DESIGNING OF VCD TO PREVENT TRAIN ACCIDENTS USING GSM AND GPS TECHNOLOGY

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Abstract - *This paper is proposed to design the rail engines with a new automatic braking system called Vigilance Control Device (VCD) to prevent the train accidents. Mostly the train accidents are due to the unalertness of the loco pilots. This system microcontroller based alerting system which will keep the loco pilots in a high alert state by generating warnings and automatically stopping the train if the pilot is incapacitated or dead. This paper also gives the information to the Vigilance Control Officer(VCO) regarding the position of the train where it is stopped and position of the loco crew by using Global Positioning System(GPS) and Global System For Mobile Communication(GSM) technologies. This system also stops the train when the loco polit jump the Traffic RED signal and also informs to higher authority. The system can display the particular compartment number when any passenger pulls the chain in Train.*

Key Words: ARM7 Micro Controller, VCO, Loco, GSM, GPS, IR Sensor, Vigilance Warning.

1. INTRODUCTION

In railways, most of the accidents have been caused due to failure of railway staff. Under optimum field conditions and with the best of intentions, a human being is likely to commit a mistake from time to time. This is the reason why operating conditions include so many redundancies in safety process and operating rules involve number of checks and balances. The paper provides a method to prevent train accidents by alerting the loco pilot cyclically at regular time intervals. The Vigilance Control Device (VCD) is an ARM7 Micro Controller based Device which will automatically apply the penalty breaks in case the driver is in unalert or dead or fast sleep. This system was introduced to prevent train accidents, even if the driver died at his controls, hence the name. Unless a certain amount of pressure is maintained on the lever, brakes get automatically activated and the train stops. In this case the facility to inform the action of the loco pilot and the position of the train to Vigilance Control Officer to take any responsible action.

2. EXISTING SYSTEM

In existing system is the AT89S52 micro controller based driver safety system which detects inputs from loco pilot. It can give continuous warnings to driver alertness; give emergency braking system and the position of the train to higher authorities to take action. In this system to ensure safety to passengers the new automatic braking system is proposed by using ARM 7 Micro controller. This System give the continuous time period alerts in cyclic manor, also can display in which compartment the chain is pulled and traffic RED signal intimation to the loco pilot, if pilot not alert automatically train will be stopped and message will be send to the Vigilance Control Officer (VCO).

3. PROPOSED SYSTEM

In Existing system AT89S52 is used for penalty braking system. In proposed system we are using ARM7 microcontroller this system developed for automatic braking system when pilot is in un-alert state, if jump the traffic Red signal and inform to Vigilance Control Officer(VCO). The position of the train also sends to the Vigilance Control Officer by using GSM. AT89S52 microcontroller need more clock cycles compared with ARM7 microcontroller. ARM7 having harward architecture. ARM7 compiler is more suitable for any operation it also more efficient in console function.

4. WORKING

This paper consists of following blocks ARM7 controller is central for all controlling of the Vigilance Control Device (VCD). The Total Blocks shown in Fig -1. This system Vigilance Control Device is ARM7 microcontroller based equipment designed to enhance the safety of the passengers. This system generates the cyclic warnings to the loco pilot in throughout the journey. The first indication to the pilot is Flashing LED, the Second Warning is Buzzer. If the pilot is not alert/ respond to the warnings, **the VCD can send message to the guard "Driver is not alert" if the guard apply the brake train will be stop. If the guard not responds to the message, this system can give auto brake to the train and train will be stopped. The** "Driver and guard are not alert" message will be send to the Vigilance Control Office through GSM, by using GPS train location find out. If the dark night, invisible **conditions the loco pilot can't see the traffic red signal at**

