AUTOMATED RAILWAY SIGNALLING SYSTEM USING HASH ALGORITHM

A PROJECT REPORT

*Submitted by*

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##### "AUTOMATED RAILWAY SIGNALLING SYSTEM USING HASH

**ALGORITHM",** under the guidance of **S.T. SANTHANALAKSHMI,**

**M. Tech.,** is the original work done by us and we have not plagiarized or submitted to any other degree in any university by us.

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**ABSTRACT**

Human development is directly related to the transport facility. India has been starting its transport through railways since 19th century. The Indian railway system is very big and very complicated. When generation moves forward, the technology and complexity are also moves to its higher levels. Now days, there is no exact communication between Indian railways and passengers, so we introduce Automated Railway Signaling System **(ARSS)** which automatically collect the information about the Train. The movements of the train can be controlled based upon the signal which will be automatically generated by the system. In this system, we get the train's arrival time at the station with the help of an RTC and proximity Sensor, update the information in the Java web application with the train's ID with the help of an RFID module. If another train arrives in the same track, it will automatically intimate the co-driver to allocate the track according to their availability in order to send to their respective platform, and also send updates to the Loco Pilot with the help of a ZIGBEE transmitter. Then the Java web application will send Gmail to the persons who are logged into the web application. We are planning to provide a system to automatically collect the information about trains and make the schedule based on track availability.

**KEYWORDS:** RTC, Web Application, RFID, ZIGBEE Transmitter

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**LIST OF ABBREVIATION**

|  |  |
| --- | --- |
| ARSS | Automated Railway Signaling System |
| MT | Million Tons |
| TNT | Train Number Tracking |
| ATA | Automatic Train Arrival |
| DTR | Departure Time Recording |
| RFID | Radio Frequency Identification |
| ACL | Access Control List |
| CTC | Centralized traffic control |
| ELM | Extreme learning machine |
| ML | Machine Leaming |
| FCFS | First Come First Server |
| PSO | Particle swarm optimization |
| OSPF | Open Shortest Path First |
| LDR | Light Dependent Resistors |
| LED | Light Emitting Diode |
| S&C | Switches and crossings |
| GPS | Global Position System |
| AC | Alternate Current |
| RTC | Real Time Clock |
| RRI | Route Relay Interlocking |
| IR | Infrared |
| SQL | Structured Query Language |
| MSSMS | Microsoft SQL Server Management Studio |
| CSM | Centralized signalling monitoring system |

## CHAPTERl INTRODUCTION

###### INTRODUCTION

* 1. **OVERVIEW**

Railways constitute a major portion of transport infrastructure in most countries. It is essential to employ good strategies for the maintenance of railway networks to avoid a disruption to services and ensure the safety of the system. For example, the railway track condition needs to be regularly monitored to detect faults at an early stage before they become major issues. The Indian Railways is among the world's biggest rail systems. The Indian Railways course length arrange is spread more than 115,550 km, with 12,617 passenger trains and 7,421 goods prepares every day from 7,439 stations handling 26 million travelers and 3.5million tons **(MT)** of cargo day by day. India's railroad organize is perceived as one of the biggest railroad frameworks on the planet under single administration. The rail road arranges is likewise perfect for long travel and development of mass products, aside from being a vitality effective and financial method of movement and transport. In this system, the development of a low-cost sensor node that focuses on the concept of train arrival time detection and updating is Key. We get the train arrival time at the station and update the information on the webpage with the train id.

###### PROBLEM DEFINITION

Automated Railway Signaling Systems (ARSS) is a Real-Life Problem to be implemented to connect driver and expertise simultaneously by the help of RFID Tags matching the actual arrival time and existing arrival time to allocate the free tracks by depending on the circumstances. The Time may vary on different situations with the actual arrival time and existing arrival time due to delay of train

facing problems with other issues including the train itself or expertise of other stations or arrival of the goods train which is unexpected at that times or Sudden Rail Accident occurs or Medical Issues occurs with the patients. Even the Existing Station Signalling Expertise absence may occur at unexpected time, So the Automated Railway Signalling System is brought into the action to solve these kind issues by the sides of a railway station. This will assume the allocation automatically as per the railway time-table. In general, Railway system is the most commonly used transportation system especially in India. But due to miscommunication about the railway schedules and lack of coordination, accidents happen. And there is no exact communication between Indian railways and passengers. In this system, we get the train arrived time of the station and update the information to the webpage with the train id.

