

Time Bound Automated Railway Level Crossing

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ABSTRACT: Indian Railway, one of the world's largest network of transport of roughly 67,500-kilometre of size, which carried approx. 8.5 billion passengers and transported 1.2 billion tonnes of freight in last fiscal with operating ratio of 96 percent. This transport is self-developing day by day and now the PPP model (Public-Private Partnership) as well working very efficiently in this industry.

Nevertheless, at present also some of the existing railway system operate based on the traditional approach. Therefore aim of this paper is to automate this existing traditional model of operating railway gates and reduce the manual effort. By doing so the accuracy and precision will also increase and the chance of accident in railway gates can be reduced by enhancing safety measures.

This idea is highly economical, which can be designed for use in almost all the unmanned level crossings in the country and later can be expanded in different areas across different industry where separation of things are required from one another like at security check points, luggage separation and detection of dangerous substances etc.

KEYWORDS: Processors, RAM, Harddisk, Microcontroller- 89S52, IR-Sensors, RF Module, LED Display

I. INTRODUCTION

The objective of this paper work is to provide a time bound automatic railway gate control at unmanned level crossings. After deploying the automatic railway gate control the arrival and departure of train is detected by the sensor placed on either side of the gate and the sensed signal is sent to the microcontroller. At the same time, buzzer indication and light signals on either side are provided to the road users indicating the opening and closure of gates. If no vehicle is sensed in between the gate motor is activated and the gates are closed. These signals sent to the microcontroller, which in turn operates the motor and open, close the gate. Therefore, the time for which the gate is closed and opened is less compared to the manually operated gates. Also reliability and accuracy is high as it is not subjected to manual errors. In addition, these IR sensor capable to detect any dangerous or suspicious things in train which can lead to terrorist activity and due to this security forces can be informed in advance and increase the safety of system. One of the example of this concept is below:

Example: - Baggage handling process at airports.

In air mode of travel we come across the baggage collection process implemented at airport all the time. If there is small airport than no problem with manual operation however in case of large airports to operate a lot of baggage manually is complex. So here we can implement the sensor based baggage collection process where multiple baggage belts connected to one central belt which in terms is responsible for baggage delivery for travellers. These multiple belts are internally connected with each other via different sensors and these all belts put the baggage in central belt only when there is no bags in front of them otherwise belt stop till the vacant space is not there in central belt. This is completely automatic process and reduce the manual labour to operate with baggage.



Figure 01: Baggage handling at airport

In addition, this feature can be applied in security check in various places like metro train stations, entry and exit at different important and crowded places where separation of crowd is required.

II. LITERATURE REVIEW

With help of literature review of different papers, scholarly articles and other references, we are able to implement our work to obtain the desired result. This literature review gives critical look at the existing research that is significant to the work that is carried out.

This paper is based on the automatic control system analysis and their positive and negative feedback to open system. It describes about how microprocessor can be helpful to control and manage the processing of whole system in one go. How Microcontroller's different ports can be used in interfacing with several devices and what is basic differences between a Microcontroller and Microprocessor. With help of the information published in this paper we have identified which devices are compatible enough and can perform up to the marks without any degradation in performance after interfacing with microcontroller.

With help of IOSR Journal of Electrical and Electronics Engineering (IOSR-JEEE) "Design and Implementation of Astable Multivibrator using 555 Timer" we use the different feature of 555 timer IC to bind our system operation in timely manner. We use astable mode of operation for our work (also called monostable) it can produce accurate time delays from microseconds to hours. In astable mode it can produce rectangular waveforms with a variable Duty cycle. Accurate outcome were obtained with continuous production of Rectangular waveform without the aid of any external triggering. With the use of 555 timer, the system is stable, easy to use and requires low cost. In addition another important boon is that, generating time delays from microseconds to hours is useful for our work.

V. Pavlov, H. Ruser and M. Horn, "Feature extraction from an infrared Sensor array for localization and surface recognition of moving Objects". This paper help us to identify the compatibility of TSOP-1738 which is an IR Transmitter/Receiver Sensor, which can be used to receive IR signals of 38 KHz. The sensor specification are 5V and 5ma consumption to operate. We connected the signal pin (pin 3) IC to a microcontroller to analyses the IR signal received and it detected IR signals from Remotes. This also have high Range and wide coverage area and will respond only to IR signals. And due to high immunity against ambient light, low power consumption.

