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Electronic Railway Control and Safety System

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Abstract: Integrating features of all the hardware components used have been developed in it. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Secondly, using highly advanced IC's with the help of growing technology. In this work, Electronic Railway Control and Safety System (EMRCS) has been successfully designed, implemented and tested. We mainly intended to protect the passengers of train using fire sensors and automatic control the unmanned level crossing gate from long distance. Electronic Railway Control and Safety System (EMRCS) has been successfully designed, implemented and tested. This paper aims in detection of occurrence of fire in railways. Fire detection should be taken place in right time to avoid damage. The fire extinguishers like sprinkling water; air coolants etc can be automatically operated.

Keywords: Railway Safety, Fire detection, ERCS System, PIC16F876A.

I. INTRODUCTION

An embedded system is a combination of software and hardware to perform a dedicated task. Some of the main devices used in embedded products are Microprocessors and Microcontrollers.

This work deals Electronic Railway Control and Safety System using PIC16F876 Microcontroller. It is an exclusive work that can provide security at railways according to the instructions given by the above said microcontroller. Further the implementation of Unmanned Railway Gate using PIC16F876A microcontroller [1, 2] is explained.

In this paper, we presented a model which can be detected the occurrence of the fire without any delay successfully and the fire extinguishers like sprinkling water; air coolants etc can be automatically operated. The system alerts through SMS message to a control station using GSM modem, so that they act immediately with the necessary actions. Hence, the accidents taking place due to fire in the locomotives can be controlled. Further, the objective of this paper is to provide an automatic railway gate opening and closing at a level crossing replacing the gates operated by the gatekeeper. It deals with two things. Firstly, it deals with the reduction of time for which the gate is being kept closed. Secondly, it increases the safety of road users by reducing the accidents.

The paper explains the implementation of "Electronic Railway Control System" using PIC16F876 microcontroller and PIC16F877A. The organization of the paper is explained here, section 2 is presented, the ERCS Systems hardware and software modules. In the same section the explanation of microcontrollers, GSM modem, LCD, fire sensor, buzzer, firefighting equipment, are considered. And also it presented the software description. It explains the implementation of the module using PIC C Compiler software. Section 3 is discussed results and section 4 is concluded the work.

II. ERCS SYSTEM

Our paper is implemented with the help of fire sensor, GSM modem, LCD and also firefighting equipment. We employ fire sensors to sense the presence of fire which detects the fire. The output of the fire sensor is fed as input to the micro controller. Whenever fire is detected the sensor communicates the message with the central control station along with the automatic operation of extinguishers in which the fire aroused.

The microcontroller is responsible for receiving the information sent by different sensors like fire sensor, detection sensor and when it receives information for presence of fire it then displays the same on the LCD and alerts through SMS message to the control station using GSM modem. The firefighting equipment is operated automatically when the fire has been detected.

By employing the automatic railway gate control at the level crossing the arrival of the train is detected by the sensor placed near to the gate. Hence, the time for which it is closed is less compared to the manually operated gates and also

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reduces the human labor. This type of gates can be employed in an unmanned level crossing where the chances of accidents are higher and reliable operation is required. Since, the operation is autonomous error due to manual operation is prevented.

The fig 2.1 is shown that block diagram of ERCS using GSM. It explains the interfacing section of each component with micro controller and GSM module. The temperature sensors are used in this work to detect the temperature, once the temperature rises above 80 degrees; the buzzer sound alerts the passengers and the locomotive driver. The LCD display present near the locomotive driver shows the temperature reading inside the compartment. Once the temperature rises above 80 degrees automatic water pumping system will be implemented and message is sent to the nearby control stations, using GSM module.

The temperature sensor records the temperature and sends the value to ADC and ADC sends the digital output to the microcontroller. Microcontroller compares the threshold value and the given input and switches on the buzzer driver, LCD driver, relay driver and GSM accordingly. The relay driver switches on the firefighting equipment i.e. the automatic pumping of water. Microcontroller operates at the frequency range of 25 MHz; hence we use a crystal oscillator.

The unmanned railway gate uses a pair of IR sensors and a stepper motor driver for gate operation. In this prototype model, we detected the train when it is in 5km away from the level crossing. This distance range can be adjusted by using pot. We used two pairs of IR sensors, one for entry and one for exit. Using H bridge circuit, the clockwise and anti-clockwise switching of gate operation for the motor is done. By employing the automatic railway gate control at the level crossing the arrival of the train is detected by the sensor placed near to the gate. Hence, the time for which it is closed is less compared to the manually operated gates and also reduces the human labour. This type of gates can be employed in an unmanned level crossing where the chances of accidents are higher and reliable operation is required. Since, the operation is automatic; error due to manual operation is prevented.

III. RESULT AND DISCUSSIONS

In this work, hardware and software module has been implemented successfully and matched the expected results.

