International Journal of Electrical and Electronics Engineers
Vol. No. 9, Issue No. 01, January-June 2017
ISSN (O) 2321-2055
ISSN (P) 2321-2045

A DRIVERLESS METRO TRAIN USING 89S52 MICROCONTROLLER

Sushama Arjun Kolhe[1], Sakshi Ashok Waje [2]

[1,2] *Department of Electronics and Telecommunication, Guru Gobind Singh polytechnic Nashik, (India)*

ABSTRACT

The technology used in metro train movements which are used in most of the developed countries. The introduction of fully automated metro system has greatly reduced the dependency on human to drive the train and offered greater flexibility in the system operation. This train is equipped with Microcontroller that enables the automatic stopping of the train from station to station.89S52 Microcontroller has been used as CPU. In this system the concept of driverless train by using microcontroller in which train start and stop automatically between two stations.IR sensor gives signal to microcontroller which open and close door automatically while entering and exiting of passenger it also detects smoke in train by using smoke detector.LCD display is used to display the time; day, date and station name. These trains are equipped with the CPU, which control the train. The train is programmed for the specific path. Every station on the path is defined; stoppage timing of the train and distance between the two stations is predefined.

Keywords: ***DC Motor, IR Sensors, Limiting Count of Passengers, Metro Train, 89S52 Microcontroller.***

I. INTRODUCTION

Lots of improvements are made in railway transportation system such as steam operated engine, bullet trains, metro train etc. This proposed system is to develop automated train without driver. Microcontroller 89S52 has been used as CPU. The automated train equipped with the CPU which controls the whole operation of the train movement. When train arrives at station door of train automatically open to allow passenger to enter in train. A sensor is used to detect overloading of passengers in train, if overload is detects door will close immediately by announcing. Fire alarm sensor is used to detect fire in train and sprinkle the fire extinguisher gas in train.

1.1 Existing Vs Proposed System [1]

So many systems are available to automate transport systems which has same drawbacks such as

- High cost
- Less reliable
- No reload protection
- Time consuming process
- More manpower requirements

International Journal of Electrical and Electronics Engineers
Vol. No. 9, Issue No. 01, January-June 2017
ISSN (O) 2321-2055
ISSN (P) 2321-2045

We have developed proposed system to overcome above drawbacks.

Our system has following advantages:

- Less manpower requirements
- IR sensor to control door operation
- Separate sensor to detect overloading
- Low cost
- Fire alarm is used
- Automatic control of light and fans
- Faulty track detection

II. SYSTEM REQUIREMENTS

The system in this paper proposes consist of consists of AT89S52 microcontroller, DC motor, L293 D motor driver IC, IR Sensor**,** LCD, limit switch, fire alarm system. The block diagram of proposed system is as follows.

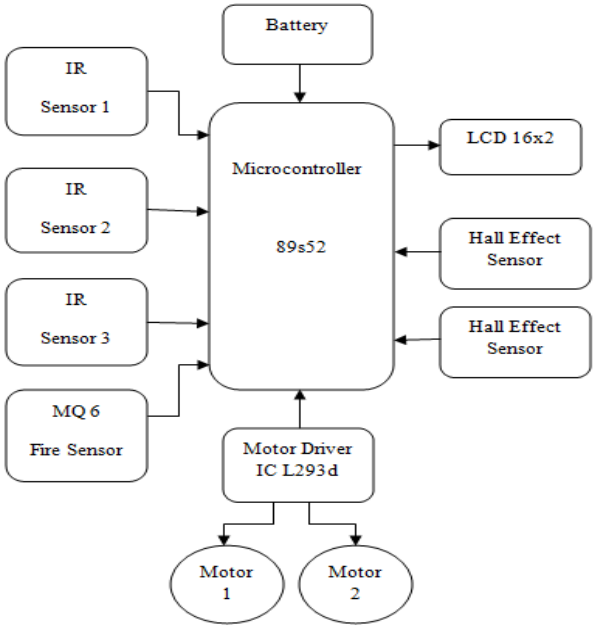

Fig 1: Basic Block diagram of the Metro Train Project.

2.1 AT89S52 Microcontroller

The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. In addition, the AT89S52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial

port, and interrupt system to continue functioning. The Power-down mode saves the RAM con-tents but freezes the oscillator, disabling all other chip functions until the next interrupt or hardware reset.

