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Automated railway track crossing and monitoring system using ATMEGA 16 microcontroller

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ABSTRACT

In the rapidly flourishing country like India, accidents in the unmanned railway level crossings are increasing day by day. No fruitful steps have been taken to reduce accidents. The proposed project deals automatic railway gate at a level crossing trading the gates operated by the gatekeepers. It will save time for which the gate is being kept closed as well as to provide safety to the road users by reducing the accidents. By employing the automatic railway gate control at the level crossing the arrival of the train is detected by the sensors placed near to the gate. Hence, the time for which it is closed is less compared to the manually operated gates. As operation is automatic; error due to manual operation is prevented. By the automated railway track crossing and monitoring system using Atmega16 Microcontroller will reduce the opening and closing times of the gates considerably and increase the safety of the crossing system. So the proposed project is society useful as it saves time, cost and easy to mount and monitor as its size is very small.

Keywords: Infrared Sensor (IR Sensor), ADC (Analog Digital Convertor), ATMEGA (Atmel Mega AVR), DIP (Dual In-Line Package)

1. INTRODUCTION

The accidents at unmanned level crossings and collision of trains running on same track are the major types of accidents in railways which causes heavy human causality and damage to train. Hence it is proposed to develop a fail proof system to avoid such accidents. The unmanned level crossing is fitted with obstacle (IR) sensor and automatic gate closing mechanisms and Atmega16 Microcontroller. The Atmega16 Microcontroller will receive information from IR sensor and continuously estimate the distance between the train and the gate.

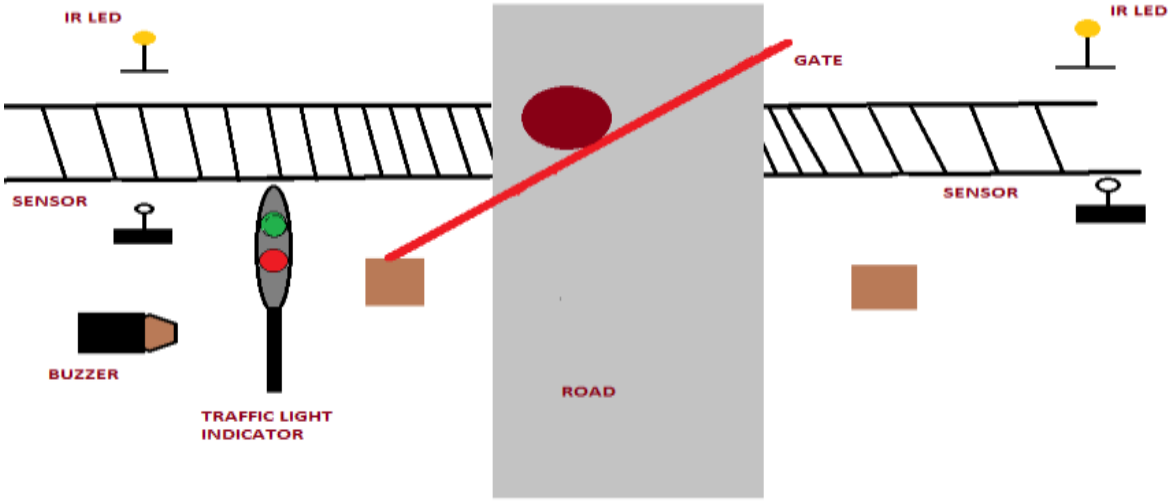

Fig 1.1 Automated Level Crossing Layout

"When the train is sufficiently near to an unmanned gate, controller will monitor the status of obstacle in the gate. If an obstacle is sensed, then command will be issued to slowly close the gate. If no obstacle is sensed, then the controller will issue command to close the gate without any delay with an alarm/siren. In addition to automatic unmanned gate closing, the prevention of collision between two trains running on same track will also be implemented. The Atmega16

microcontroller will receive information from IR sensors placed near the track and estimate the distance between two consecutive trains running on same track and transmit this information to corresponding train, controller/officer.