# CHAPTER2 LITERATURE SURVEY

###### LITERATURE SURVEY

* 1. **INTRODUCTION**

The following shows the survey did for ARSS system. The most popular of the existing technique is been discussed as follows:

###### LITERATURE SURVEY

1. **IOT BASED RAILWAY TRACK FAULTS DETECTION AND LOCALIZATION USING ACOUSTIC ANALYSIS**

Rail is one of the most energy efficient and economical modes of transportation. Regular railway track health inspection is an essential part of a robust and secure train operation. Delayed investigations and problem discoveries pose a serious risk to the safe functioning of rail transportation. The traditional method of manually examining the rail track using a railway cart is both inefficient and susceptible to mistake and biasness. This research develops an Internet of Things (IOT)-based autonomous railway track fault detection scheme to enhance the existing railway cart system to address the aforementioned issues. In addition to data collection on Pakistani railway lines, this work contributes significantly to railway track fault identification and classification based on acoustic analysis, as well as fault localization. Based on their frequency of occurrences, six types of track faults were first targeted: wheel burnt, loose nuts and bolts, crash sleeper, creep, low joint, and point and crossing. Support vector machines, logistic regression, random forest, extra tree classifier, decision tree classifier, multilayer perceptron and ensemble with hard and soft voting were among the machine learning methods used. The results indicate that acoustic data can successfully assist in discriminating track defects and localizing these defects in real time. The results show that MLP achieved the best results, with an accuracy of 98.4 percent.

###### AUTOMATED RAILWAY TRACK CRACK DETECTION SYSTEM

Scheduling trains in order to minimize the traveling time is a challenging optimization problem. Delay may occur due to the bottleneck or many trains need to use the same track at the same time. These delays increase the journey time and may cause secondary delays to the other trains in the network. Double track railway scheduling can be modelled as a Job-Shop Scheduling Problem that can be achieved by considering the train trips as jobs which will be scheduled on tracks. This research is focus on scheduling trains in order to minimize the delay time. First Come First Serve (FCFS) dispatching rule is used to calculate the traveling time at each block section by sequencing the trains in order of starting time. The other rule is priority queue to solve the bottleneck problem by assigning the block section to the highest priority train. The simulation result is that the proposed model produce a less optimal schedule than the actual schedule due to the great average delays but the number of the delayed trains are less.

###### A DELAY PREDICTION MODEL FOR HIGH-SPEED RAILWAY

This paper makes a survey on the current development, underlying issues, and the future prospects associated with China railway signalling monitoring technologies. To overcome the problems involved such as interconnection, data sharing and intelligent analysis, an integrated scheme of the intelligent monitoring and maintenance system for railway signalling systems is further presented. In this scheme, all kinds of monitoring data are centralized to conjointly and intelligently analyze the status of signalling devices. Moreover, interacting with the maintenance management system, the integrated scheme will have the functions of monitoring, diagnoses, intelligent maintain and management, which will greatly

improve the usability of railway signal. Finally, some principles and precautions are pointed out in the future construction of the proposed scheme.

###### A DEEP LEARNING APPROACH TOWARDS RAILWAY SAFETY RISK ASSESSMENT

Railway stations are essential aspects of railway systems, and they play a vital role in public daily life. Various types of AI technology have been utilized in many fields to ensure the safety of people and their assets. In this paper, we propose a novel framework that uses computer vision and pattern recognition to perform risk management in railway systems in which a convolutional neural network **(CNN)** is applied as a supervised machine learning model to identify risks. However, risk management in railway stations is challenging because stations feature dynamic and complex conditions. Despite extensive efforts by industry associations and researchers to reduce the number of accidents and injuries in this field, such incidents still occur. The proposed model offers a beneficial method for obtaining more accurate motion data, and it detects adverse conditions as soon as possible by capturing fall, slip and trip (FST) events in the stations that represent high-risk outcomes. The framework of the presented method is generalisable to a wide range of locations and to additional types of risks.