that situations this system can apply the auto brake when the RED signal jumped and the message will be send to the Vigilance Control Officer. If any passenger pulls the chain in the compartment that particular compartment number is shown in the LCD display in loco motive.
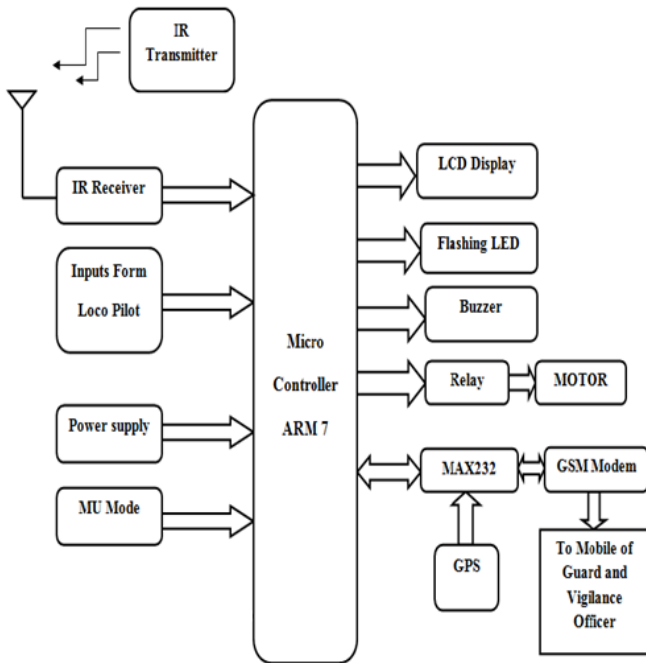

Fig -1: Block Diagram of Proposed System

The input to the proposed system is applied from the regulated power supply. The A.C input i.e. 230V from the main supply is step down by the transformer to 12V and is fed to a bridge rectifier. The output obtained from the rectifier is D.C voltage from the rectifier is fed to a filter to remove any A.C components present even after regulation. Now, this voltage is given to a voltage regulator to obtain a pure constant DC voltage.

The inputs form the loco pilot are the mechanical inputs, they are discussed in this paper by using switches. These inputs are Flashing LED, Horn, Brake, Speed1, Speed2, Red signal LED, Chain pull in S1, Chain pull in S2 and reset.

MU Mode is multiple unit modes to support the efficiency of the second engine to the train.

IR Sensor is used to finding the traffic red signal on the traffic poles. The IR Sensor has the transmitter part and receiver part. The transmitter part of the sensor project is an infrared (IR) LED which transmits continuous IR rays to be received by an IR Receiver. The output of receiver varies depending upon its reception of IR Rays. Since this variation cannot be analyzed as such, therefore this output can be fed to a comparator.

The LCD Display use to Display the messages. LCD screen is a electronic display module and find a wide range of applications. A 16*2 LCD means 16 columns and 2 rows i.e., It can display 16 characters per line and there are 2 lines. The LCD interfacing diagram is shown in Fig -2.
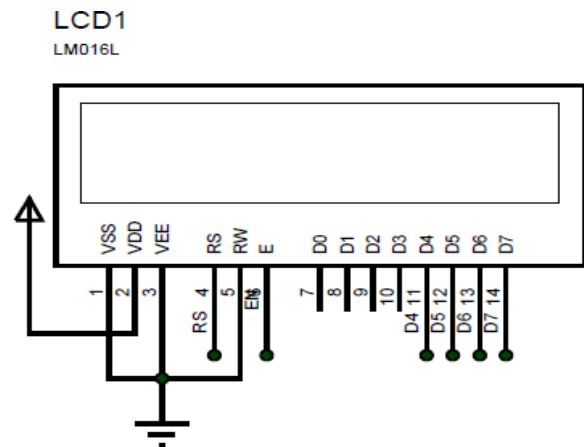

Fig -2: LCD interfacing diagram

LEDs (Light Emitting Diodes) are semiconductor light sources. They are manufactured in different shapes, colors and sizes. Based on semiconductor diode, LEDs emit photons when electrons recombine with holes on forward biasing. The forward voltage of LED(1.7V-2.2V) must be lower than the voltage supplied(5V) to drive it in a circuit using an LED as such would burn it because a high current would destroy its p-n gate. Therefore a current limiting resistor is used in series with LED. The LED is interfaced to the output port of microcontroller as the first indication to alert the loco pilot.