2.2 L293D IC

The L293 and L293D devices are quadruple high-current half-H drivers. The L293 is designed to provide bidirectional drive currents of up to 1 A at voltages from 4.5 V to 36 V. The L293 and L293D are characterized for operation from 0°C to 70°C.Each output is a complete totem-pole drive circuit, with a Darlington transistor sink and a pseudo- Darlington source. Drivers are enabled in pairs, with drivers 1 and 2 enabled by 1,2EN and drivers 3 and 4 enabled by 3,4EN.

2.3 LCD

LCD (liquid crystal display) is the technology used for displays in notebook and other smaller computers. Like light-emitting diode (LED) and gas-plasma technologies, LCDs allow displays to be much thinner than cathode ray tube (CRT) technology. LCDs consume much less power than LED and gas-display displays because they work on the principle of blocking light rather than emitting it.

2.4 IR Sensor

IR reflectance sensors contain a matched infrared transmitter and infrared receiver pair. These devices work by measuring the amount of light that is reflected into the receiver. Infrared radiation is an electromagnetic wave with wavelength of 700nm to 1 mm. It is emitted by objects with temperature above 0 Kelvin. Furthermore intensity and wavelength of infrared radiation depends on the temperature of the object. The infrared sensors are the sensors that detect/measure infrared radiation or change in the radiation from outer source or inbuilt source. Also sensors that use the property of infrared radiations to detect the changes in surrounding are termed as infrared sensors.

2.5 DC Motor

A DC motor is a device that converts direct current (electrical energy) into mechanical energy. The operating principle of DC motor it's important that we have a clear understanding of Fleming's left hand rule to determine the direction of force acting on the armature conductors of DC motor. Fleming's left hand rule says that if we extend the index finger, middle finger and thumb of our left hand in such a way that the current carrying conductor is placed in a magnetic field (represented by the index finger) is perpendicular to the direction of current (represented by the middle finger), then the conductor experiences a force in the direction (represented by the thumb) mutually perpendicular to both the direction of field and the current in the conductor.

2.6 Limit Switch

Limit switches are used in a variety of applications and environments because of their ruggedness, ease of installation, and reliability of operation. They can determine the presence or absence, passing, positioning, and end of travel of an object. They were first used to define the limit of travel of an object; hence the name "Limit Switch "Standardized limit switches are industrial control components manufactured with a variety of operator types, including lever, roller plunger, and whisker type. Limit switches may be directly mechanically operated by the motion of the operating lever. A reed switch may be used to indicate proximity of a magnet mounted on

International Journal of Electrical and Electronics Engineers
Vol. No. 9, Issue No. 01, January-June 2017
ISSN (O) 2321-2055
ISSN (P) 2321-2045

some moving part. Proximity switches operate by the disturbance of an electromagnetic field, by capacitance, or by sensing a magnetic field.

2.7 Fire Alarm System

A fire alarm system is number of devices working together to detect and warn people through visual and audio appliances when smoke, fire, carbon monoxide or other emergencies are present. These alarms may be activated from smoke detectors, and heat detectors. Alarms can be either motorized bells or wall mountable sounders or horns. They can also be speaker strobes which sound an alarm, followed by a voice evacuation message which warns people inside the building not to use the elevators.

III. METHODOLOGY

Microcontroller 89S52 is the central component which controls all the activities like reading data from serial port, writing and reading data to/from EEPROM, displaying information on LCD (Liquid Crystal Display), controlling buzzer and Relay.[2] In order to do all the activities a program must be written for the microcontroller. In order to execute the program, microcontroller requires 5V regulated power supply, clock, and reset circuit. 16*2 (2 line of 16 character) LCD is used for displaying people counting and relay status. Buzzer is used for audio indication. Microcontroller and IC's require 5V regulated power supply, which is obtained from 230V AC by using step down transformer, rectifier, filter and IC 7805 regulators. Fire detector is based on IR detector diode. L293D motor driver is used to drive the two DC motors. MQ-6 sensor is used for smoke detector it is highly sensitive to LPG and less sensitive to alcohol, cooking fume and cigarette smoke. Hall Effect sensors are used for proximity switching, positioning, speed detection applications. For the interruption we use one infra-red LED plus photodiode.

