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A Model of Accident Avoiding System for Trains

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ABSTRACT: Safety must be the top most priority in train running and it plays an important role in safe running of trains in our country. Already many systems are existed to avoid accidents, even though an attempt is made in this project work to study the subject of train accidents avoiding systems to enhance the technology further. The Train Collision Avoidance System (TCAS) is the major subject to detect unsafe situations arising due to over speed and train collisions in station area. The advanced accident prevention methods must be incorporated those measures under which the trains will be in constant communication with the protection systems through electronic communication systems. Although, Indian Railways have safe running devices, we have made an effort to cover few more important features like, 1 – to detect the track break in running rail track, 2 – object detection in between the tracks with auto control, and 3 – auto stop when train detects Red signal present over the track side signal post. These are the three important parameters incorporated in our project work and for live demo, a mini model train will be constructed over which all required sensors and their control circuits will be installed to prove the theme practically.

The demo module presented here is aimed to design self controlled which is aimed avoid accidents. Monitoring the track side signals manually and controlling the train accordingly is the existing method, in this process due to the human errors, sometimes accident may take place. To avoid human errors, this automatic system is developed such that the system itself monitors the trackside signal and controls the train accordingly. To simulate the train, a moving motorized mechanism will be constructed using spur gears and specially designed metal grooved wheels such that the moving mechanism will not deviate from the track.

Major building blocks: Simulation of train with motorized trolley, Signal data transmitting unit built with 89c2051 Micro Controller chip, Main processing unit built with 89c52, IR sensors, Signal post with auto setting keys, DC motor, L293D H Bridge IC, metal track, Alarm, rechargeable battery, object sensing and track break detecting circuits both are built with IR sensors and 567 IC's, etc.

I. INTRODUCTION

The concept presented in this project work is to prove the technology of Autonomous train that is intended to avoid accidents without interference of driver. In this regard a prototype model is designed for live demonstration. Automatic accident avoiding Autonomous trains operate based on the condition of unexpected situations like obstacle sensing between the running tracks, track break detection, and controls automatically according to the track side signals. There are many safety parameters to be considered for automatic accident alerting cum preventing systems in trains, but here since it is a prototype module, few important situations are considered to stop the train automatically. One main important aspect of the system is that the train will be stopped automatically when it detects red signal over the track side signal post. To prove this concept, one small signal post will be installed a side of track and it contains Red and yellow signals. Here the running train will have a wireless communication system between the signal post and train control circuit, such that the train will be stopped at red signal. When the red signal turned in to yellow, automatically, the train moves further.

The model train constructed here is having three control keys by which the model train moves in forward and reverse directions and if required the train can be stopped where required. To prove this concept motorized model train and its track is essential for live demo purpose. This simulated train rely on digital signalling, but they require additional powerful sensors to analyse hazards around them and processors that enable them to adapt and even make decisions. In

fact fully fledged Autonomous trains do not need a driver or attendants on board. But here in this concept much importance is given for accident avoiding concepts, so driver or operator is essential.

Another advantage of using this system is, during winter and due to the fog, the driver may not recognize the colour of signal over the track side signal post, in such condition the signal present over the outside signal post will be displayed over the dash board of the rail engine, i.e., in front of driver. If the driver neglects to stop the train when red signal is present, than automatically, the train itself will be stopped and it remains in halt condition until the signal colour changes.

The program is nothing but an instruction set, this is often prepared in binary code, & are referred as machine code, there by this software is called as machine language. Writing a program in such a code is a skilled and very tedious process. It is prone to errors because the program is just a series of 0's and 1's and the instructions are not easily comprehended from just looking at the pattern. An alternative is to use an easily comprehended form of shorthand code for the patterns 0's and 1's. Micro controller can read and it can store the information received from the external devices. Micro-controllers are dedicated to one task and run one specific program. The program is stored in ROM (read-only memory) and generally does not change. If there are any modifications in the function, or errors in the software, the existing program must be erased from the chip & again modified program must be loaded in the chip through chip burner.

