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Design of an Advanced Intelligent Automatic Railway Gate Controller System for Avoiding Accidents at Crossing Points Using Verilog HDL

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Abstract: ***Railways being the cheapest mode of transportation are preferred over all the other means. In this paper a solution is proposed for the problem of accidents at railway crossings using VERILOG HDL. When train arrives at the sensing point, alarm is triggered at the railway crossing point so that the people get intimation that gate is going to be closed. This design utilizes two alarms on both sides of the tracks. One is fixed at upside (from where the train comes) at a level higher than a human being in exact alignment and similarly the other is fixed at down side of the train direction. Alarm activation time is so adjusted by calculating the time taken at a certain speed to cross at least one compartment of standard minimum size of the Indian railway.***

Keywords: Railway crossings, Automatic control, alarm, VERILOG HDL

1. Introduction

There are many railway crossings which are unmanned due to lack of manpower, needed to fulfill the demands. Hence, many accidents occur at such crossings, since there is no one to take care of the functioning of the railway gate when a train approaches the crossing. The objective of this project is to manage the control system of railway gate.

The proposed model has been designed to avoid railway accidents occurring at unattended railway gates, if implemented detection of train approaching the gate can be sensed by means of sensor placed on the gate. Now a days, India is the country which having world's largest railway network.

Over hundreds of railways running on track every day. As we know that it is surely impossible to stop, the running train at instant is some critical situation or emergency arises. Train accidents having serious repercussion in terms of loss of human life, injury, damage to Railway property. These consequential train accidents - include Collision, Derailments, Fire in Trains, and Collisions of trains at Level Crossings. Our country is a progressive country. It has already enough economical problems, which are ever been unsolved.

To avoid all these things some sort of automatic and independent system comes in picture. So, keeping all these things, aspects, and need of such system our paper tries to make such type of system with the help of various electrical, electronic and mechanical components.

2. Existing System

Accident contributors such as train visibility advance signs, active warning, driver behavior, driver distraction and risk taking have been identified as common human factors contributors to vehicle train grade crossing accident. Factor includes highway and railway characteristic are contributing factor to accident at Railway Level Crossing (RLC). The environmental factors are snow, heavy rain, fog, or blowing snow, which collision the train.

The three main factors contributing to accidents at RLC is basic safety engineering studies, human factor, engineering factor, and environment factor. The taxonomy of railway intersection accident contributors was created.

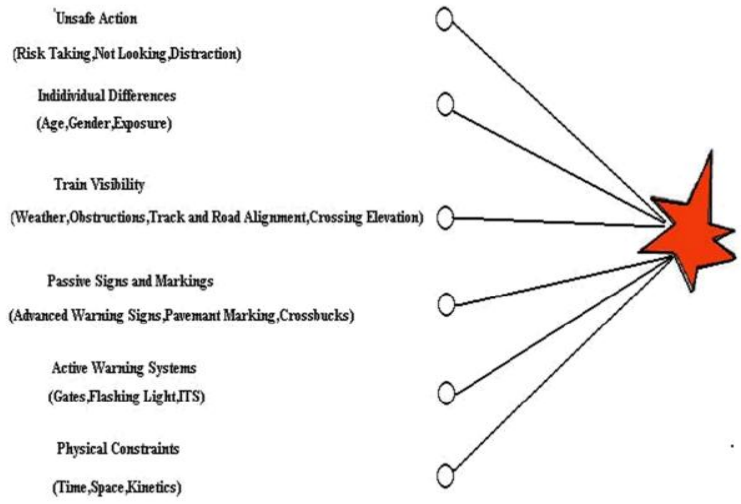


Figure 1: Specific Case and Common Patterns of Accidents

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. As trains cannot be centrally located, often more than one train runs on the same track in opposite direction leading to accidents.

2.1 Existing Problems:

1) Presently in Indian Railway only semiautomatic railway gate operation is followed in certain areas.
2) Signals are located in the vicinity of the railway gate along with gate master board and a marker light.
3) 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 build - up before the next train arrival at the crossing.
4) A number of train accidents happened due to a manual system of signals between stations.
5) Presently signals are control by mean of interlocking system and for this system require regular maintenance and upgrading.