III. METHODOLOGY

Introduction of oldest technique

The traditional process is tedious as on most of the railway station in India now also when any train is going to arrive at any station than station master give signal to gate keeper which stand at near to railway crossing though telephone after that gate keeper give a signal to road users for gate closure and then he close the gate and he again call to station master for gate closing confirmation and then station master give signal for train passing. Once train passed from railway

crossing then gatekeeper call station master again and give information of train passing to him and then station master inform for opening of gate if there is no second train in line for arrival. So shortcoming of this technique is that it is a time consuming and manual labour dependent process, diagram of oldest railway crossing system is shown in figure.

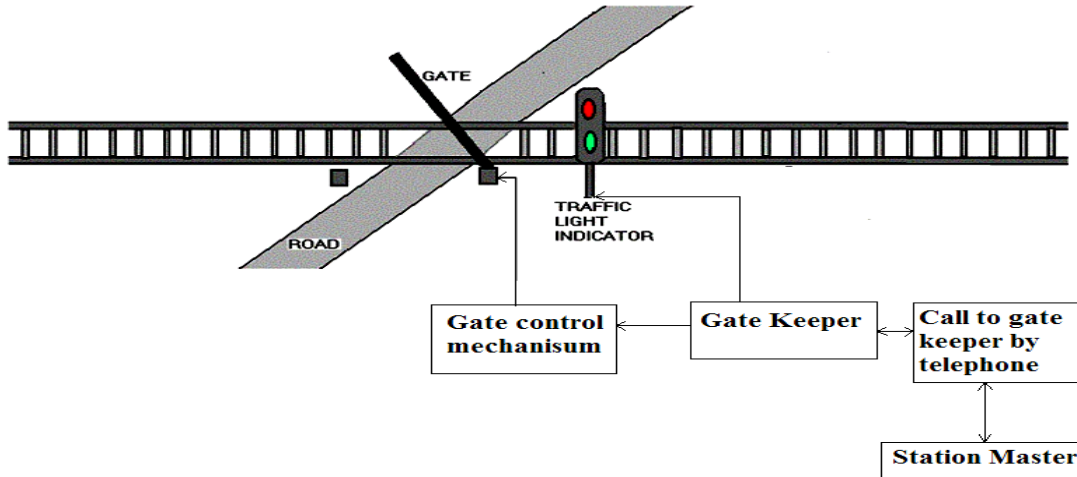


Figure 02: Single line diagram oldest railway crossing technique

Automatic control system

Automatic control system designed in a way where physical components connected in such a manner so as to direct or regular itself or by some another system, here some controlled condition forming part of the system is maintained in a prescribed manner. This system has influenced the current way of life. In recent year these types of systems have been rapidly increasing importance in all fields of engineering. Some wide range application of this system is from design of precision control devices to design of massive equipment used for manufacture of steel and other industries.

Here we use a D.C. series motor and Gear arrangement to show the gate lifting functioning. The IR sensor used at two points on the either side of railway crossing gate. The sensor transmitter transmit the signal which placed in engine, guard block. and IR receiver is placed on track which received a data and complete the circuit when train will pass through it than subsequently closed the gate and similarly when the train will pass through the another receiver which is mounted on the other side of gate, the receiver detect the signal to controller and get operated. Hence the motor will operate and with help of gear, gate will open or closed as required. The gate which is unguarded, at such place the percentage of accidents is more. Therefore to overcome such problems this system is capable.

