A NEW STEP TOWARDS SAFE INDIAN RAILWAY

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ABSTRACT

The objective of this paper is to propose a new way of solution for problem creates by fog. 'Bring the signal to the pilot cabin' concept has been proposed first time known to our knowledge. This work shows a PLC based model for controlling Railway Gate automatically and reduce the number of accident at Railway crossing. We have used 38 KHz and 36 KHz for signal transmission respectively for red and green signal. This experiment allows less number of mishaps at level crossing for both manual and natural (fog) reason.

Keywords: ***Fog, Railway Gate Control, PLC Ladder Logic***

I. INTRODUCTION

Every year the Indian Railways incurs heavy losses due to fogs. In last 3 years the Indian Railways has lost in access of 1 lakh crores due cancellation of trains, heavy delay in running trains and accidents occurring due to foggy conditions. Moreover many people have lost their lives in these mishap, those have tagged the Indian Railways as unsafe and unreliable [1 -7]. Though railways has been using Firecrackers [1 ,2,3] , it is not really very fruitful as it has no impact on late running train. Previous work used GPS based system for navigation [7]. In this paper we have introduced a PLC based gate control system with prevention of fog problem inbuilt. It has potential to replace GPS based systems.

II. TECHNICAL APPROACH

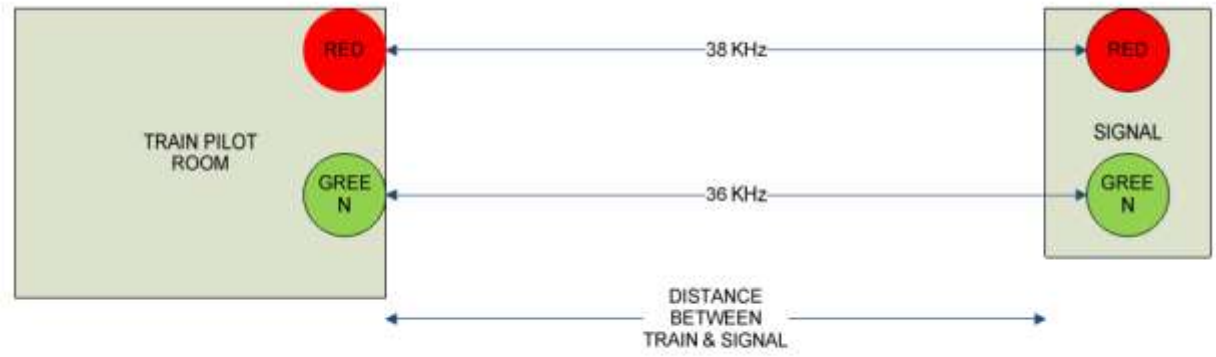

Figure 1: New approach for fog problem

The main idea behind this work is that normally trains delayed because the pilot could not find the nearby signal. So if any way we can bring the status of the nearby signal in front of the pilot, whether it is green or red, then the work will be done. We connect two IR LED along with two signaling LEDs, green and red such that when green signal

will be ON first IR LED will generate one frequency and for red signal second IR will do the same. We set the frequency for first IR is 36 KHz and for second IR 38 KHz. In the same way we have introduced two different receiver circuit using TSOP 4836 and TSOP1 738. These two signal receiver will be situated at locomotive pilot room. If TSOP4836 receives signals with 36 KHz it will set one green LED and TSOP1 738 will set a red LED after receiving 38 KHz in the pilot compartment. Now when the pilot will unable to see the signals due to fog, those IR LEDs will transmit the respective frequency which glows the corresponding LEDs in pilot compartment.