###### A RAILWAY TRAIN NUMBER TRACKING METHOD USING A PREDICTION APPROACH

Indian railways are often called the lifeline of the nation. It not only transports passengers and goods but also connects the entire nation to one single thread. Indian railways are Asia's largest network and further rmore stands as the second largest network in the whole world which is driven under a solitary administration. Also, in our country most of the commercial transportation are carried out by

railway network as it is the cheapest mode of transportation preferred over all other means of transportation. However, when it comes to reliability, dependability, and passenger safety, the Indian Railways is not up to the global standards. Being such a vast network, for it to operate flawlessly, constant monitoring and inspection is mandatory. Currently, railway track inspection and monitoring is mostly done manually which is time consuming and may not always generate accurate data regarding the railway track conditions. There are high chances of human error and moreover practically it's impossible to inspect and monitor the railway track manually as it runs over thousands of kilo meters in length. Amongst the other factors, often cracks are developed on the railway tracks due to absence of timely detection and oversight. Hence the project work aims to design an automated railway track crack detection system which is a robust and an efficient system to detect the cracks. The proposed framework utilizes GPS system along with GSM module, Node MCU and Ultrasonic sensor for transmitting and receiving messages during a faulty condition. This work proposes a dynamic approach towards the issue of cracks on the track using an ultrasonic sensor that utilizes its transmitter and receiver for detecting the faulty section on the track so that maintenance can be done as soon as possible.

##### MODELLING OF TRACK LAYOUT FOR INTELLIGENT RAILWAY SIGNALLING SYSTEM: A MACHINE LEARNING APPLICATION

The railway signalling domain is a complex critical infrastructure, linking communication and number of control elements. Ensuring safety in railway signalling system is always considered as a guarantee of intact operation of the railway. Current signalling system composes of centralized controllers which provide a single feature such as interlocking, and level crossing control. The Indian Railways **(IR)** uses Panel Interlocking **(Pl),** Route Relay Interlocking **(RRI),** and

Solid State Interlocking (SSI) or Electronic Interlocking (El) for signalling safety, however, permitting movement of the trains lies in the hands of a human. The main challenge is to combine multiple sources of data and define a system which can intensify the functionality of the system. This paper mainly focuses on development of an automated model, beneficial to Intelligent Signalling System **(ISS).** Assessing its ability to take a decision which authorizes the movement of trains according to the timetable and modify it depending on real-time information using Machine Leaming **(ML).** For modelling, IR standard single line station layout is considered and graphical model-based design techniques are implied. For analysis consider the track sections as nodes, signals as the start point and the end point linked to specific routes and assessing the developed model for various operating scenarios. Implementation of such system in the railway network will not only provide a comprehensive level of safety in railway transportation but also takes a step forward towards systematizing various methods and strategies such as rescheduling system, monitoring performance under one roof using ML.

##### CONTROLLING RAILWAY GATES USING SMART PHONES BY TRACKING TRAINS WITH GPS

Railway is the most commonly used transportation vehicle. Most of the people choose this transportation mainly for low cost and it gives comfort ability. To increase this comfort zone and to reduce the number of accidents, our system gives a complete solution. Nowadays, we met a lot of railway accidents. Most of these accidents occur at railway gate level crossings. Up to date there are several proposals to avoid the number of accidents and to reduce the manpower at railway gates. Most of the proposals used sensors as a key device to detect the arrival of the train but which requires maintenance cost and it is not efficient method. It also requires monitoring process to detect the fault in sensors. This paper track and

detect the arrival of the train by using GPS and not by the sensors. This way of train tracking using GPS is embedded with our mobile application. Using this application the engine driver controls the railway gate.

