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Integrated Automated System in Railway Network by Fuzzy Toolboxes

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Abstract: Nowadays we are witnessing a huge development in railways and an enormous increase in the number of trains. Even though it brings us a lot of boons, there is also a danger of losing lives in the unmanned level crossings and in the railway stations while the passengers try crossing the railway tracks. This paper focuses on the automation of the unmanned level crossings and also the path connecting two platforms in the railway stations. The system proposed in this paper also reduces the use of flyover bridges in the railway platforms. Instead of flyover bridges, an automated path is proposed between two platforms. This system has three sensors placed before and three sensors placed after the gate. When the first compartment of the train passes through the first sensor the gate closes. When the last compartment of the train passes through the last sensor,the gate opens. The same technique is used in the pedestrian crossing in the stations. The simulation of this integrated system is done by Fuzzy toolbox. This paper briefly explains the simulation of the integrated safety system in railway networks and the possibilities of reducing the losing of lives in the tracks.
Keywords: fuzzy-toolbox, railway safety, unmanned crossings

I. INTRODUCTION

There is an enormous development in our country's railway network. This has led to the increased number of the trains all over the country. As our country has the world's second longest road networks, there occurs the possibility of interruption of roads in the railway tracks. Thus there are several level crossings installed everywhere all over the country. As not all the level crossings are controlled by humans, there are still several unmanned level crossings in our country. This has led to the increased number of accidents across the unmanned level crossings. The haste and hurry of the humankind can be taken as the reason for accidents. Also the same situation prevails in the railway stations. We have flyover bridges in the railway stations. But most of the passengers find it idle to use the flyover bridges. Also the aged persons cannot use such bridges. When they try to cross the track in a hurry there occurs the danger of getting trapped in the train. To avoid this issue, the path is proposed between the two platforms. If the path is laid, it may interrupt the trains. Thus the automation of the path is proposed. The system proposed here is the integration of the unmanned level crossing control and the path control.

II. FUZZY TOOL BOX

Fuzzy tool box is the collection of functions built on the MATLAB numeric computing environment. It provides the tool to create and edit the fuzzy inference systems within the framework of MATLAB. It also integrates the fuzzy systems with the SIMULINK. The building of stand alone C programs that call on fuzzy systems that are built with the MATLAB. The fuzzy toolbox heavily relies on the Graphical User Interface(GUI) tools. The toolbox provides the following tools 1)Command line functions, 2)Simulink functions along with the commands and 3)Graphical tools 4)Interactive tools. Fuzzy is used here because it is tolerant of imprecise data. It can also be blended with the conventional control techniques.

III. SYSTEM PROPOSED

A. Unmanned Level Crossing Management

The system proposed here includes six counters in total.Three are placed before the gate and three placed after the gate.When the first compartment of the train passes through the first counter the gate is closed.When the lst compartment train passes through the last counter the gate is lifted up.

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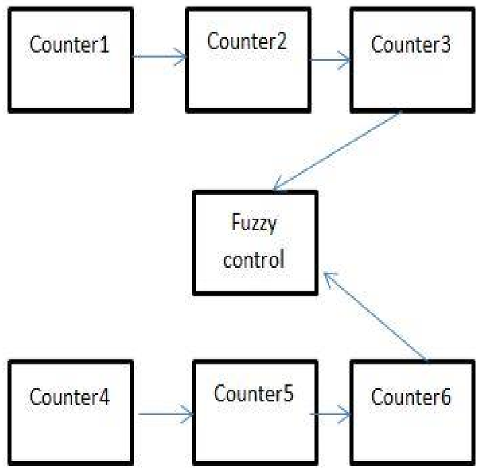

Figure1: Block diagram of the system

IV. SIMULATION

The simulations with the following steps.

