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AUTOMATIC CONTROL SYSTEM FOR RAILWAYS

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Abstract: Since human error is inevitable in any sector of life, railways are one of the public transportation used mostly. And where human error or negligence can cause great casualties of human life. The machines or rather autonomous system has been introduced long ago in many aspect of life to mitigate the errors generated in humannegligence. To solve this problem we built a prototype for a project that can takes decision depending on the situation or peripheral conditions to diminish the accidents that occur in railways. Our project called as automatic control system (ACS) for railways, uses a RF receiver, microcontroller, and driving mechanism to control the motion of railway depending the traffic signal generated in the surroundings. We programmed the system such that, it will generate PWM signal of different width to drive the train at different speed for different signals. While switching from on signal state (RED, GREEN, YELLOW) to other signal state, (YELLOW, GREEN, RED) the change in the width of PWM is not abrupt, instead the width of PWM increases or decreases monotonically. This PWM signal is fed to the driving mechanism of the railway, to control the speed of it. The average speed depends on the duty ratio of the PWM signal, a 50 per cent duty ratio means average speed is half of the given speed and 0 per cent duty ratio means average speed is zero, hence train will be stopped for 0 per cent duty ratio. To test this algorithm we built a prototype of the system with a cart to which DC motor driving wheels are connected.

Keywords: Microcontroller, railways, RF receiver, transmitter.

I Introduction:

The growing traffic on the railways as well as the demand for higher speed increases the safety systems requirements. The train control system plays a vital part in the safety ofthe railways and is the link between landside equipment such as interlocking, line block etc. and rolling stock. We developed a prototype of microcontroller based control system to control the locomotion of the railways hence to avoid accidents due to human errors. The system is built using a microcontroller and a RF receiver and driving mechanism.

The RF receiver will receive the traffic signals of the track which are generated on RF transmitter side and depending on the status of the type of signal (i.e. RED, YELLOW, GREEN) and current state of the railway (i.e. running or stopped) decision will be taken by the automatic control system (ACS) to actuate or break the motion of the railway.

The paper is organized as follows: in section II the operation of the system is and the algorithm is explained, section III has results of various scenarios and section IV contains the conclusion of the paper, section V shows some practical set up of the prototype and references.

II ACS operation and algorithm

The Fig 1 shows the block diagram of our ACS. The RF receiver will receive the traffic signal from the track whenever it is generated and decode it and fed to the microcontroller. The signal sensed by the receiver is given to the microcontroller for the operation. According to the signals as mentioned R, Y & G the respective output is given to driving mechanism of the train. The microcontroller will generate Pulse Width Modulation (PWM) signal for controlling the speed of the train.

Consider that at present train is running on normal condition and a Red signals occurs at some instant then ACS will generate PWM signals to stop the train. It does not stop simply by applying sudden break, instead the a monotonically decreasing in duty ratio signals are send to the driving mechanism and at last it stops the train. Similarly if the train is in halt state due to R signal or any other reasons, the microcontroller generates the a monotonically increasing in duty ratio

signals and send to driving mechanism to gain the full speed of the train.

As it is shown in Fig 1, there is also a block of signal which will imitate the detected signals so the driver will know the status of traffic signals. If driver wants then he can overwrite the operation of the system by using his credentials.

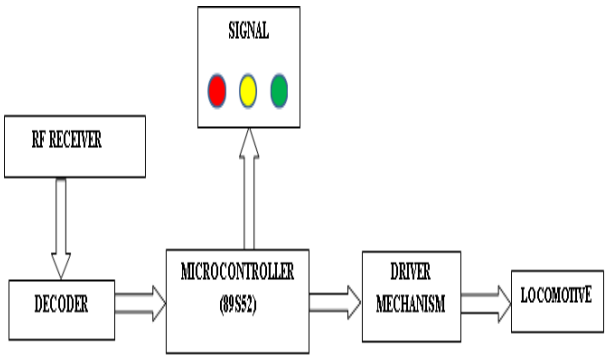


Fig. 1 Block diagram of the ACS

Steps involved in the decision making

1) Initialize the system.
2) Check for traffic signal until it occurs.
3) Generate interrupt on occurring of traffic signal.
4) Decode the traffic signal and also store the present state of the train.
5) Compare the traffic signal and present state.
6) If both are same then continue with the same width of the PWM signal.
7) If the signal received is different then set the appropriate width for PWM. Stay in this until interrupt is generated by the traffic signal.

These are the steps involved in the programming of the microcontroller. Apart from the traffic signal the manual stopping and starting of the train are considered as respective signals for the system. If driver stops the train due an emergency or any other reason the system will turn on Red light on the panel and the all conditions of Red traffic light will be activated. If railway is in normal running mode, the Green light on the panel is turned on.

III Results

This section includes the results that has been generated by the ACS on various conditions. Like if the present state is Green and a Red light occurs then what will be nature output at PWM.