##### DETECTING RAILWAY UNDER-TRACK VOIDS USING MULTITRAIN IN-SERVICE VEHICLE ACCELEROMETER

The Siemens track monitoring system is being developed in collaboration with Rail Safety and Standards Board (RSSB) and the Institute of Railway Research at the University of Huddersfield. It makes use of the existing on-board GSM-R cab radio present in every train in the UK, through the fitment of a sensor card, which detects track condition over three axes of train vibrations. By using advanced on­ train signal processing, only a small amount of data to be transferred to the Ground System. For voided switches and crossings (SC), the GPS location allows the SC asset number to be identified and reported. This ensures maintenance staff are accurately directed to the location of voids, minimising time spent inspecting and maintaining track and improving safety. This ensures maintenance staff are accurate. The Ground System monitors the voids detected by multiple trains, to increase the reported accuracy(within Sm) of voids and to reduce false alarms. Automated void reporting, including whether the voids are located at S&C or other track types (such as plain-line track or bridges), allows maintenance to be directed and planned. The Ground System provides advanced warning of track defects, allowing more effective and prioritised preventative maintenance. The real benefit of the track monitoring system is that, by way of a simple activation, it can be present on every train within the UK and therefore be monitoring the track on a large number of train journeys, providing a network-wide track monitoring system. Recent on-train trials have shown that the small low-cost sensor is able to detect voided sleepers underneath both S&C and bridges. The repeatability between trains

and for different journeys was found to be excellent. The Network Rail upgrades to the Siemens cab radio, planned for the next 2-3 years include a GSM-R/GPS antenna, and the addition of a GPS module to the cab radio, providing a GPS connection in every train. As part of these upgrades Siemens will introduce a the sensor card into the cab radio, minimising installation costs, making it hardware ready for track monitoring, the Siemens implementation of RCM (Remote Condition Monitoring).

##### JOB-SHOP SCHEDULING MODEL FOR OPTIMIZATION OF THE DOUBLE TRACK RAILWAY SCHEDULING

Scheduling trains in order to minimize the traveling time 1s a challenging optimization problem. Delay may occur due to the bottleneck or many trains need to use the same track at the same time. These delays increase the journey time and may cause secondary delays to the other trains in the network. Double track railway scheduling can be modelled as a Job-Shop Scheduling Problem that can be achieved by considering the train trips as jobs which will be scheduled on tracks. This research is focus on scheduling trains in order to minimize the delay time. First Come First Serve (FCFS) dispatching rule is used to calculate the traveling time at each block section by sequencing the trains in order of starting time. The other rule is priority queue to solve the bottleneck problem by assigning the block section to the highest priority train. The simulation result is that the proposed model produce a less optimal schedule than the actual schedule due to the great average delays but the number of the delayed trains are less. The advantages of this model are scheduling trains in order to minimize the delay time, used to solve secondary delays to other trains in the network. The proposed scheduling model is not promising to solve the problem because decause the average delays are greater than the actual schedule although the number of delayed train are less.

##### FUTURE PROSPECTS ON THE INTELLIGENT MONITORING TECHNOLOGIES FOR RAILWAY SIGNALLING SYSTEM

This paper makes a survey on the current development, underlying issues, and the future prospects associated with China railway signalling monitoring technologies. To overcome the problems involved such as interconnection, data sharing and intelligent analysis, an integrated scheme of the intelligent monitoring and maintenance system for railway signalling systems is further presented. In this scheme, all kinds of monitoring data are centralized to conjointly and intelligently analyze the status of signalling devices. Moreover, interacting with the maintenance management system, the integrated scheme will have the functions of monitoring, diagnoses, intelligent maintain and management, which will greatly improve the usability of railway signal. Finally, some principles and precautions are pointed out in the future construction of the proposed scheme.