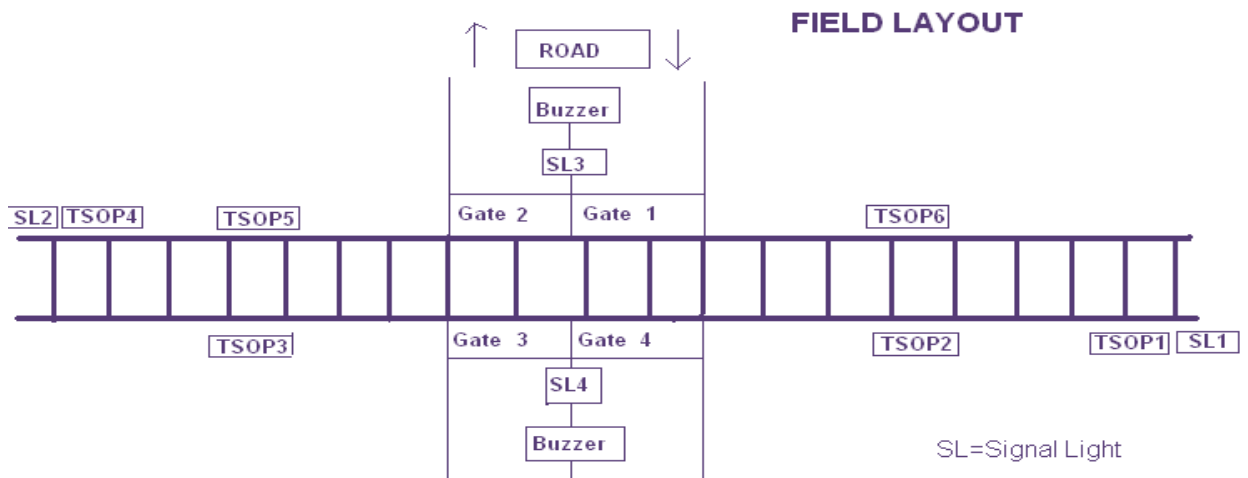


Figure 03: Field Layout of railway crossing

This is our working field layout. Railway track, Road and position of gates, TSOPs, signal lights, buzzers is shown below with operational steps.

Operational Steps: ---

- ❖ Gate 1 and Gate3 are the left side gate from where road traffic enters in the Gate assembly because in our country we follows the left side.
- ❖ Another two gates Gate3 and Gate 4 are the exiting gate for road traffic.
- ❖ SL1 and SL2 light signal for railway traffic and SL3 and SL4 are the light signal for road traffic.
- ❖ Buzzer is for indication of that for gates are close.
- ❖ SL1, TSOP1, TSOP2 and TSOP3 are for controlling the gate when train comes from right to left.
- ❖ SL2, TSOP4, TSOP5, TSOP6 are for controlling the gates when train comes from left to write.
- ❖ When train comes from our right hand direction then because of IR ledis placed in the left direction of engine so that it point to the sensors which is left side of engine i.e. TSOP1,TSOP2 and TSOP3 will be used for controlling the gates.
- ❖ When train comes from our left hand direction then because of IR led is placed in the left direction of engine so that it point to the sensors which is left side of engine i.e. TSOP3,TSOP4 and TSOP6 will be used for controlling the gates.

Block Diagram

Working block diagram of our project is shown below:

- ❖ In this diagram various module like TSOP sensors, signal light, buzzer and L293D ICs are connected by Atmega16 microcontroller.
- ❖ All module are controlled by microcontroller according to the program residing in it.
- ❖ Power supply for various module is provided by LM7805 (+5V regulator) or LM7812 (+12V regulator).
- ❖ The IR transmitter is placed in the left side of Rail engine which is sensed by left side TSOPs of engine when engine comes in line of sensors.