Case 1. Let the present state of the train is Red. This Red signal can be due to the traffic signal or due the manual stopping. From Red the train may switch to either in Yellow or Green state. Again, these signals become active either due to traffic signals or due to manually.

The following figure, Fig 2, depicts the change in the width of PWM signal, due to Red to Green switching of state.

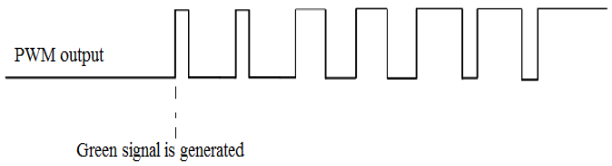


Fig. 2 PWM output

The following figure, Fig 3, depicts the change in the width of PWM signal, due to Red to yellow switching. When yellow signal occur the program of ACS will keep the train at slower but constant speed. Here we are generating a pulse of 50 percent duty ratio.

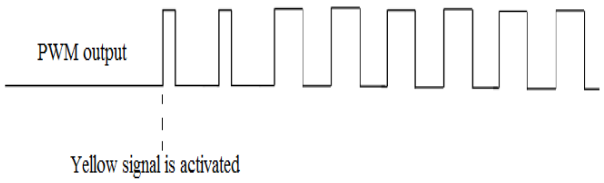


Fig. 3 PWM output

Case 2. Let the present state of the train is Green. This Green signal can be due to the traffic signal or due the manual starting. From Green the train may switch to either in Yellow or Red state. Like in case of red, these signals become active either due to traffic signals or due to manually.

The following figure, Fig 4 depicts the change in the width of PWM signal, due to green to red switching.

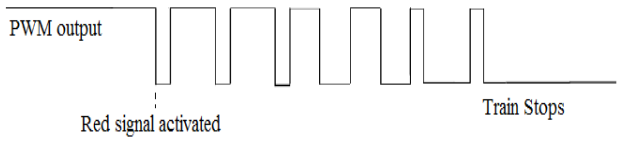


Fig 4 PWM output

The following figure, Fig 4 depicts the change in the width of PWM signal, due to green to yellow switching.

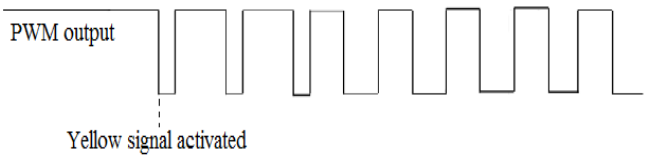


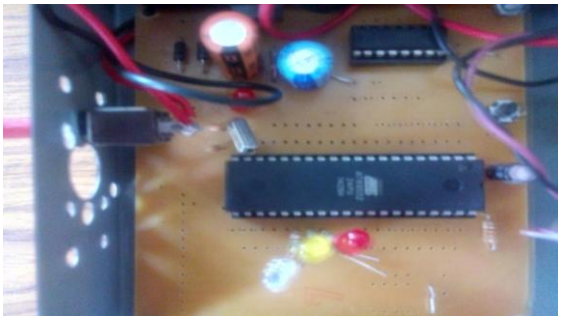
Fig 5PWM output

Similarly for case 3, i.e. for yellow signals the PWM signal will change depending on the transition signal.

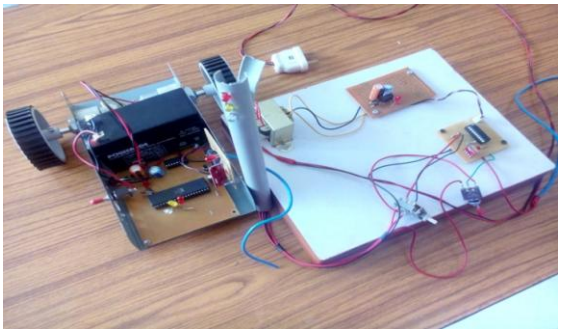
V Practical Set Up

The following photographs show the practical set up of the prototype we have built. Here the output is given to DC motor instead of railways' driving mechanism, except this only thing we made the setup for analogous to real situations in railways.

For this ACS we have used ATMEL's microcontroller AT89s52, L293d to drive motors, a module of RF receiver and transmitter and encoder, decoder pair.



Photograph 1.Microcontroller Circuit



Photograph 2. Practical hardware set up for ACS.

IV Conclusion

The automatic control system built by using microcontroller provides more accuracy and helps in reduction of the accidents caused on the track. Here the microcontroller do continuous monitoring of traffic signals and gives speed control operation for railways, hence ACS completely eliminates the human errors to hence it is more reliable system.

References

1] 8051 Programming and Embedded Systems using C and Assembly Language by
Muhammad Ali Mazidi and Janice GillispieMazidi

2] 8051 microcontroller by SubrataGhoshal, Pearson Publication.

3] http:// www.alldatasheets.com