# CHAPTER3 SYSTEM DESIGN

###### SYSTEM ANALYSIS

* 1. **EXISTING SYSTEM**

Railway track monitoring and maintenance is essential for an effective and safe railway operation. Absence of agreed, stable and effective track fault detection methods, results in safety alerts, accidents and losses in terms of assets, time, and lives. Thus, satisfactory and timely track maintenance and fault prevention should be conducted as a matter of fact. In many developing nations, the present typical railway cart for track inspection involves manual inspection, heavily relying on human action and judgement for track defect identification. A smart IoT based railway cart is proposed to autonomously identify railway track faults using acoustic analysis and localization. The microphone and GPS sensor mounted on **RPi** positioned near the wheels of the cart was used to record the sound and send acoustic signal and a GPS location every five seconds to a remote cloud. A dataset was maintained by deriving forty **MFCC** features from the collected fault sounds. Different machine learning models were trained and evaluated on this data. Amongst them, MLP achieved 98.4% accuracy. The authors are now preparing for a IOT system for the train rather than railway carts to gather more fault types or data from other typical railway terrains through international collaboration.

###### DISADVANTAGES OF EXISTING SYSTEM

* + - * It detects only few fault types that are mentioned
      * Very Expensive

###### PROPOSED SYSTEM

Here we choose RFID, every train have a separate tag, reader is placed on a

separate signal lamp post which is placed before a railway station in particular distance. Inductive proximity sensor which placed nearly same location where reader placed, but our proximity sensor placed in track. The reason we used this sensor is ,it only identifies the metal object so it avoids the false trigger. Moreover, the message should be passed to respective Station Signalling Authority Portal or the Signalling Expertise as acknowledgement of the allocation. We can update the arrived time of the train with train id. This system updates the time with respected id of the train to the cloud.

###### ADVANTAGES OF PROPOSED SYSTEM

* + - * We can get the arrival time of the train to the station.
      * We can update the information to the co-driver and passengers through mail.
      * Reduces waiting time of passengers.
      * Prevent accidents.

###### FEASIBILITY STUDY

Feasibility studies aim to objectively and rationally uncover the strengths and weaknesses of the existing business or proposed venture, opportunities and threats as presented by the environment, the resources required to carry through, and ultimately the prospects for success. In its simplest term, the two criteria to judge feasibility are cost required and value to be attained. As such, a well-designed feasibility study should provide a historical background of the business or project, description of the product or service, accounting statements, details of the operations and management, marketing research and policies, financial data, legal requirements and tax obligations. Generally, feasibility studies precede technical development and project implementation.

###### THREE TYPES OF FEASIBILITY STUDY

* Economical feasibility
* Technical feasibility
* Operational feasibility

###### 3.3.1. ECONOMICAL FEASIBILITY

The assessment is based on an outline design of system requirements in terms of Input, Processes, Output, Fields, Programs, and Procedures. This can be quantified in terms of volumes of data, trends, frequency of updating, etc. in order to estimate whether the new system will perform adequately or not.

###### 3.3.2 TECHNICAL FEASIBILITY

This study is carried out to check the technical feasibility, that the technical requirements of the system .Any system developed must not have a high demand on the available technical resources.

###### 3.3.3. OPERATIONAL FEASIBILITY

The aspect of study is to check the level of acceptance of the system by the user. This includes the process of training the user to use the system efficiently. The user must not feel threatened by the system, instead must accept it as a necessity.

###### HARDWARE ENVIRONMENT

* ARDUINO UNO
* ARDUINO MEGA
* POWER SUPPLY
* LCD DISPLAY
* PROXIMITY SENSOR
* RFID READER
* RFID TAG (5)
* BUZZER
* SERVO MOTOR
* RS232
* RTC
* ZIGBEE PAIR

###### HARDWARE DESCRIPTION ARDUINOUNO

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino Boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. A worldwide community of makers - students, hobbyists, artists, programmers, and professionals - has gathered around this open-source platform, their contributions have added up to an incredible amount of accessible knowledge that can be of great help to novices and experts alike. All Arduino boards are completely open-source, empowering users to build them independently and eventually adapt them to their particular needs. The software, too, is open-source, and it is growing through the contributions of users worldwide.