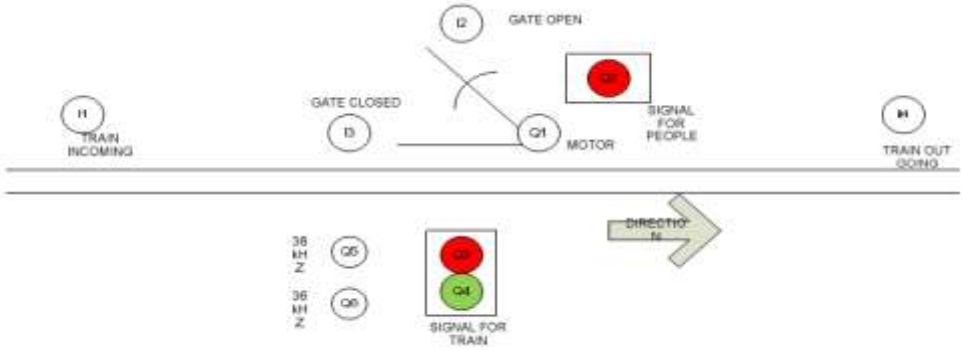

Figure 2: Schematic model

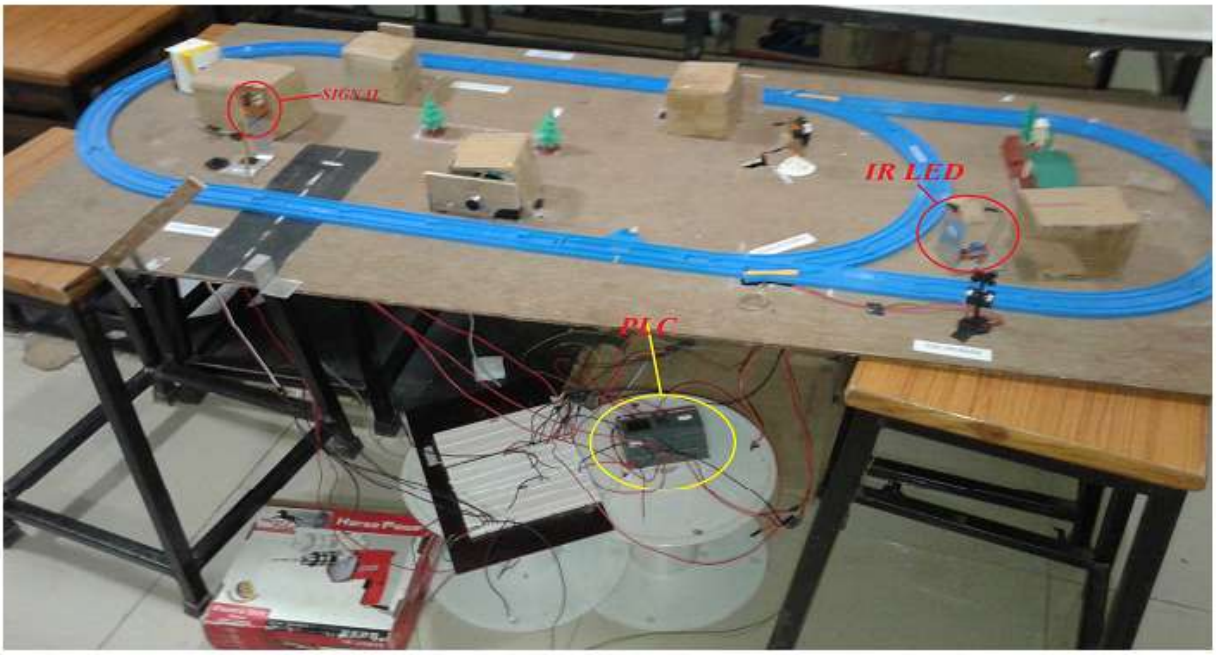

Figure 3: Actual set up

III. HARDWARE SET UP

The entire model (Figure: 3) consists of sensors, actuators and controller. All the sensors used are capacitive proximity type and a servo has connected for gate control. After fetching sensors data a PLC (ABB LM043 CE20TDC) will run the motor and glow LEDs (Figure 2).