Buzzer is used to alert the loco pilot. The Buzzer is connected to output port as a second indication to driver. Buzzer is an audio signaling device, which may be electronic, mechanical or electro-mechanical that sounds a warning of continuous or intermittent sound. It produces high sound pressure levels with minimal from 1 to 30V whilst sound output may be as high as 75dB at 1m. Buzzer operates a buzzing noise in the frequency range 300 to 500Hz.

A Relay is an electrically controllable switch widely used in industrial controls, automobiles and appliances. A relay is able to control an output circuit of higher power than the input circuit. Relays are devices which allow low power circuits to switch a relatively high current/voltage ON/OFF. For a relay to operate a suitable pull-in & holding current should be passed through its coil. Generally relay coils are designed to operate from a particular voltage often its 5V or 12V. DC (direct current) motors convert electrical pulses to mechanical movement maximum speed of DC motor is indicated in RPM. The RPM of a motor is proportional to the voltage across its terminals. The motor will sign up in speed until the generator portion of the motor model matches the supply voltage. At that point no more current will flow into the motor and it will produce zero torque. The interfacing of relay and motor is shown in Fig -3.
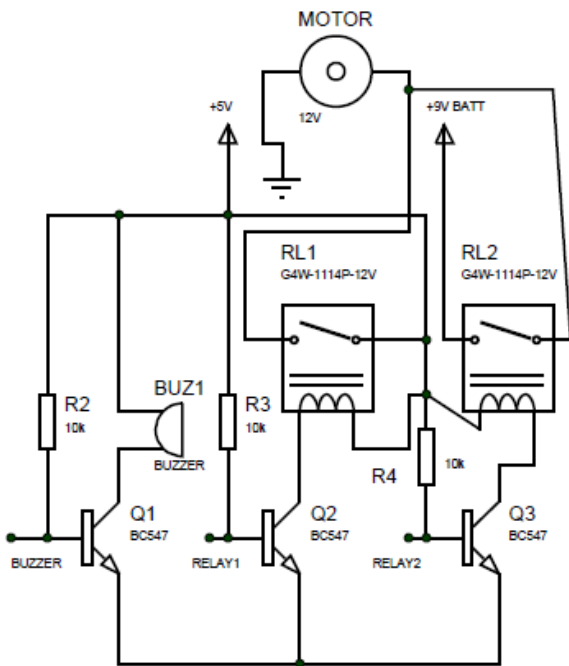
Fig -3: Relay and Motor interfacing

The microcontroller can communicate with the serial devices using its single serial port. The logic levels at which this serial port operates is TTL logics. But some of the serial devices operate at RS232logic levels. For example PC and smart card Reader, GSM Modem etc. In order to communicate the microcontroller with modem a mismatch, in other words to match the logic levels, a serial driver id is used. And MAX 232 is a serial line Driver used to establish communication between modem and micro controller. The interfacing of MAX232 is shown in Fig -4. A DB-9 connector is used for connecting the other serial devices.
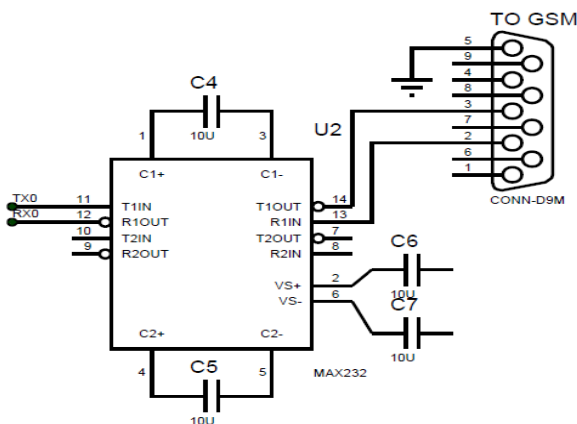
Fig -4: MAX232 interfacing

GSM module is used to establish communication between a computer and GSM-GPRS system. A GSM module is a wireless modem that works with a GSM wireless network.

