

Railway Accidents Avoidance and Security System

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Abstract: The railway system is an important transportation system in our country. The railway has become a prime means of transportation owing to their capacity, speed, and reliability even a small improvement in the performance of railways has significant economic benefits to the rail industry. Most of the trains in our country are the induction trains and hence there are chances of fire mishaps. Fire on a running train is more catastrophic than on a stationary one since fanning by winds helps spread the fire to other coaches very soon after the accident. Moreover, passengers sometimes jump out of a running train on fire resulting in increased casualties. In this project, we had planned to implement an adaptive security system that will continuously monitor parameters such as temperature smoke level, etc, and take adaptive security to rescue the lives and provide information to the concerned authority regarding the issue. System failure may also take place in the absence of power to the entire unit hence to overcome this problem we implement an idea. For this problem, we added a solar panel power system and generate electric power to the entire unit when power is absent in the entire unit immediately solar power will supply to the entire unit. With changes taking place in the field of electronics fabrication, units placed within every bogie can be embedded on a single board thereby making it compact size. Human lives that cannot be evaluated will be under trouble due to the above-mentioned problem. So, we got motivated to overcome this problem, at least reduce the above-mentioned problem by using Embedded system design technology.

Keywords: Bogie, Embedded System, RFID.

1. Introduction

Many inserted frameworks have generously various plans as indicated by their capacities and utilities. In this task plan, an organized measured structure idea is received and the framework is mostly made out of a single microcontroller, buzzer, Fire sensor, Smoke sensor, Heat sensor, GSM module, Water sprinkler, RFID card reader, Motor driver, LCD, Circuit breakers, the microcontroller situated at the focal point of the square graph shapes the control unit of the whole undertaking. Inserted inside the microcontroller is a program that encourages the microcontroller to make a move dependent on the sources of info gave by the yield of the sensors. Different sensors like Fire sensor, Smoke sensor, Heat sensor are set in each bogie of

the Train so that if any mishaps happened in any bogies of Train Immediately the Respective sensor will deliver the signs. These yield voltages are taken care of as contribution to the microcontroller input pins. The microcontroller forms the approaching voltages from the sensor relying upon the program inserted inside it. The yield of the microcontroller is passed to the yield gadgets like GSM module, Buzzer, LCD, Circuit Breakers So that essential move is made by the circumstance to forestall the harms or the wounds that will occur. A crisis Door is consequently worked in this task show. In the event that there emerges a situation, wherein the Passengers may need help or support who is absent in that specific Bogie, so a buzzer is a buzz, along these lines causing them to notice the individual present in another Bogie. In the above square, outline LCD is used to exhibit the working of the whole unit and show the making Messages aware of the Passengers. GSM module is utilized in the task and the reason for utilizing it in our Project is to flag the following close by station or to send a making message aware of the station so he can see some mishap or crisis condition has happened and he can take the vital things to forestall further mishaps. RFID labels are introduced on the Railway tracks a way off of each one kilometre. Furthermore, a RFID card reader is put on the base segment of the Train with the end goal that the card is looking towards the ground or the track and each RFID labels has a novel number so every time the card reader detects a sign from a RFID label it imparts the signs to the microcontroller and the controller checks the label number and it keeps a note on the number and this RFID number is utilized to ascertain the good ways from the station where the train is and on account of a mishap happen the microcontroller sends the separation where the mishap happen to the closest station. Circuit breakers are utilized in this undertaking so that on account of mishap we can trigger the force with the goal that significant mishaps like stuns and fire and short out can be forestalled. Water sprinklers are additionally remembered for this venture and its need is on the off chance that there is a fire happen in the train, at that point before spreading of the fire we have to put it off so to accomplish it we have utilized in our undertaking when the fire

sensor detects some fire it sign's the microcontroller and the controller turns on the buzzer and partially sends a making message aware of the closest station and switch off the force through the circuit breaker and switch on the water sprinklers.

2. Problem Formulation

- Transportation, the most important for modern civilization in which railways plays an important role since railways had taken a part to carry heavy loads compared to other transportation channels.
- In case of railway accidents causing very high rate of disaster [human lives, goods].
- The major cause for train accidents are cracks in railway tracks, explosives on the track, fire catch in the bogies etc., since these accidents cannot be avoided since the mobile train cannot be got to static condition.
- We don't find any other system which can pre detect the abnormality in the above-mentioned parameters.

3. Objectives

- The ability to detect the cracks in the track, stop the train without making any damage to train in a distance if 500 meters for the train.
- To detect the fire catch, smoke on the train.
- To inform the authority regarding the problem to authority via SMS.
- To turn emergency tools such as water sprinklers, emergency door during critical situations.
- To generate the electric power to the system via solar power.

4. Proposed Methodology and Working Description

The block diagram of the proposed method is as shown below.