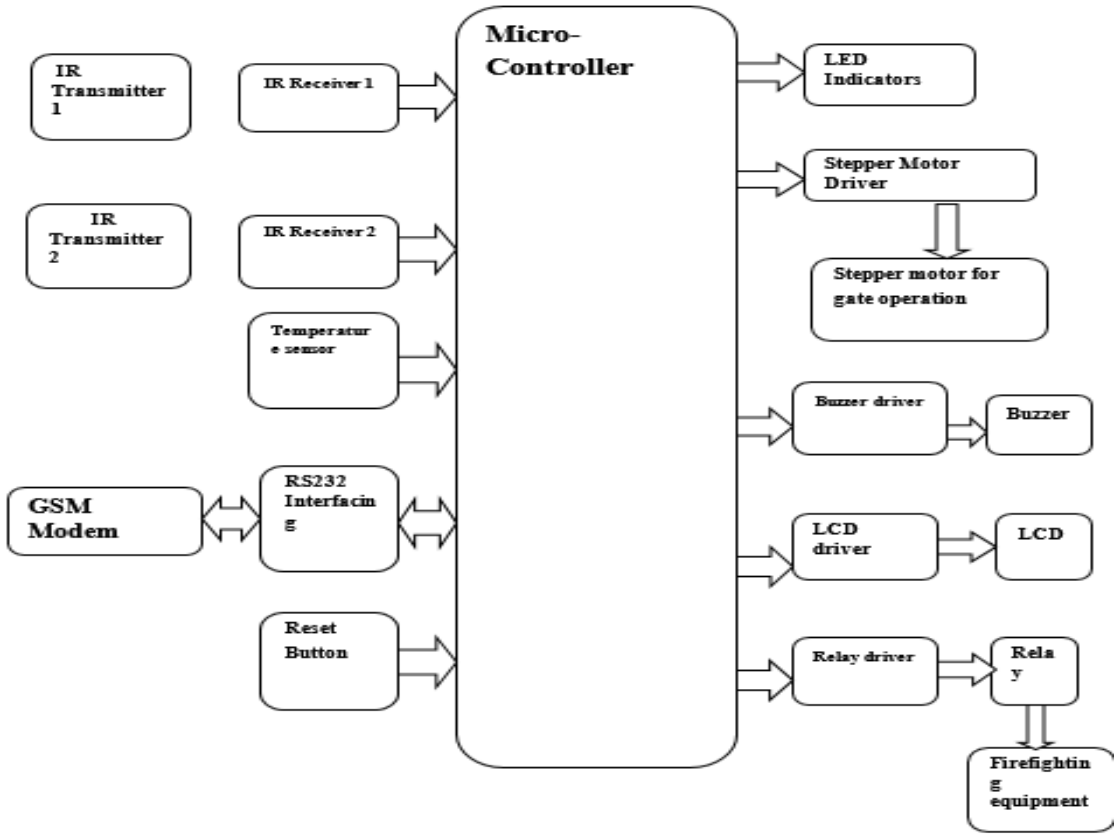

Fig 2.1 Block diagrams of ERCS system

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3.1 Observations:

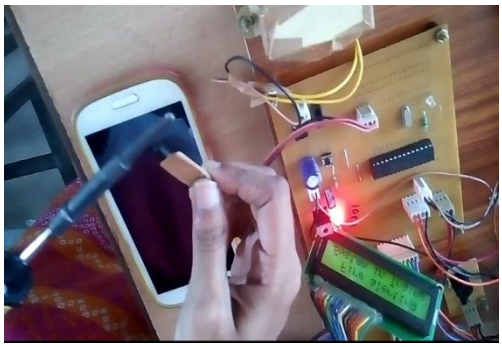

Fig3.1. Images of working of Temperature Sensors

The above fig 3.1 shows that the measured temperature in LCD display. Heat senor is heated by soldering iron. The measured temperature is displayed in mobile phone by using GSM module shown in fig 3.2.

Fig3.2. Images of temp displays in Cell phone

Fig 3.3 Images of Water pumping system

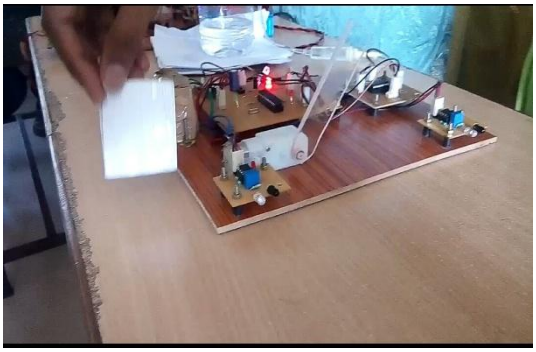

Fig 3.4 Images of Unmanned Level crossing

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The above fig 3.3 shows that when the temperature exceeds prescribed value then the water pumping system is spread the water in the cabin. The working model of unmanned level crossing system is shown in fig 3.4.

4. CONCLUSION

Our paper is implemented with the help of fire sensor, GSM modem, LCD and also firefighting equipment. We employ fire sensors to sense the presence of fire which detects the fire. The output of the fire sensor is fed as input to the micro controller. Whenever fire is detected the sensor communicates the message with the central control station along with the automatic operation of extinguishers in which the fire aroused.

The system must be capable of sensing the train arrival and it should automatically close the gate. Also, the system should sense the train departure and automatically reopen the gate.

This work can be extended using laser and LDR (Light Dependent resistor) which gives better performance than IR sensors used in the paper. And also it can be extended by using gas sensor, humidity sensor, GPRS and 3G technologies.

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