2. COMPARITIVE STUDY OF VARIOUS METHODOLOGIES PREVIOUSLY USED

The status of the present Indian Railway is as follows:

a) Presently railway-crossing gates are operated manually. At present scenario, in level crossings, a gatekeeper operates the railway gate normally after receiving the information about the train's arrival. When a train starts to leave a station, stationmaster of the particular station delivers the information to the nearby gate. The above said procedures are followed for operating the railway gates. Sometimes the road traffic is so busy that it becomes impossible for the gatekeeper to shut down the gates in correct time. In many remote areas, railway-crossing gates are open and no person is located for the operation of gates and hence leading to accidents. Many times gates are shut down too early leading to wastage of time of people stuck at crossing.

b) Presently as such no centralized system is there through which we can track the location of trains from any canter point. As trains cannot be centrally located, often more than one train runs on the same track in opposite direction leading to accidents.

c) Presently in Indian Railway only semi-automatic railway gate operation is followed in certain areas. Signals are located in the vicinity of the railway gate along with gate master board and a marker light. If barriers remain closed for excessive periods on crossings carrying a high volume of road and rail traffic, the build-up of road traffic will exceed the capacity of the crossing to safely discharge this buildup before the next train arrival at the crossing. A number of train accidents happened due to a manual system of signals between stations.

d) Presently signals are controlled by means of interlocking system and for this system require regular maintenance and upgrading. Hence here we proposed an automatic railway ga1te control (i.e., railway gate operated without gate keepers' system in this project.

e) Automatic Railway control using microcontroller published by Oriental Scientific Publishing Co., India Here we learnt the idea of converting the manual work of operating gates to automatic operation of gates. This project used 8051 microcontroller series, not using an updated version of the microcontroller

Unmanned railway level crossing system published by: International Journal of Modern Engineering Research (IJMER) Here we learnt about the use of stepper motor to open and close the gates and the idea of its proper working.

3. SYSTEM IMPLEMENTATION

A. Hardware Requirements

A micro controller is an embedded chip consisting of a powerful CPU tightly coupled with fixed amount of memory (RAM, ROM or EPROM), various devices such as serial port, parallel port, timer/counter, interrupt controller, ADC, DAC, everything integrated on to a single silicon chip. It does not mean that any micro controller should have all the above said features on chip. Depending on the area of application for which it is designed, the on chip may not include some of the sections.

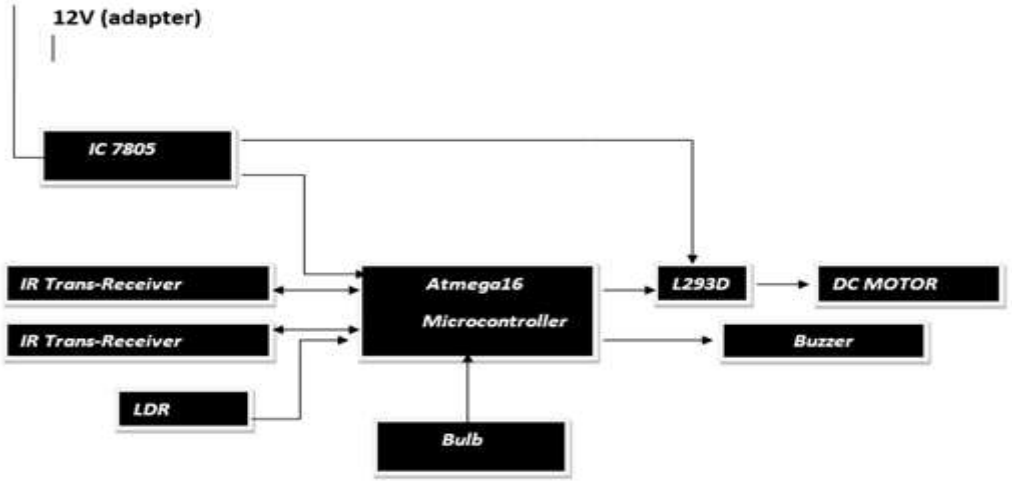

Fig 3.1 Basic Block Diagram of the System

Microcontroller: -Totally 40-pin DIP package manufactured with CMOS Technology.

L293D (motor driver):-L293D 16DIP /ULN 2003 IC is used to drive the stepper motor.

Stepper motor: -This is used to open and close the gates automatically when it is rotated clock wise or anticlockwise direction. Stepper motor requires 500m amps current, so use the uln2003 or L293D drivers to drive the stepper motor.

B. Software Requirements

a) C used for embedded systems is slightly different compared to C used for general purpose (under a PC platform)

b) Programs for embedded systems are usually expected to monitor and control external devices and directly manipulate and use the internal architecture of the processor such as interrupt handling, timers, serial communications and other available features.

c) There are many factors to consider when selecting languages for embedded systems

d) Examine and utilize various features of the microcontroller's internal and external architecture this includes:

- Interrupt Service Routines
- Reading from and writing to internal and external memories
- Bit manipulation
- Implementation of timers / counters
- Examination of internal registers Standard C compiler communicates with the hardware components via the operating system of the machine but the C compiler for the embedded system must communicate directly with the processor and its components.