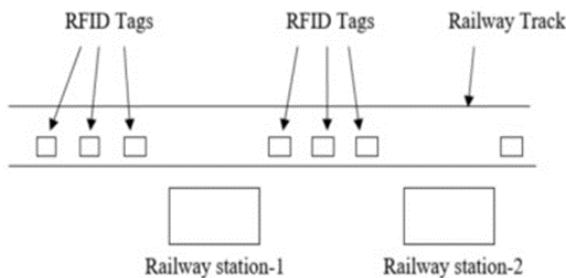


Fig. 1. RFID Tags placed on Railway tracks between railway stations

A. RENASIS RL-78 R5F100LE

- Universally useful register: 8 bits × 32 registers
- ROM: 512 KB, RAM: 32 KB
- Data streak memory: 8 KB
- On-chip rapid on-chip oscillator
- On-chip single-power-gracefully streak memory (with denial of square eradicate/composing capacity)

- On-chip investigate work
- Ports → Total 11 ports with 58 Info/Output Pins
- On-chip power-on-reset (POR) circuit and voltage finder (LVD)
- On-chip guard dog clock (operable with the committed low-speed on-chip oscillator)
- I/O ports: 16 to 120 (N-ch open channel: 0 to 4)
- Timer → 16-piece clock: 8 to 16 channels, Guard dog clock: 1 channel
- Different expected interface: Can associate to a 1.8/2.5/3 V gadget
- 8/10-piece goals A/D converter (VDD = EVDD =1.6V to 5.5 V): 6 to 26 channels
- Power flexibly voltage: VDD = 1.6 to 5.5 V

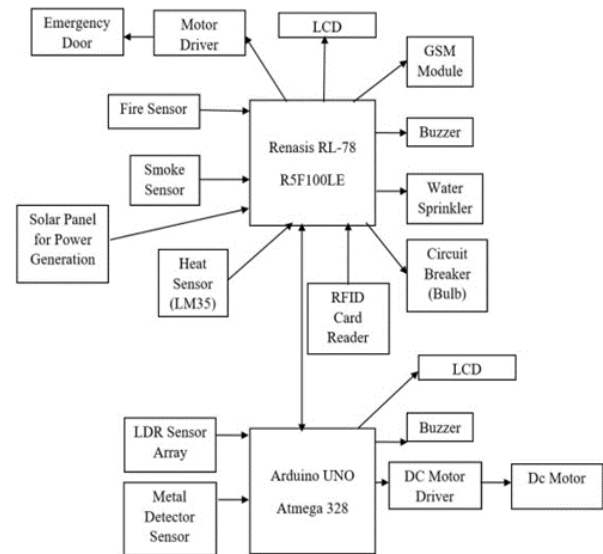


Fig. 2. Block diagram

B. GSM module

GSM represents Global System for Mobile Communications once in the past called as Group Special Mobile. This is a standard set created by the European Telecommunications Standards Institute (ETSI) to portray innovations for second-age (or "2G") computerized cell systems. The GSM standard at first was utilized initially to portray exchanged circuit arrange for full-duplex voice communication to supplant the original simple cell organizes The standard was extended after some time to incorporate the principal circuit-exchanged information transport, at that point packet information transport using GPRS (General packet radio service). Packet information transmission speeds were later expanded through EDGE. The GSM standard is prevailing by the third era (or "3G") UMTS standard created by the 3GPP. GSM systems will develop further as they fuse fourth era (or "4G") LTE Advanced standards. "GSM" is a symbol or trademark possessed by its association. GSM systems work in a few distinctive bearer recurrence ranges (isolated into GSM recurrence ranges for 2G and UMTS recurrence groups for 3G), with most 2G GSM systems

working in the 900 MHz or 1800 MHz groups. Where these groups were at that point distributed, the 850 MHz and 1900 MHz groups were utilized rather (for instance in Canada and the United States). In uncommon cases, the 400 and 450 MHz recurrence groups are allocated in certain nations since they were recently utilized for original frameworks.

C. Motor drive

The L293 is an integrated circuit engine driver that can be utilized for synchronous, bidirectional control of two small engines. Small methods were small. The L293 is restricted to 600 mA, yet as a general rule, it can just deal with many small flows except if you have done some genuine warmth sinking to hold the case temperature down. Uncertain about whether the L293 will work with your engine? Attach the circuit and run your engine while keeping your finger on the chip. On the off chance that it gets too hot to even consider touching, you can't utilize it with your engine. The L293 arrives in a standard 16-pin, dual-in-line integrated circuit bundle. For complete information. The pinout for the L293 in the 16-pin bundle is appeared beneath in top view. Pin 1 is at the upper left when the indent in the bundle faces up. Note that the names for pin capacities may be marginally unique in relation to what is appeared in the following charts. The following schematic tells the best way to interface the L293 to your engine and the PIC. Each engine takes 2 PIC pins.

D. Smoke sensor

Structure and setup of MQ-2 gas sensor is made by micro AL₂O₃ ceramic tube, Tin Dioxide (SnO₂) delicate layer, estimating an anode and warmer are fixed into a covering made by plastic and hardened steel net. The radiator gives fundamental work conditions to work of touchy parts. The encompassed MQ-2 have 6 pins, 4 of them are utilized to bring signals, and the rest two are utilized for giving warming current.