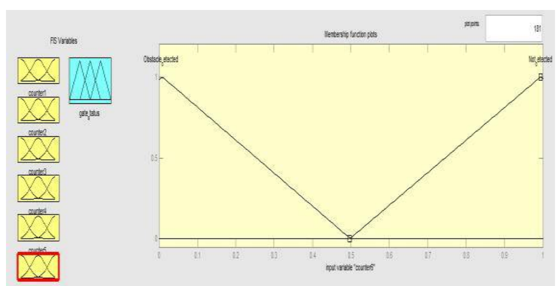

Figure 2:FIS Editor

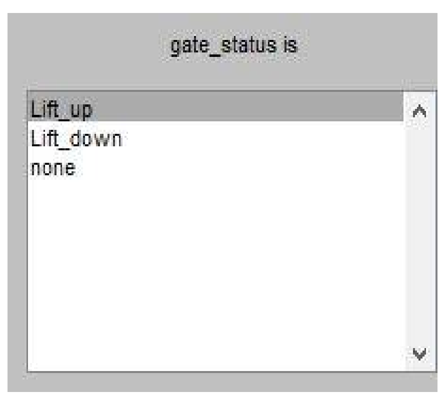

Figure 3:Input Membership functions.

Six counters are taken as the input membership functions and the gate status is taken as the output membership function.The six membership functions are analyzed by the fuzzy logic and the decision is taken.The rules are given as per our requirement.The rules consider the inputs given and the output which has to be obtained.The input signal is varied and the required output can be obtained.

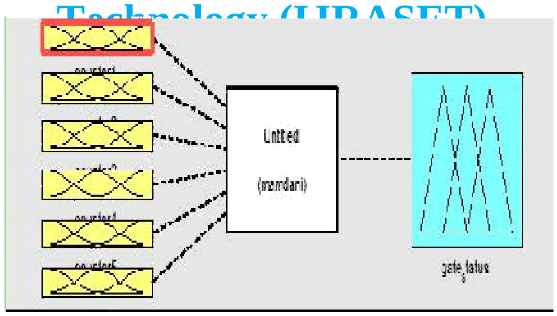

Figure 4:Output membership function

The rules are fed as follows,

Figure 5:Rules editor

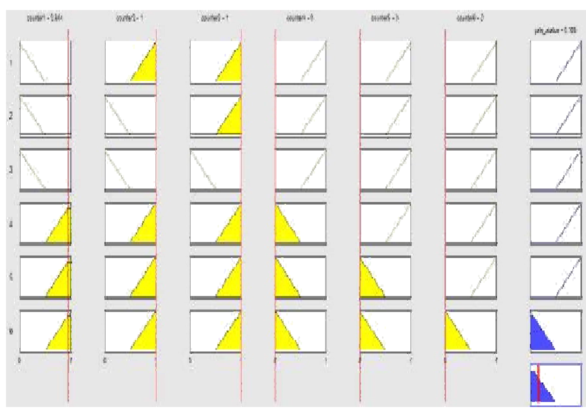

Figure6:Rule viwer in 1st case.

In this case,the train is passing through the first counter.The first compartment of the train is passing through the first counter

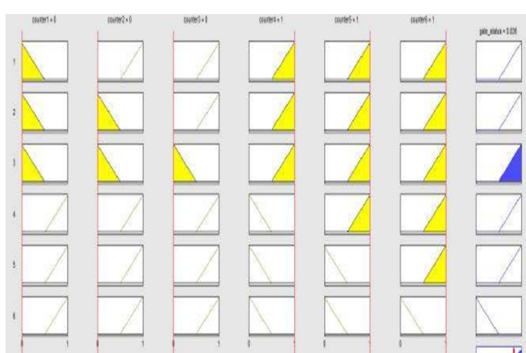

Figure 7: Rule viewer in 2nd case

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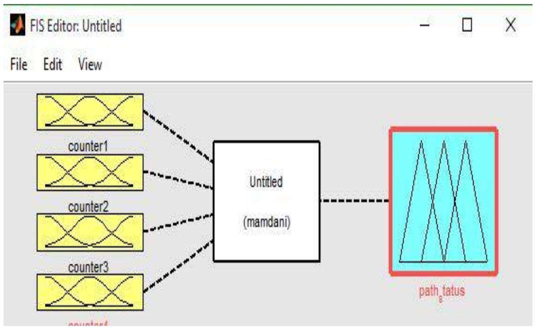
In this case,the last compartment of the train has passed through the last counter,thus the gate is lifted up. These diagrams show that the system is working properly.Thus the unmanned level crossings can be made automated.The simulation is successfully achieved using the fuzzy toolbox.