It is clear that the above functions cannot be performed without microcontrollers, therefore these devices are said to be heart of the communication systems, now a days there is no such electronic device or instrument that works without microcontroller. Hence micro-controllers are increasingly being used to design all sorts of communication systems, instruments, control systems, robots, etc. It is therefore important to understand micro-controller based control systems well.

II. CONTROL STRATEGIES

- DC Motor:

DC motors are widely used, inexpensive, small and poweful for their size. They are most easy to control. One DC motor requires only two singals for its operation. DC motors take direct current voltages as input and convert it into rotation movement. DC motors usually have two wires and can be powered directly from battery or DC power supply. DC motor can also be powered through driver circuit that can regulate the speed and direction of the motor.

- MICRO-CONTROLLER

Micro-controller unit or embedded system is constructed with ATMEL 89C51 Micro-controller chip. The ATMEL AT89C51 is a low power, higher performance CMOS 8-bit microcomputer with 4K bytes of flash programmable and erasable read only memory (PEROM). Its high-density non-volatile memory compatible with standard MCS-51 instruction set makes it a powerful controller that provides highly flexible and cost effective solution to control applications.

- GSM MODULE INTEGRATION

GSM is known as Global System for Mobile Communication. A technology developed in 1985 by a French company known as Group Special Mobile. In fact this communication system is designed for personal communications, but today this technology has been in use for many applications. The only one technology, which doesn't have any range restriction in wireless communications, any device which is controlled or monitored can be operated anywhere from the world.

- IR SIGNAL MODULATOR

In this block 555 timer IC is used to modulate infrared light, modulation is necessary to make infrared signal stand out above the noise. The modulation technique makes the IR light source to blink in a particular frequency, so that it can ignore everything else.

III. METHODOLOGY

As per the circuit diagram and priority wise, the process begins with track break detecting circuit, this circuit and object detecting circuit both are constructed with IR sensors and IC's 567.
The frequency generated by the tone decoder IC can be calculated using the

formula:

$F = [1 / (2 \pi R C)]$

Why DC Motors: Easy to Control, Require only two signals, For change the direction of rotation just reverse the polarity, Speed can be controlled by the voltage Use of Gears: To provide enough torque, Increases the torque on the expense of speed