4. SYSTEM FLOW CHART

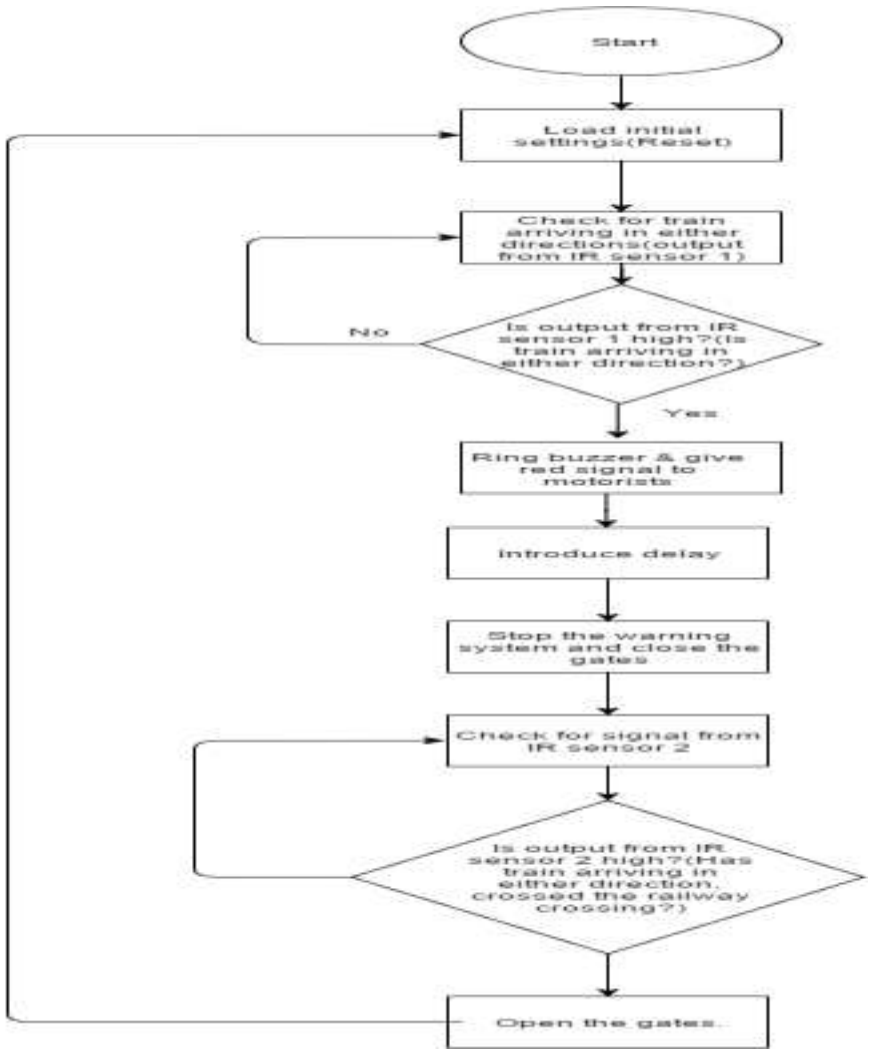

Fig 4.1 Flow Chart of the System

5. CONCLUDING REMARK

The accidents are avoided at places where there is no person managing the railway crossing tracks. By using Atmega16 microcontroller monitoring and controlling of railway track becomes easy, secure, automated and efficient. We are using ATMEGA 16 microcontroller specifically because it has loads of on chip peripherals like timers, 8 channel 10 bit ADCs and UART interface, watchdog timer which makes our circuit less complex. We have done the programming of ATMEGA 16 in embedded C because it is small, and reasonably it is simple to understand, program and debug. The project's software is coded using the "Code Vision AVR" because it is the best IDE for getting started with AVR programming on windows as it has a very good code wizard which generates codes automatically and makes the coding part simple.

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REFERENCES

[1]. Adler, R. B., A. C. Smith, and R. L. Longani: "Introduction to Semiconductor Physics," vol. 1, p. 78, Semiconductor
[2]. Electronics Education Comitee, John Wiley & Sons, Inc., New York, 1964.
[3]. Jacob Millman Christos C. Halkias.: "Electronic Devices And Circuits", Tata McGraw-Hill Publishing Company Ltd. Sep, 2003 .
[4]. C by Muhammad Ali Mazidi, Janice Gillispie, Rolin D. Mckinlay.
[5]. Embedded C Programming and the Atmel AVR (With CD) (English) 1st Edition by Richard H. Barnett, Sarah Cox.
[6]. Automatic Railway control using microcontroller published by Oriental Scientific Publishing Co., India.