3. Proposed System

This paper is designed to avoid railway accidents happening at unattended railway gates, if implemented in spirit. This design utilizes two alarms on both sides of the tracks. One is fixed at upside (from where the train comes) at a level higher than a human being in exact alignment and similarly the other is fixed at down side of the train direction. Alarm activation time is so adjusted by calculating the time taken at a certain speed to cross at least one compartment of standard minimum size of the Indian railway.

This design is to Automate unmanned railway gate using VLSI Technology. When train arrives at the sensing point, alarm is triggered at the railway crossing point so that the people get intimation that gate is going to be closed. Then the control system activates and closes the gate on either side of the track. Once the train crosses the other end, control system automatically lifts the gate. The logic is produced by the program written in VERILOG language. The software program is executed, by using the ISE environment.

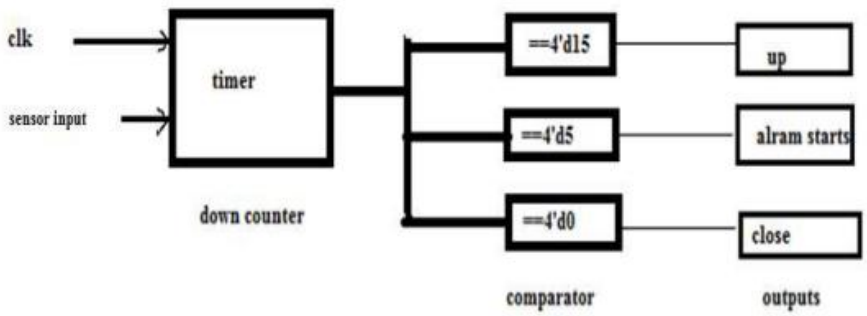


Figure 2: Block diagram of Proposed System

Initially the gate will be in open state and the counter is set high [4'd15]. And by sensor input the counter starts

decrementing according to the provided clock. If the counter reaches at count 4'd5 then alarm is buzzed. If the counter reaches at count 4'd0 then the gate will be closed.

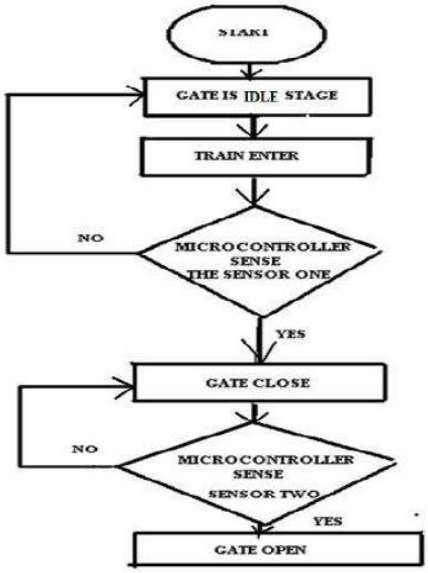
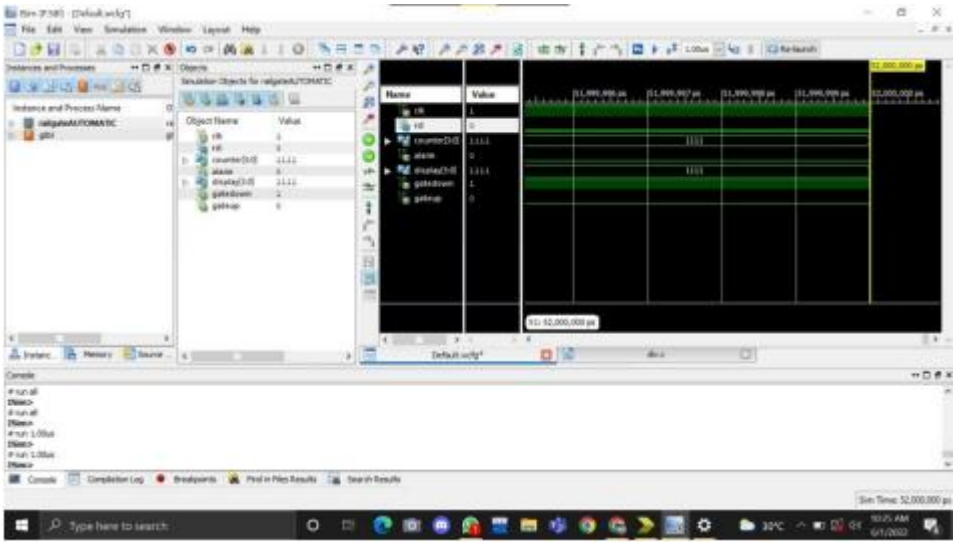