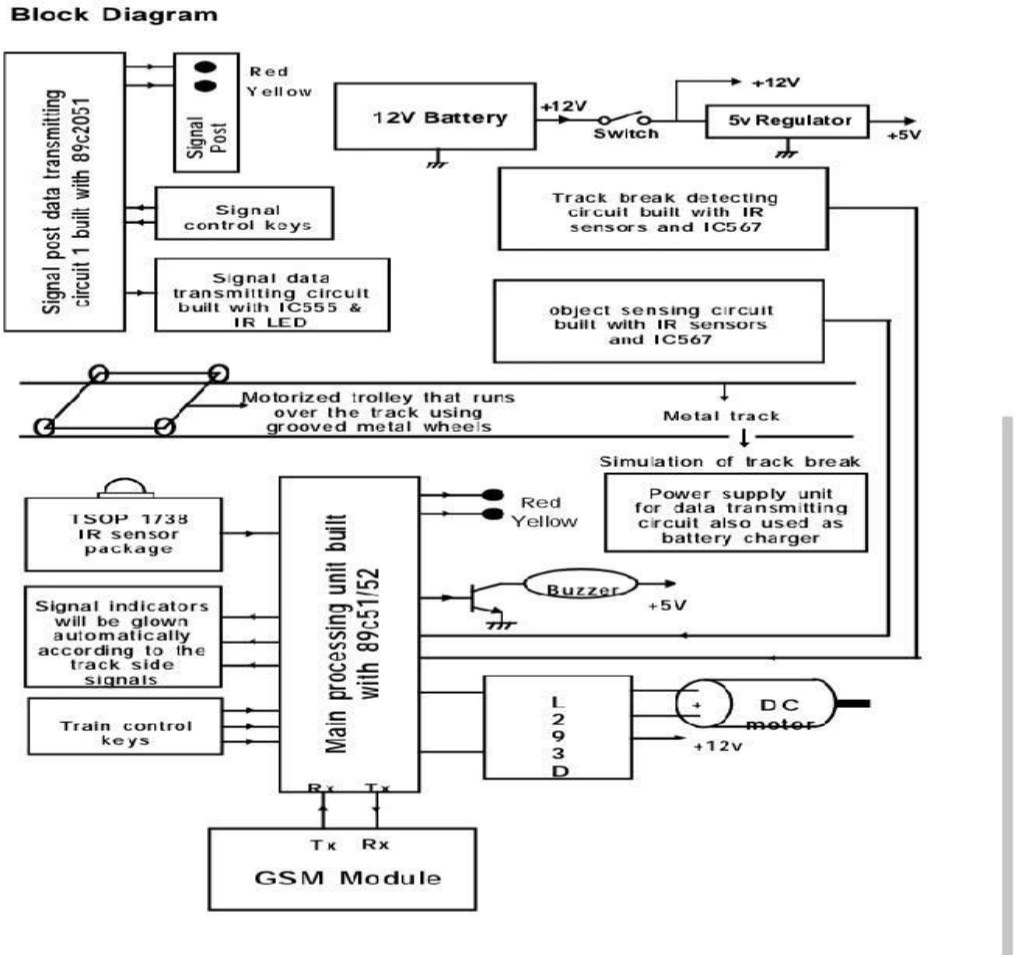
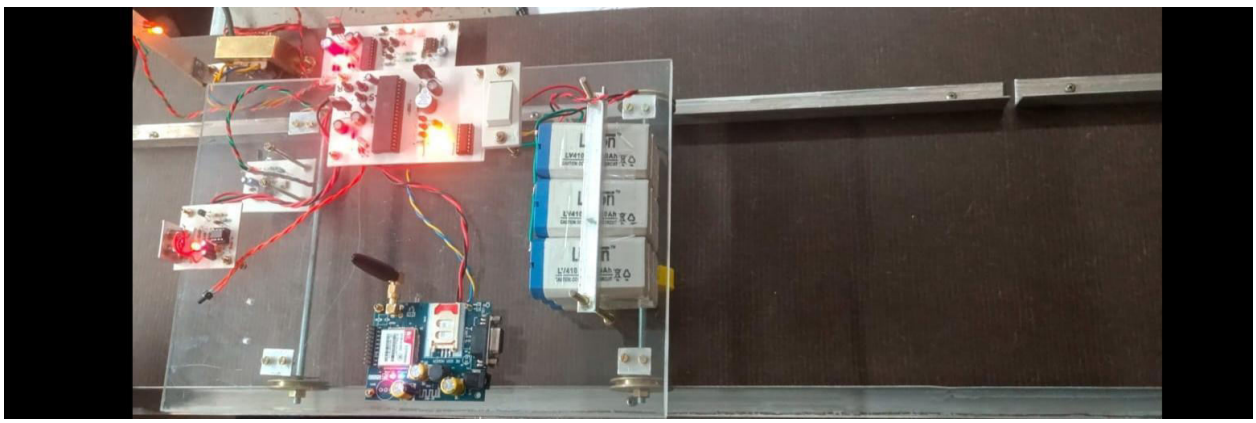


