approach should be able to bring down the rising trend in accidents at line crossings. And the display system is more flexible to the both passengers in the train and in the station. So the display system will more useful to the strange passengers especially at night times. Automation of the closing and opening of the railway gate using the switch circuit reduces the accidents to a greater extend. The obstacle detection system implemented reduces

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the accidents which are usually caused when the railway line passes through the forest. Most of the times greater loss has been caused when animals cross the tracks. One of the limitations is that, it does indeed close and open the gate but it cannot control the crossing of cars and vehicles. It only controls the gate. To combat this problem pressure sensor can be used as extension to the present work. As a future scope of work, our system can be implemented in real time by fixing the current limitations using new technologies.

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BIOGRAPHY

Mrs. N.P.Dharani, received her M.Tech degree in Digital Systems and Computer Electronics from BITS, Warangal, affiliated to JNTUH, Hyderabad in 2012 and received B. Tech degree in Electronics and Instrumentation Engineering from SITAMS, Chittoor,affiliated to JNTUH,Hyderabad in 2007.She has presented a paper in National and International conference and published four papers in reputed International journals. Currently, she is working as an Assistant Professor in S.V.College of Engineering,Tirupati.

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