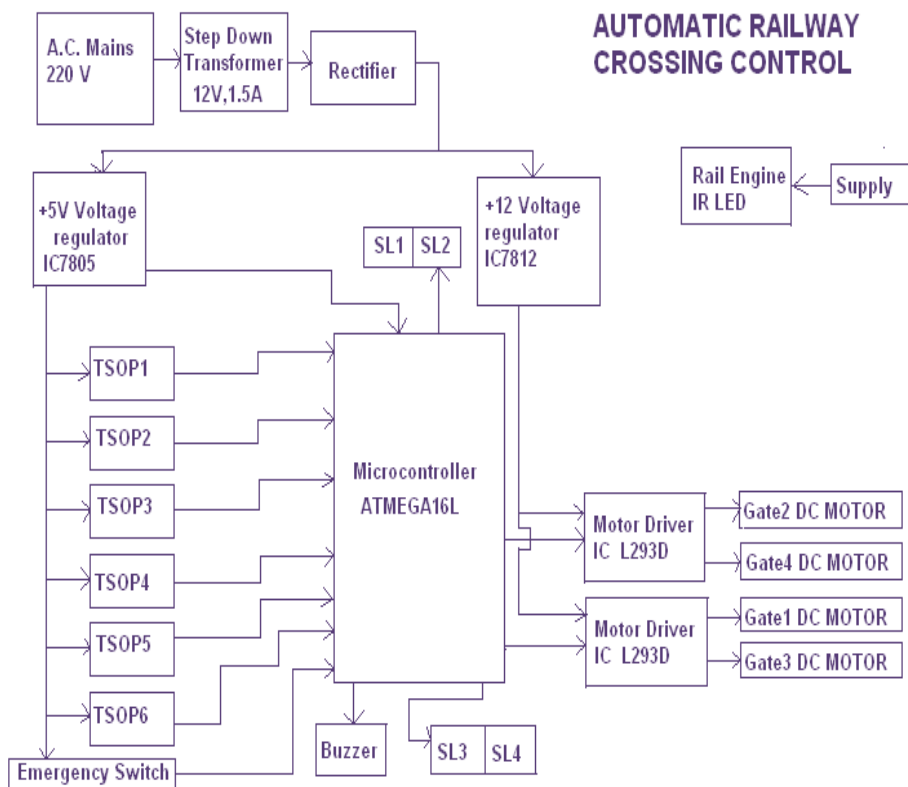


Figure 04: Block Diagram



IV. SOFTWARE SIMULATION

Introduction of CodeVision AVR

Atmel AVR family of microcontrollers contain CodeVisionAVR which is a C cross-compiler, Integrated Development Environment and Automatic Program Generator.

As allowed by the AVR architecture, the C cross-compiler consists of nearly all the elements in the ANSI C language, with some features added to take advantage of specificity of the AVR architecture and the embedded system needs. Atmel AVR Studio debugger use to compile COFF object files, it is a C source level debugger with variable watching. Automatic transfer of the program to the microcontroller chip using AVR chip which is built in Integrated Development Environment (IDE) of system programmer software. Software work joining with the Atmel STK500/AVRISP/AVRProg (AVR910 application note).

Code can be written in very small time using CodeWizardAVR Automatic Program Generator, with help of this software we have created the project and write the code for our microcontroller to operate the gate automatically when the sensor deliver the sensed signal. It will also do the needful input output port initialization for Atmega16, coding part is done in assembly language. By Chip programming features of Code Vision AVR we have read the chip signature and write-erase the code to obtain the desired result. Some of the screen shots of programming is below for reference.