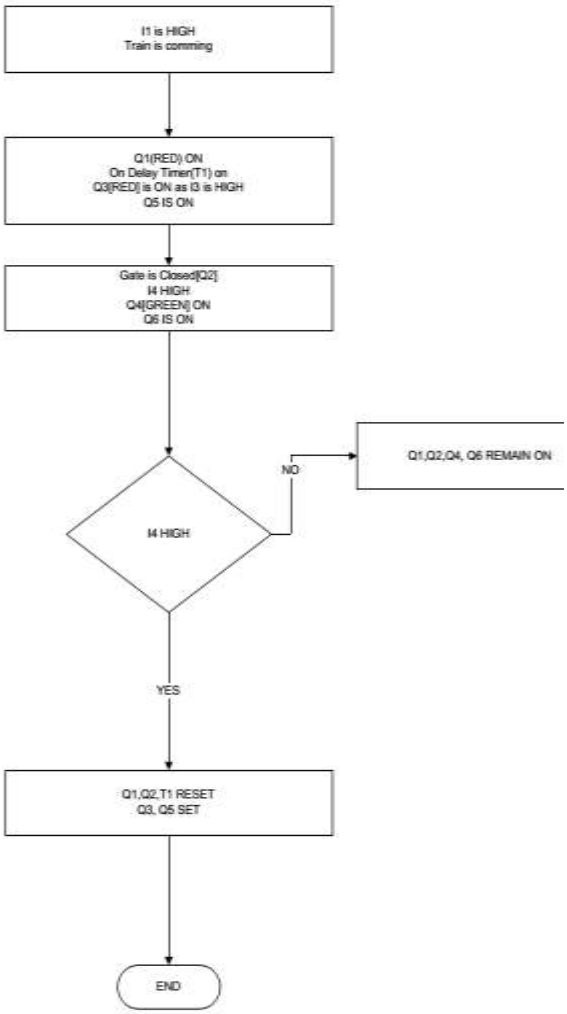

Figure 4: Algorithm

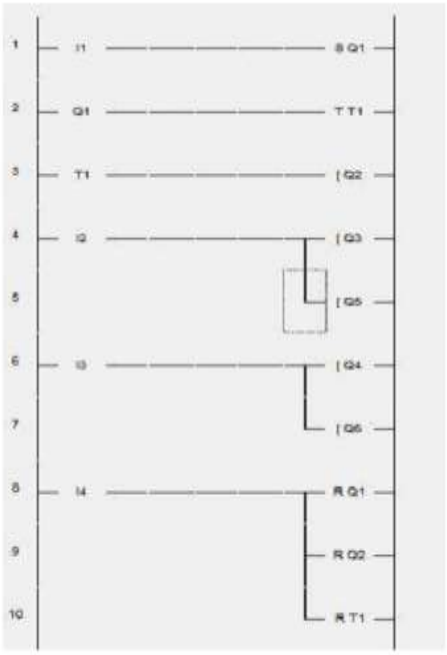

Figure 5: PLC ladder logic

Figure 4 and 5 describes the algorithm and PLC ladder logic. I1 sensor goes HIGH when any train will be coming and it will then activate a red signal (Q1) and a on delay timer (TT1) for certain time. Once timer is set, it will start closing the gate (Q2). I4 will reset the timer and Q1 , Q2 when it will go HIGH. That means train has already passed by. I2 and I3 will make change in the signal for upcoming trains. If the gate is open I2 will go HIGH and activate (RED) Q3 along with an IR LED (Q5) which will transmit 38 KHz, else the gate will be close and I3 goes HIGH. I3 will activate Q4 (GREE) along with another IR LED (Q6) which will transmit 36 KHz.

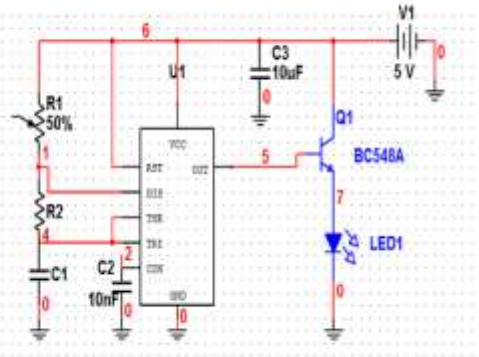

Figure 6: Transmitter circuit

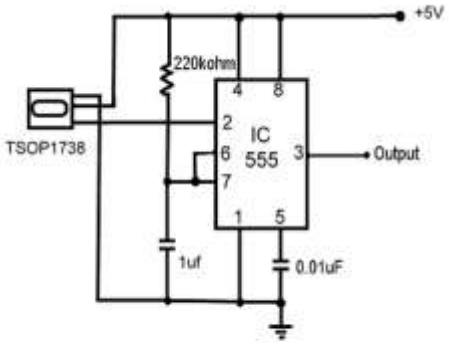

Figure 7: Receiver circuit

A transmitter circuit (Figure: 6) is made up of IC 555 timer and IR LED. We can set the output frequency by changing the parameters like R1 , R2, C1 . Table 1 shows the respective component values to get 36 KHz and 38 KHz. In the other hand a receiver circuit (Figure: 7) is consists of IC 555 timer and TSOP. If we connect TSOP1 738, it will receive ~ 38 KHz and TSOP4836 will do the same for ~ 36 KHz,

Table 1: Frequency Calculator

C1	R1	R2	TIME PERIOD	FREQUENCY	DUTY CYCLE
0.001µF	18 KΩ	10 KΩ	0 sec	37.99 KHz	73.7%
0.001µF	10 KΩ	15 KΩ	0 sec	36.07 KHz	62.5%

VI. CONCLUSION

We have successfully implemented this work with hardware set up. Receivers and transmitters are operating faithfully. 'Bring the signal to the pilot cabin' concept has been proposed first time known to our knowledge. Though it has some sort of limitations like smaller range and noise effect to transmit signals, we can overcome these problems by using antenna and faithful modulation techniques. This work has the potential to replace GPS based system and reduce accidents. A PLC has been introduced as it has a lot more advantages than that of a simple microcontroller.

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