This smoke sensor is used to detect the presence of carbon dioxide and Carbon Monoxide presents in the in and around area of the prototype.

E. Heat sensor

The LM358 arrangement comprises two autonomous, high increase, inside recurrence remunerated operational enhancers which were structured explicitly to work from a solitary force gracefully over a wide scope of voltages. Activity from split force supplies is additionally conceivable and the low force flexibly current channel is free of the size of the force gracefully voltage. The LM358 are accessible in SMD and DIP bundles.

F. Buzzer

Evaluated voltage: A piezo signal is driven by square wave

Working voltage: For the typical working however it isn't ensured to make the base SPL under the appraised voltage.

Utilization current: The current is steadily expended under ordinary activity. Be that as it may, it ordinarily takes multiple times of current right now of beginning to work.

Capacitance: A piezo bell can make higher SPL with higher capacitance; however, it expends more power.

Sound yield: The sound yield is estimated by a decibel meter. Applying appraised voltage and square waves, and the separation of 10 cm.

Appraised recurrence: A signal can make a sound on any frequencies yet we recommend that the most noteworthy and the steadiest SPL originates from the appraised recurrence.

Worked temperature: Keep functioning admirably between -30 degrees to +70 degrees.

G. RFID card reader

Radio-frequency identification (RFID) is a programmed identification strategy, depending on putting away and remotely recovering information utilizing gadgets called RFID labels or transponders. The innovation requires some degree of participation of an RFID per user and an RFID tag. Radio-frequency identification (RFID) is a programmed identification technique, depending on putting away and remotely recovering information utilizing gadgets called RFID labels or transponders. The innovation requires some degree of collaboration of an RFID per user and an RFID tag. An RFID tag is an article that can be applied to or joined into an item, creature or individual for identification and following utilizing radio waves. A few labels can be perused from a few meters away and past the view of the per user. An RFID tag is an article that can be applied to or consolidated into an item, creature, or individual for identification and following utilizing radio waves. A few labels can be perused from a few meters away and past the view of the per user.

H. Arduino Uno

The Arduino Uno is a micro-controller board which is dependent on the ATmega328. It has 14 computerized input/output pins (of which 6 can be utilized as PWM outputs), 6 simple data sources, a 16 MHz artistic resonator, a USB association, a force jack, an ICSP header, and a reset button. It contains everything expected to help the microcontroller; just associate it to a PC with a USB link or force it with an AC-to-DC adapter or battery to begin. The Uno varies from every former board in that it doesn't utilize the FTDI USB-to-sequential driver chip. Rather, it includes the Atmega16U2 (Atmega8U2 up to rendition R2) modified as a USB-to-sequential converter. The board has the accompanying new highlights:

- Pinout included SDA and SCL pins that are close to the AREF pin and two other new pins placed close to the RESET pin, the IOREF that permit the shields to adjust to the voltage gave from the board. Later on, shields will be good both with the board that utilizes the AVR, which work with 5V and with the Arduino Due that works with 3.3V. The subsequent one is a not associated pin, that is held for future purposes.
- Stronger RESET circuit.
- Atmega 16U2 replaces the 8U2. "Uno" signifies one in

Italian and is named to check the up and coming arrival of Arduino 1.0. The Uno and rendition 1.0 will be the reference variants of Arduino, pushing ahead.

I. LCD display

A liquid crystal display (LCD) is a level board display, electronic visual display, in light of Liquid Crystal Technology. A liquid crystal display comprises a variety of small sections (called pixels) that can be controlled to introduce a snippet of data. Liquid crystals don't radiate light legitimately rather they utilize light-adjusting methods. LCDs are utilized in a wide scope of utilization, including computer monitors, television, instrument panels, aircraft cockpit displays, signage, and so forth. They are basic in buyer devices, for example, video players, gaming devices, clocks, watches, calculators, and telephones. LCDs are wanted to cathode-beam tube (CRT) displays in many applications since

- The size of LCDs come in more extensive assortments.
- They don't utilize Phosphor, subsequently, pictures are not consumed in.
- More secure removal.
- Vitality Efficient.
- Low Power Consumption.

It is an electronically adjusted optical gadget comprised of any number of sections loaded up with liquid crystals and

displayed before a light source (backdrop illumination) or reflector to create pictures in shading or monochrome.

5. Application

- It can be used in safety and alerting systems on buses.
- This system can be used in shuttle buses, metro trains, heavy transport vehicles, etc.
- With a slight modification, this unit can be used in buildings also.

6. Advantages

- Installation is easy and maintenance required is less.
- Alert to approaching railway station, won't create panic situations in other stations.

7. Future Scope

With changes taking place in the field of electronics fabrication, units placed within every bogie can be embedded on a single board thereby making it compact size. Detect the eddy currents in the railway tracks.

References

- [1] J. A. Stankovic, T. F. Abdelzاهر, C. Lu, L. Sha, and J. C. Hou, "Realtime communication and coordination in embedded sensor networks."