Global system for mobile communication is an architecture used for mobile communication in most of countries. GSM module consists of a GSM/GPRS modem assembled together with power supply circuit and communication interfaces for computer. The GSM modem comes with a serial interface which the modem can be controlled using AT command interface. Multiple at commands can be sent to modem in a single command line. The commands in a line are separated by a semi-colon. The modem is provided with network status indication by LED lamp.
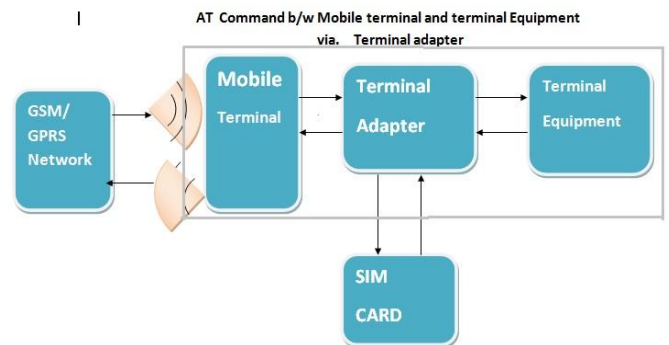
The GPS is used to find out the location of train. The satellites used for the navigation continuously send signal. In this GPS receiver is used to pick up the signal from the satellite, and with the help of this receiver the position of the user on the ground can be calculated with a high accuracy. It is very important to consider that a GPS receiver compares the time of signal transmission with the time it was received. The GPS is works in any kind of weather conditions. To track the position Digital maps are used in GPS. The prototype of GPS is shown in Fig – 5.

Fig -5: GPS Modem prototype

5. RESULTS

The hardware implementation of proposed system is shown in Fig -6. The system can give first indication as flashing LED, if driver does not operate any actions. If the loco pilot fails, the guard must apply the brake or if guard also fails, a automatic brake must be applied. In these
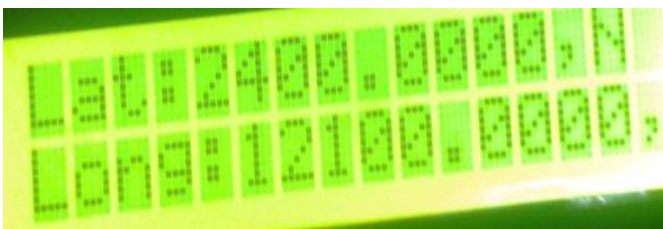
cases the train is stopped and the position of the train is given to Vigilance Control Officer in terms of latitudes and Longitudes as shown in below snap shots.
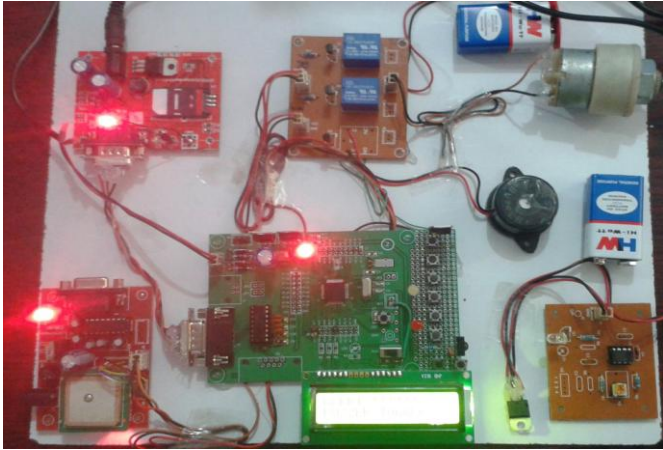
Fig -6: The implementation of proposed system

Fig -7: First indication from the System

Fig -8: GPS position tracking message

6. CONCLUSION

In this paper we implements the Vigilance Control Device with IR Sensor has been developed by using GSM and GPS technologies. It is more use full to prevent the train accidents. In this paper vigilance control device improves the alertness and provides warnings and automatic brake application in predefined manner. With this system we can analyze that whether the accident is due to loco pilot i.e., driver or loco motive. Also we can inform the action of loco pilot to the Vigilance Control Officer and the traffic signal jump intimations also.

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BIOGRAPHIES

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