Fig.1. Block Diagram of proposed work

III. EXPERIMENTAL RESULTS



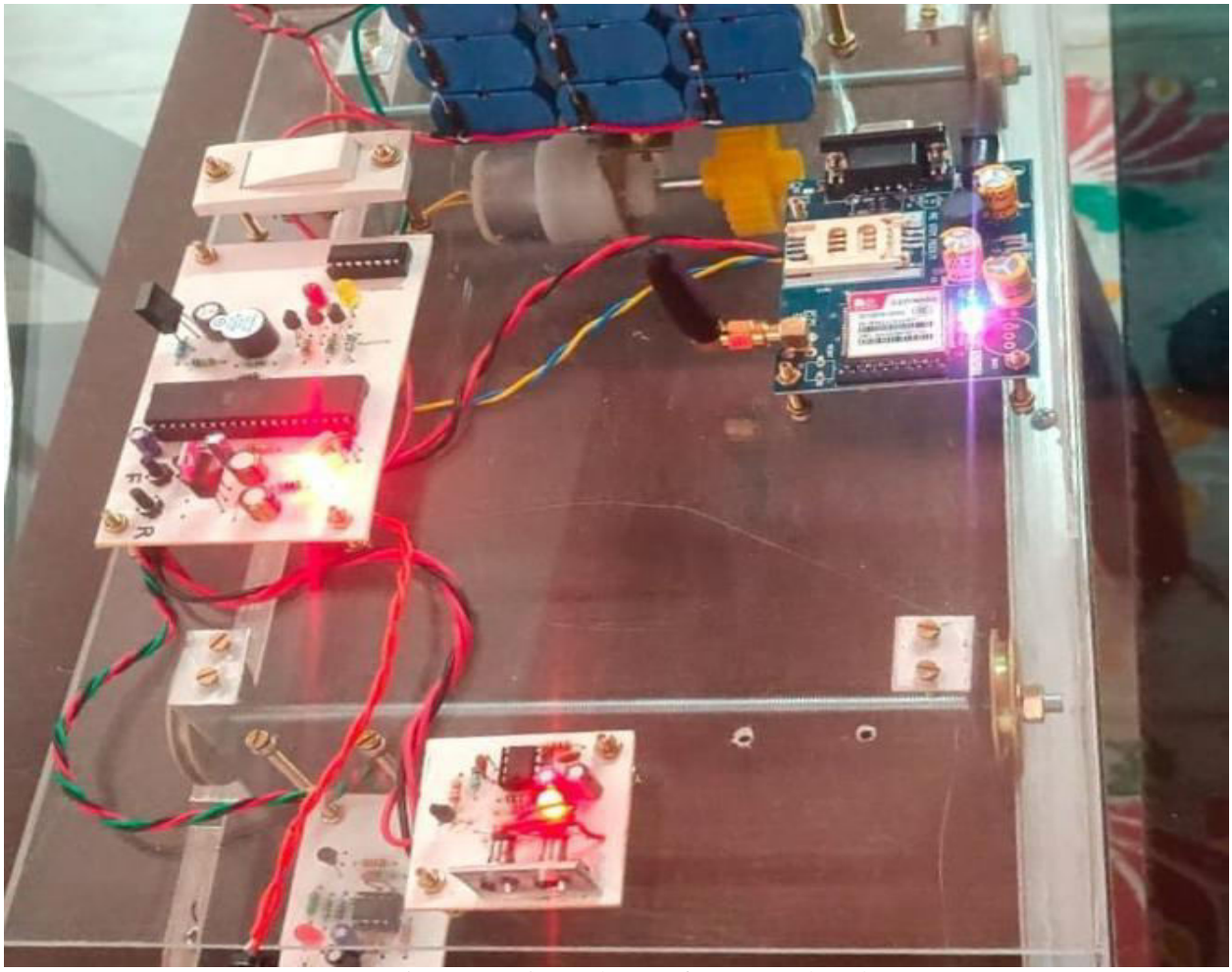


Fig. 2. Experimental set up for proposed work

IV. CONCLUSIONS

The project work "A model of accident avoiding system for trains" is completed successfully and results are found to be satisfactory. During our trail runs we found that, sending data from the track side signal post is very difficult because we won't get any suitable sensors or circuits not available. In this regard we have designed our own circuit, after conducting so many trails over
different circuits and finally we could able to achieve the desired result. The ultimate goal of this circuit is to transmit the digital data produced by the microcontroller chip. Here RF communication is also recommended, but when signal posts are nearby each other, it may be major difficulty that the signals may collide with each other by which the system may not display proper signal. Aim is to send information when the train reaches near to the signal post. In this regard we came to know that the data must be transmitted in uni direction not in Omni direction like as RF transmitter do, therefore IR signal transmitter circuit is constructed using IC 555. Since it is a prototype module, entire circuit including signal posts are arranged over a small wooden plank over which train track is also arranged for live demo. In such case entire system must be constructed packed together and hence short range communication is preferred by pumping
less current in to the IR signal transmitting LED. Finally, a mini model of train and its track is created over a small wooden plank and signal lights, buzzer, sensors, control circuit, etc, are arranged over this plank. Since the concept is autonomous, mechanized moving mechanism is designed to run over the track. This mechanism moves over the track automatically according to the command signals generated by the control keys. After arranging all devices in its position, inter connections are made with thin wire. Now the circuit is constructed fully as per the circuit diagram and suitable program for the controller is prepared.