###### ADVANTAGES

* Inexpensive
* Simple, clear programming environment
* Open source and extensible software

###### ARDUINO MEGA

The MEGA 2560 is designed for more complex projects. With 54 digital 1/0 pins, 16 analog inputs and a larger space for your sketch it is the recommended board for 3D printers and robotics projects. This gives your projects plenty of room and opportunities. The Arduino Mega 2560 is a microcontroller board based on the atmega-2560. It has 54 digital input/output pins (of which 15 can be used as PWM outputs), 16 analog inputs, 4 DARTS (hardware serial ports), a 16 MHZ crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. The Mega 2560 board is compatible withmost shields designed for the UNO and the former boards Duemilanove or Diecimila.

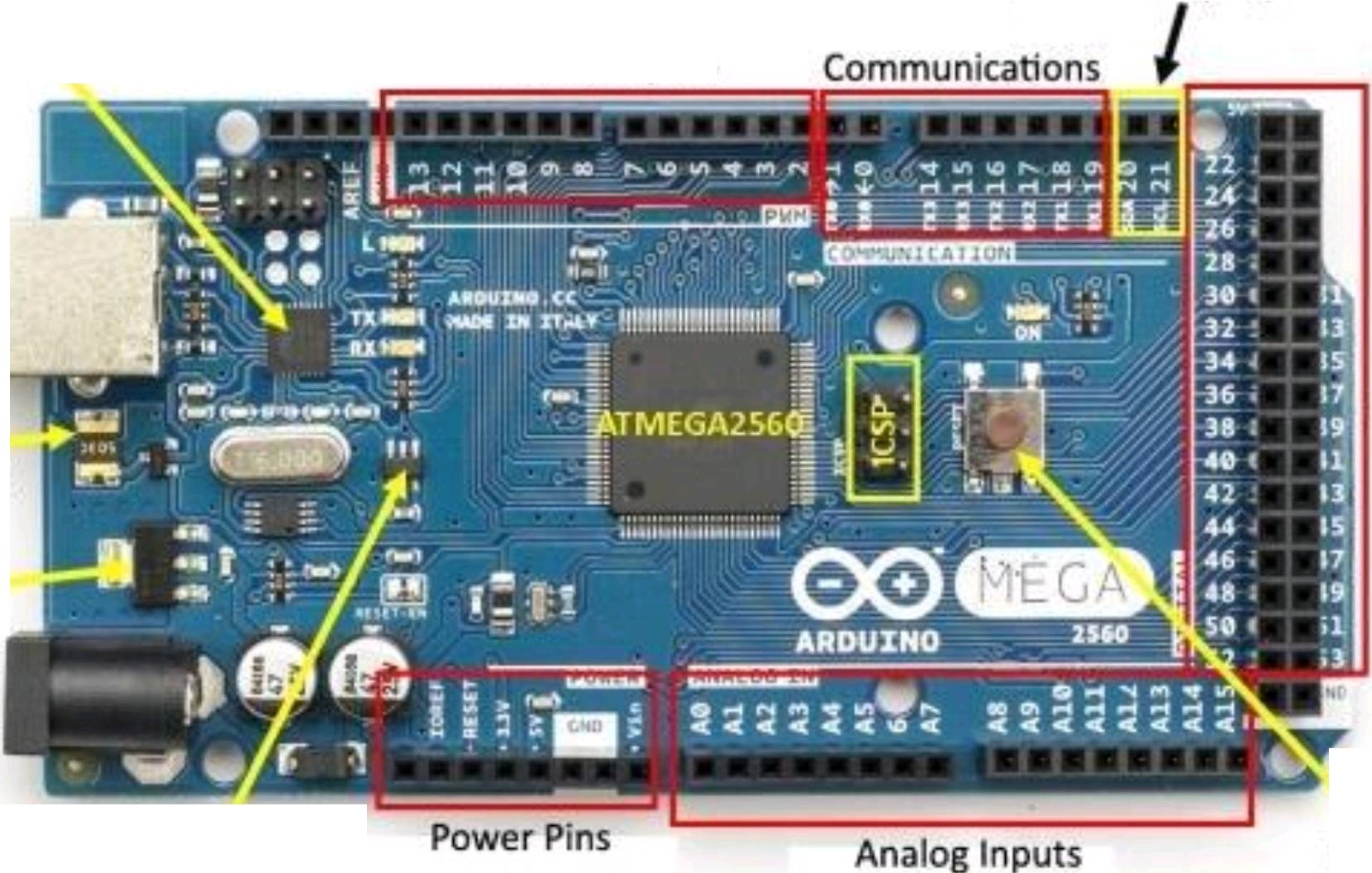