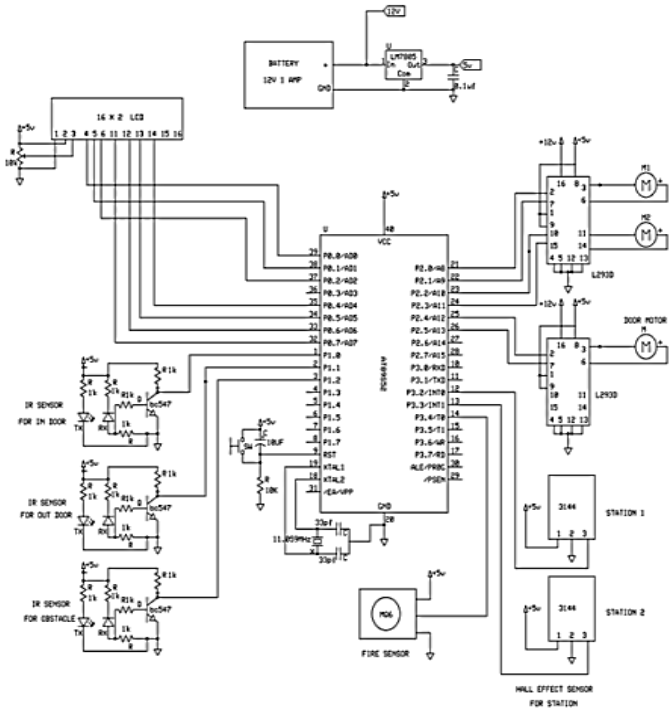

Fig 2: Circuit diagram of the Metro Train Project.

International Journal of Electrical and Electronics Engineers
Vol. No. 9, Issue No. 01, January-June 2017
ISSN (O) 2321-2055
ISSN (P) 2321-2045

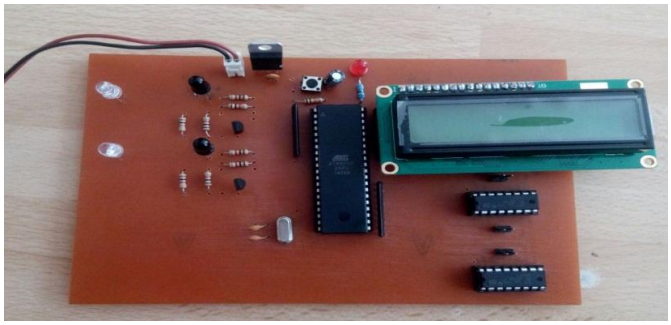

Fig 3: PCB showing controller and interfaced components.

IV. RESULTS AND DISCUSSION

- Whenever the train arrives at a station, the IR line is interrupted and the train stops automatically.
- After the train is stopped the doors of the train will be opened and a buzzer will be blown indicating the passengers that the station is arrived.
- Meanwhile the passenger counting section will count the no. of passengers present inside the train and displays it on a LCD screen.
- After a prescribed time set in the controller, a buzzer will be blown and the doors will be closed automatically.
- Then the train will move to the next station and process will continue at every station.
- MQ-6 sensor is used for smoke detector.

An example of how embedded technology is used in application is presented in this paper. A driverless train prototype has been developed as a microcontroller-based system. Both software and hardware parts are included in the development process. The programs which are written using embedded C language were simulated together with other system components Keil software. The hardware part, all the circuitry required to interface with the 89S52 microcontroller are designed and built. The prototype train is following a prescheduled path in terms of proper stations starts and stops and counting passengers.

IV. CONCLUSION

Motivation behind this project is to reduce accidents due to overloading. Automation is one of the solution to this problem. The passenger counting system counts the number of passengers till a certain limit of overload. As the count surpasses the limit, doors will automatically close. MQ 6 sensor detects smoke and gives alarm. This system operate without any staff onboard. It reduces the cost and avoid accidents.

REFERENCES

[1] V. Sriidhar, "*Automated System Design for Metro Train*", International Journal of Computer Science Engineering (IJCSE), vol. 1, no. 1, Sept.2012.

[2] Guru Prasad Patil, Dr.C.R. Rajshekhar, "*RFID Based Metro Train System*", VOL. 3, NO. 5, May 2014.

[3] The 8051 Microcontroller and Embedded Systems: Using Assembly and C by Muhammad Ali Mazidi, Rolin D. McKinley.