Passenger Bridge Automation

This system also works on the same principle.Unlike the previous system,this system is installed in the railway stations.The path which is proposed in this paper is laid between two platforms.Two counters are placed before the path and two after the path.When the train comes near to the path,the path is closed which may



prevents the passengers to cross the path. After the train passes through the path,it is opened for the passengers.The simulation of this system is done by fuzzy toolbox. The signals from the four counters are taken as the inputs and the path status whether it has to be opened or closed is taken as the output. The next procedure is to feed the membership functions.It is done as follows.

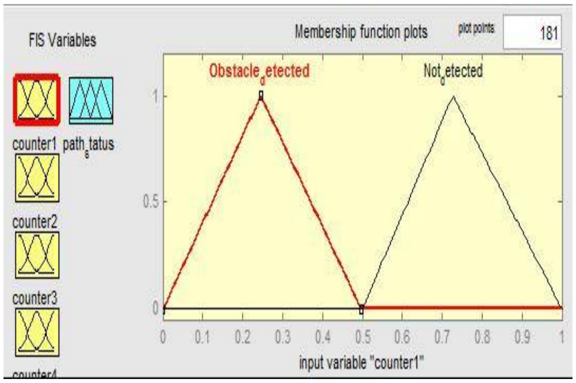


Figure 8:Input membership functions.

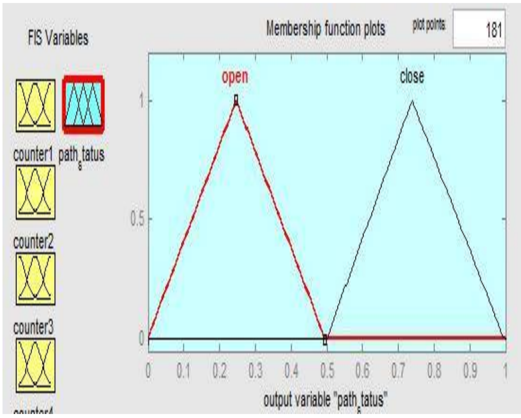


Figure 9: Output membership functions.

Then we have to consider the rules for the operation of the system.The rules can be set as per our requirement.Several cases of possibilities are considered here.

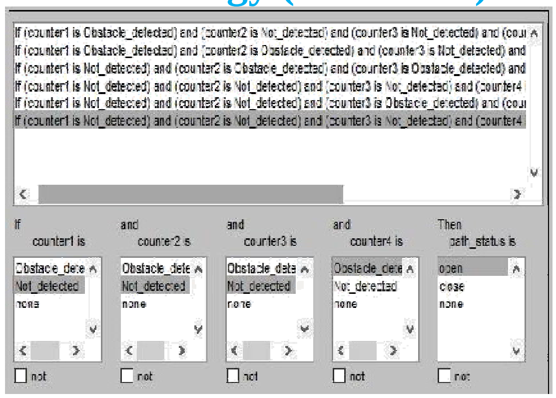


Figure 10:Rule editor.

Case 1: If counter 1 detects the obstacle and others don’t, the path has to be closed.
Case 2: If first two counters detects the obstacle and others don’t, the same state is maintained.
Case 3: If first and last counter not detects the obstacle and other two detects, path has to be closed.
Case 4: If first two counters not detect the obstacle and other two detects, the path is closed.
Case 5: If last counter alone detect the obstacle and others don’t, the path is opened.
The simulation is carried out and the output is obtained as follows.

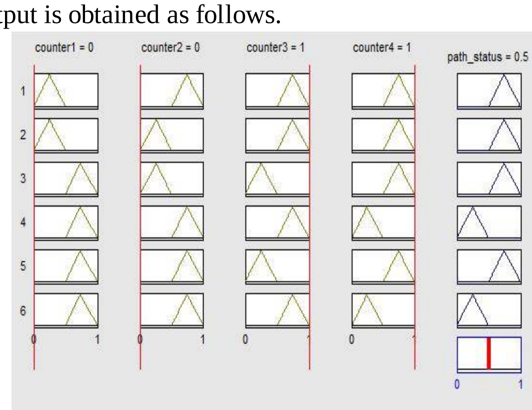


Figure 11: Rule viewer

These diagrams show that the system is successful in its operation.Thus the fuzzy logic is used to simulate this system successfully.

V. ADVANTAGES

This system reduces the death toll in accidents.
This system is easily controllable.