Figure 3: Flow Chart

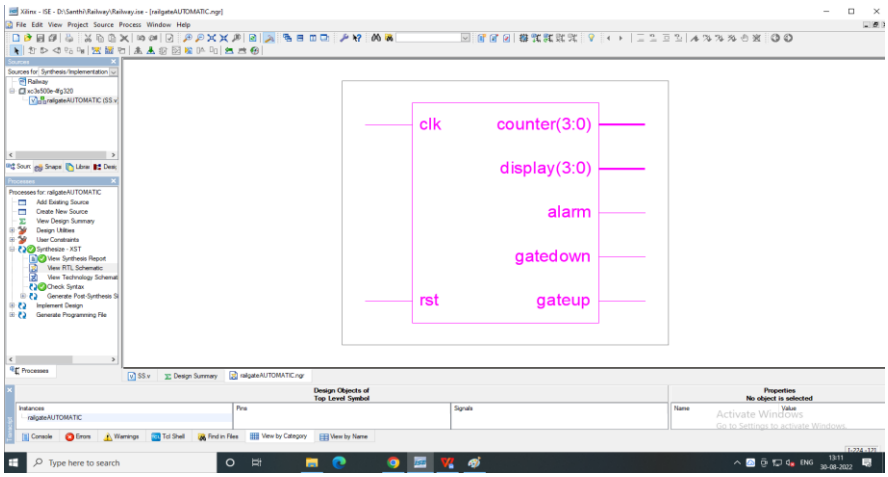
3.1 Steps in Flow Chart:

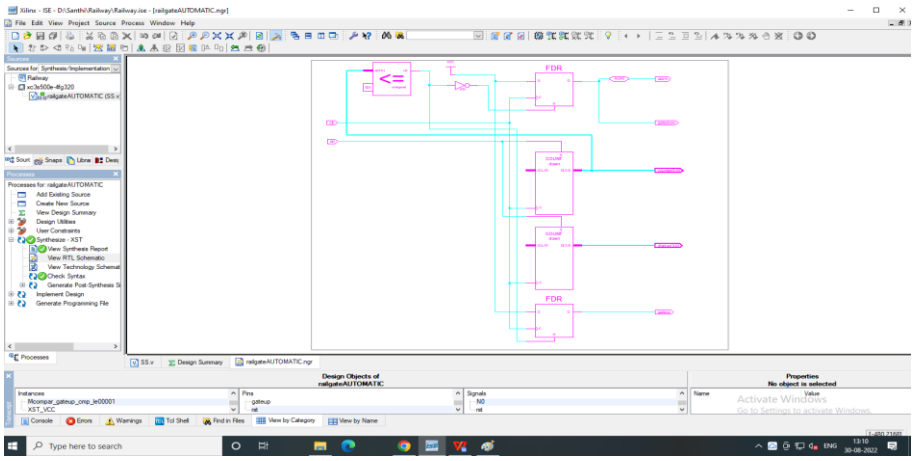
1) Start.
2) Set the variables.
3) Make initial settings of the signals for the train.
4) Check the arrival of the train in either direction by the sensors. If train is sensed go to STEP 5, otherwise repeat STEP 4. Close the gate.
5) Change the signal for train.
6) Check the train departure by the sensors, if the train sensed goes to STEP 8, otherwise go to STEP 5. the train sensed to STEP 8. otherwise go to STEP 5.
7) Open the gate.
8) Go to STEP3.

4. Simulation Results:



RTL Schematic:





5. Conclusion

The unmanned railway gate controller basic model is analyzed and implemented, synthesized and simulated in Xilinx - Ise tool. The implementation of automatic gate system will advance a lot in today's life and provides less risks of getting accidents. The analyzed design is implemented using the VERILOG HDL language. By providing the best proximity sensors are placed and according to that the operation of closing door and opening door will get related so that the whole automatic railway gate controller can be implemented effectively.

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