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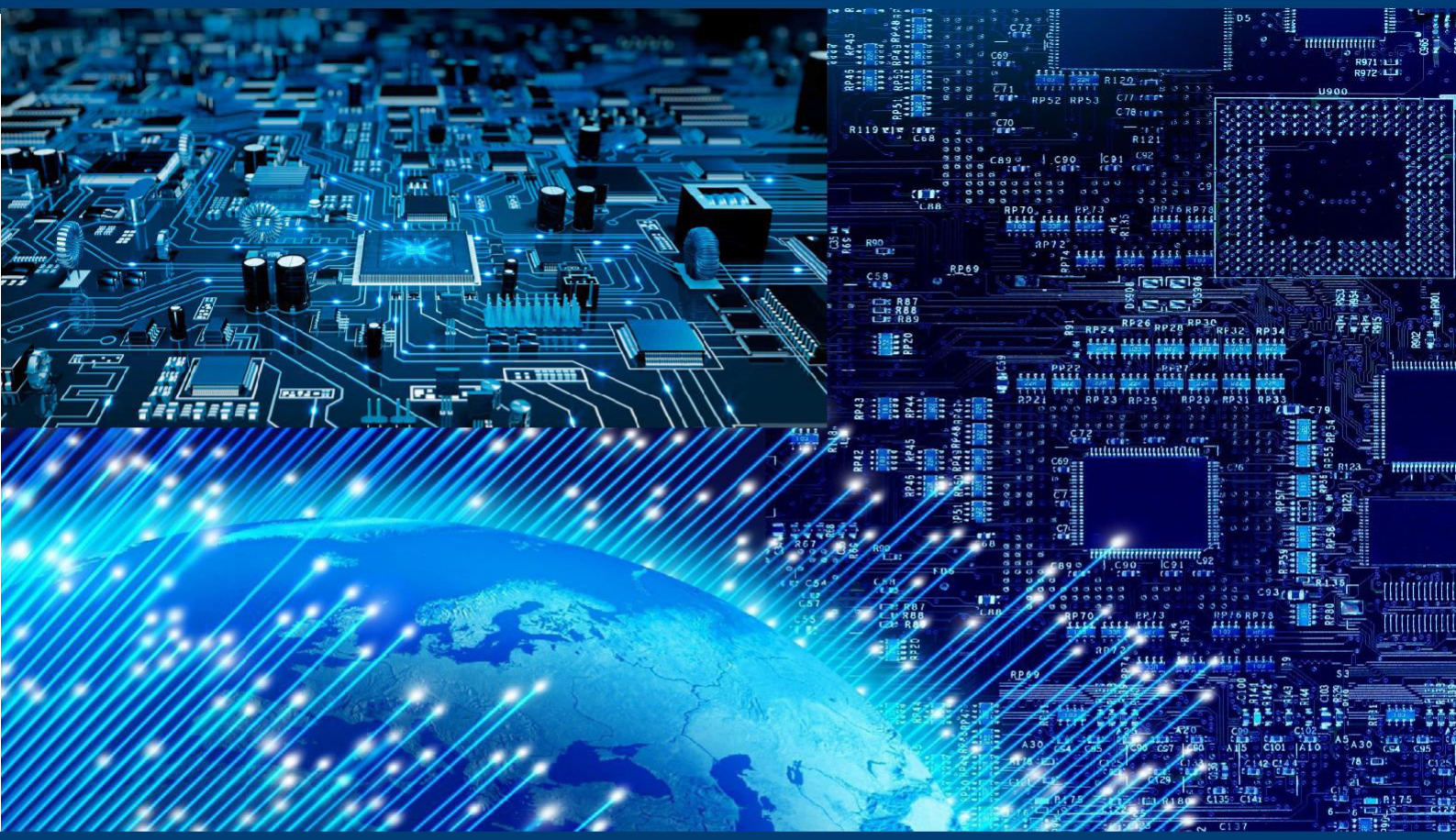

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