**Fig 3.4.1 ARUDINO MEGA**

##### TECHNICAL SPECIFICATIONS

|  |  |
| --- | --- |
| **Microcontroller** | ATmega2560 |
| **Operating Voltage** | 5V |
| **Input Voltage (recommended)** | 7-12V |
| **Input Voltage (limit)** | 6-20V |
| **Digital 1/0 Pins** | 54 (of which 15 provide PWM output) |
| **Analog Input Pins** | 16 |
| **DC Current per 1/0 Pin** | 20 Ma |
| **DC Current for 3.3V Pin** | 50 Ma |
| **Flash Memory** | 256 KB of which 8 KB used by boot loader |
| **SRAM** | 8 KB |
| **EEPROM** | 4 KB |

**Table 3.4.2 Technical Specification**

Responsible for

USB communication PWM Outputs

USB Connector

Fuse for USB protection

Regulator SV

**SOURCE**

7to 12V

Regulator 3.3V

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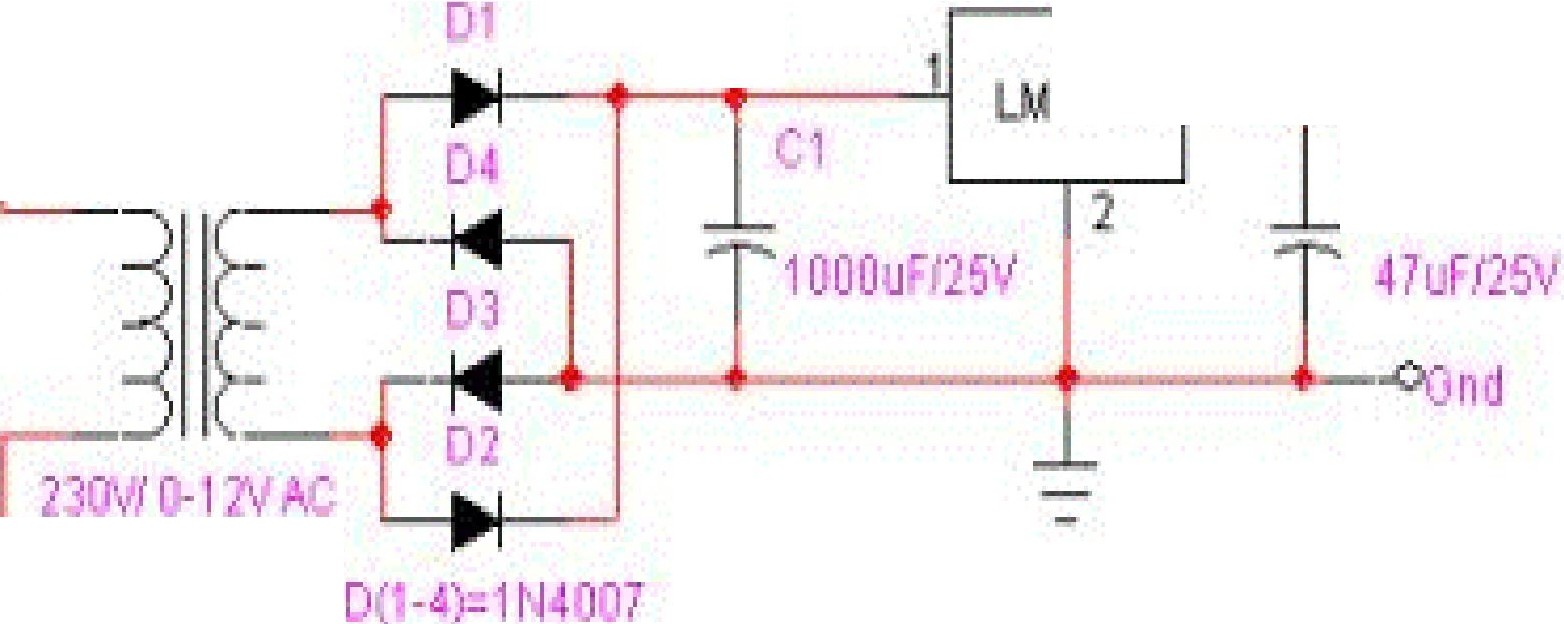
Digital Inputs/Outputs