1.) Selection of input output ports:--

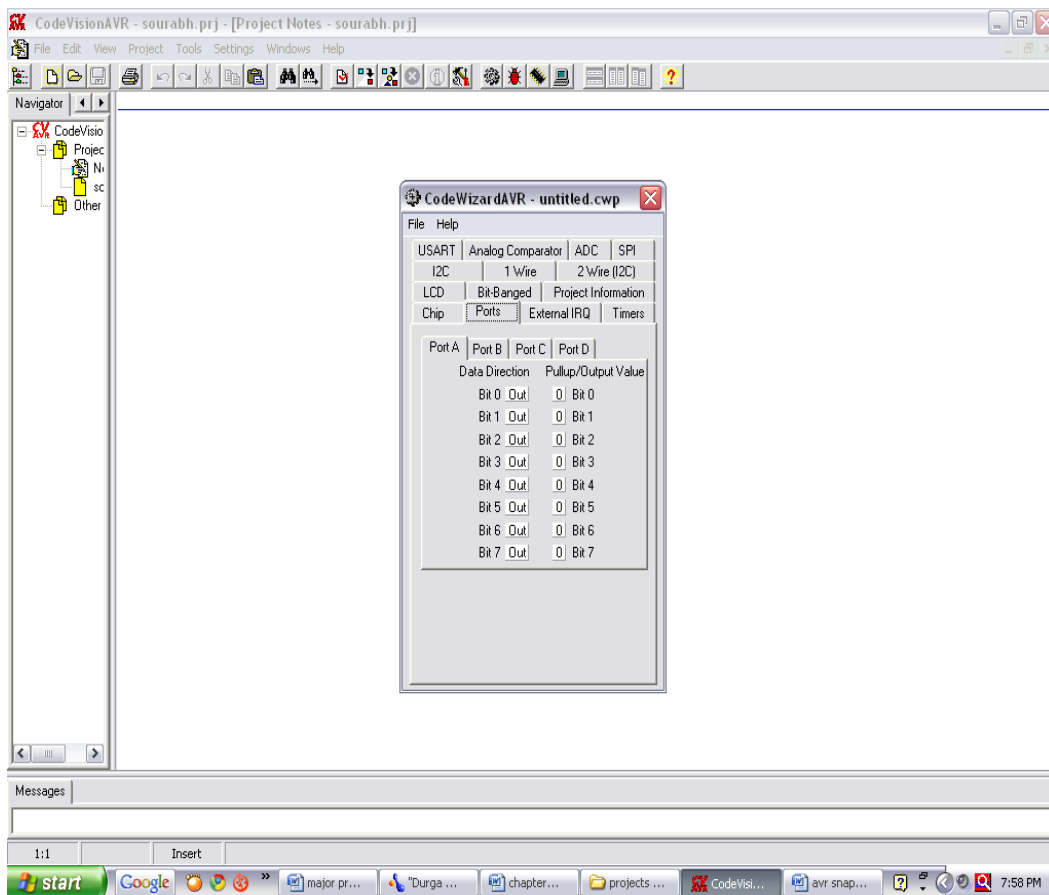


Figure 05: Port Initialization

2.) Compilation of assembly file:--

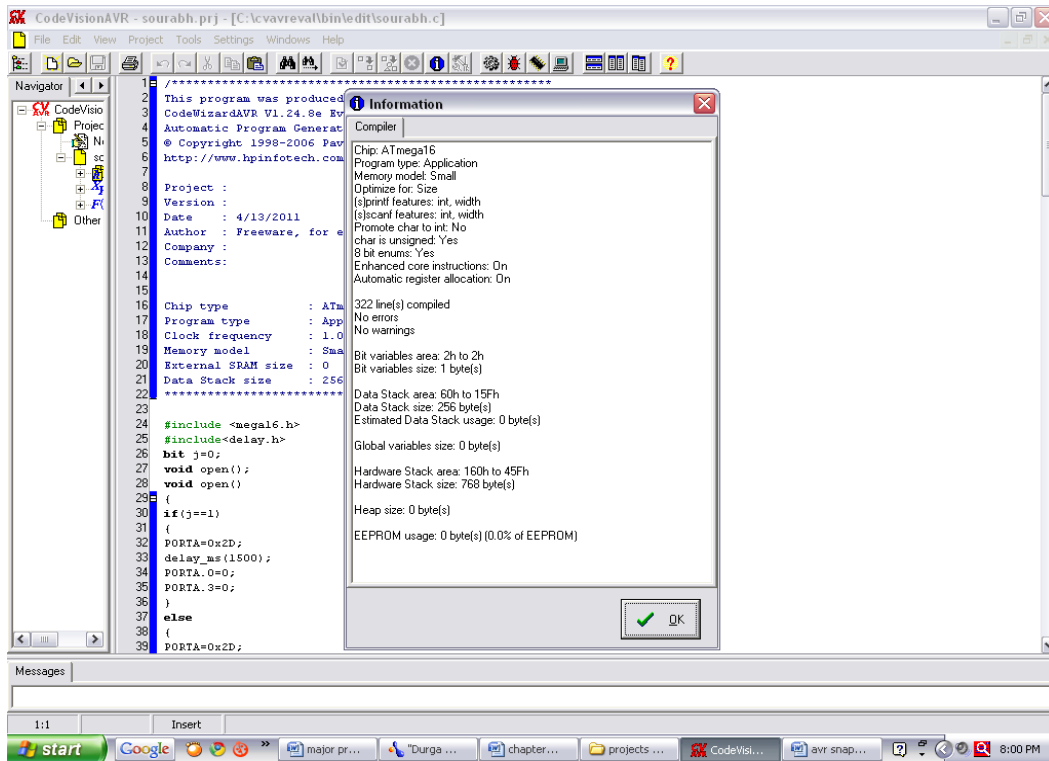


Figure 06: Compilation

3.) Reading chip signature and verifying the programming:--

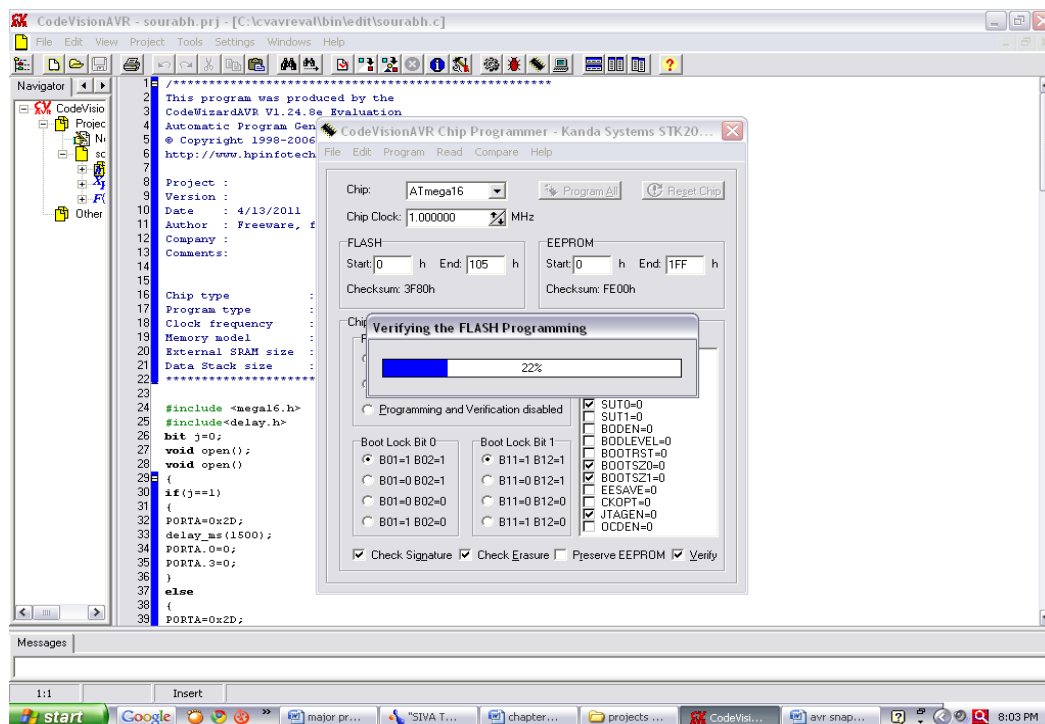


Figure 07: Chip Programming



V. RESULT

As we expected earlier we are getting desired result and when train comes from either direction TSOP sensorsensed its position using IR rays and according to sensed signal gates and various module of our project controlled with the help of programming.

So we are successfully received the desired outcome and now our concept is ready to implement in various security checks in crowded places, baggage handling in transport in addition with railway gate crossing in timely manner.

VI. CONCLUSION

System is completely automated in our work and providing us the desired result, so it avoids manual errors and thus provides ultimate safety to road users. This mechanism provides an overall fully functional automated crossing in both manned and unmanned crossings with below advantages:

- 1) Saving in energy requirements.
- 2) Elimination of human error and avoids the accidents.
- 3) Cost effective.
- 4) Time saving and efficient.
- 5) Bidirectional operation.
- 6) Traditional time consuming operation free.

Table 01: Comparison between traditional and automatic railway crossings

Traditional System	Automatic System
1. Manual working.	1. Electronic based.
2. Slow working.	2. Comparatively fast.
3. Mechanical pulley is used for barrier opening and closing.	3. DC motor and microcontroller is used for barrier automatic operation.
4. Unsafe and risky.	4. Safe & conventional.
5. Traffic rules are not exactly followed.	5. Traffic rules must to be followed.
6. Cheaper process.	6. Comparatively costly however can make it cheaper by using solar cell to operate gate phenomenon.

VII. FUTURE ENHANCEMENT

The concept of our model can be used for replacing current traditional system of railway crossing. Idea behind this model is to develop and replace the mechanical and pulley based railway gate. However in future we can replace the used power supply of the motor operation and signal lights with solar cell energy. These solar cells can use solar battery to store the solar energy during day time and charge the battery and use this energy during night time for gate functioning. And by this arrangement it can be used in remote areas where the power supply problem is always persisted with economic benefits.

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