VI. CONCLUSION

As we don’t have enough measures to implement in the unmanned railway level crossings.The simulation of the system can be prove advantageous.This system if implemented in the daily life use,the number of accidents can be reduced.Also the death toll in the accidents can be reduced.The research and development in this area can help in reducing the risk of accidents.

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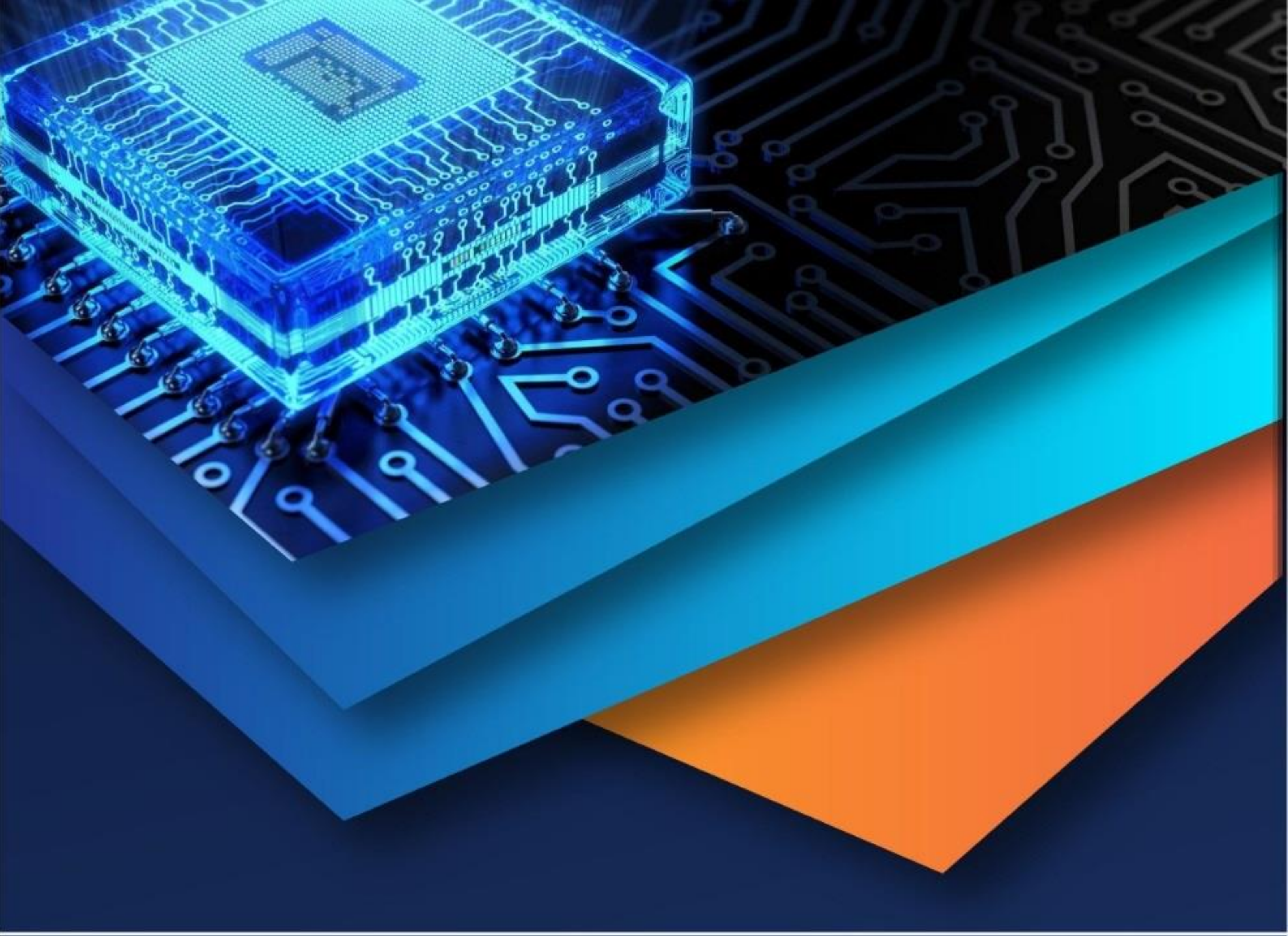

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