Reset button

Fig 3.4.3 ATmega2560

###### POWER SUPPLY





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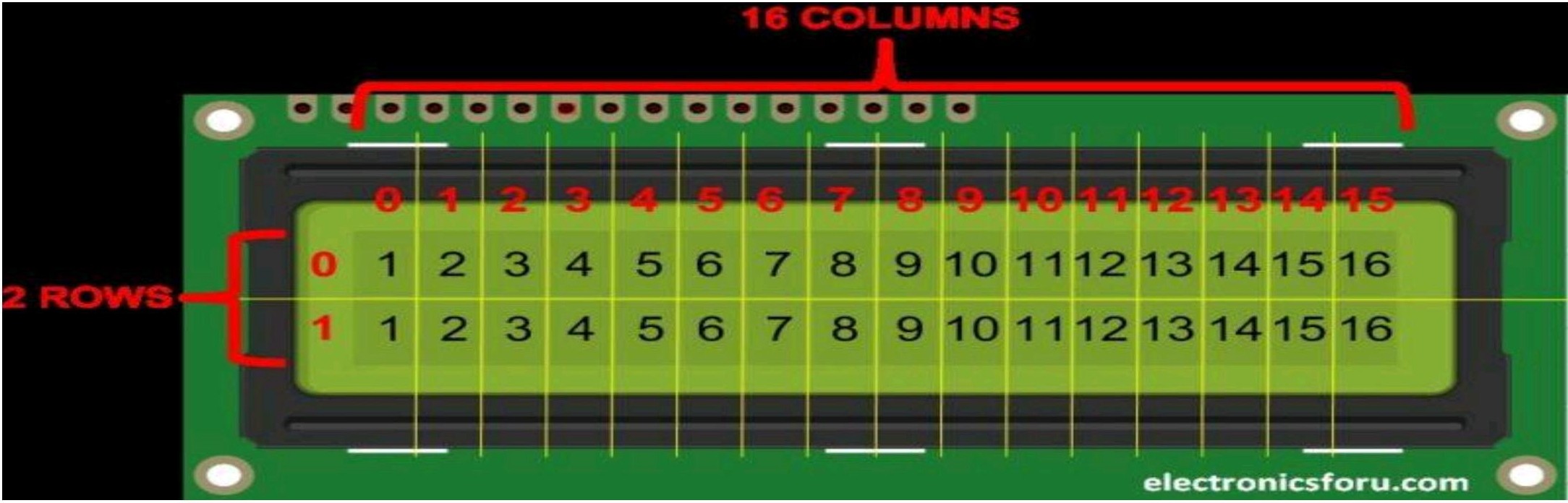
**Fig 3.4.4 Power Supply**

This section describes how to generate +5V DC power supply. The power supply section is the important one. It should deliver constant output regulated power supply for successful working of the project. A 0-12V/1 mA transformer is used for this purpose. The primary of this transformer is connected in to main supply through on/off switch& fuse for protecting from overload and short circuit protection. The secondary is connected to the diodes to convert 12V AC to 12V DC voltage. And filtered by the capacitors, which is further regulated to +5v, by using IC.

###### LCD DISPLAY

LCD screen is an electronic display module and find a wide range of applications. A l 6x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom

characters (unlike in seven segments), animations and so on. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.

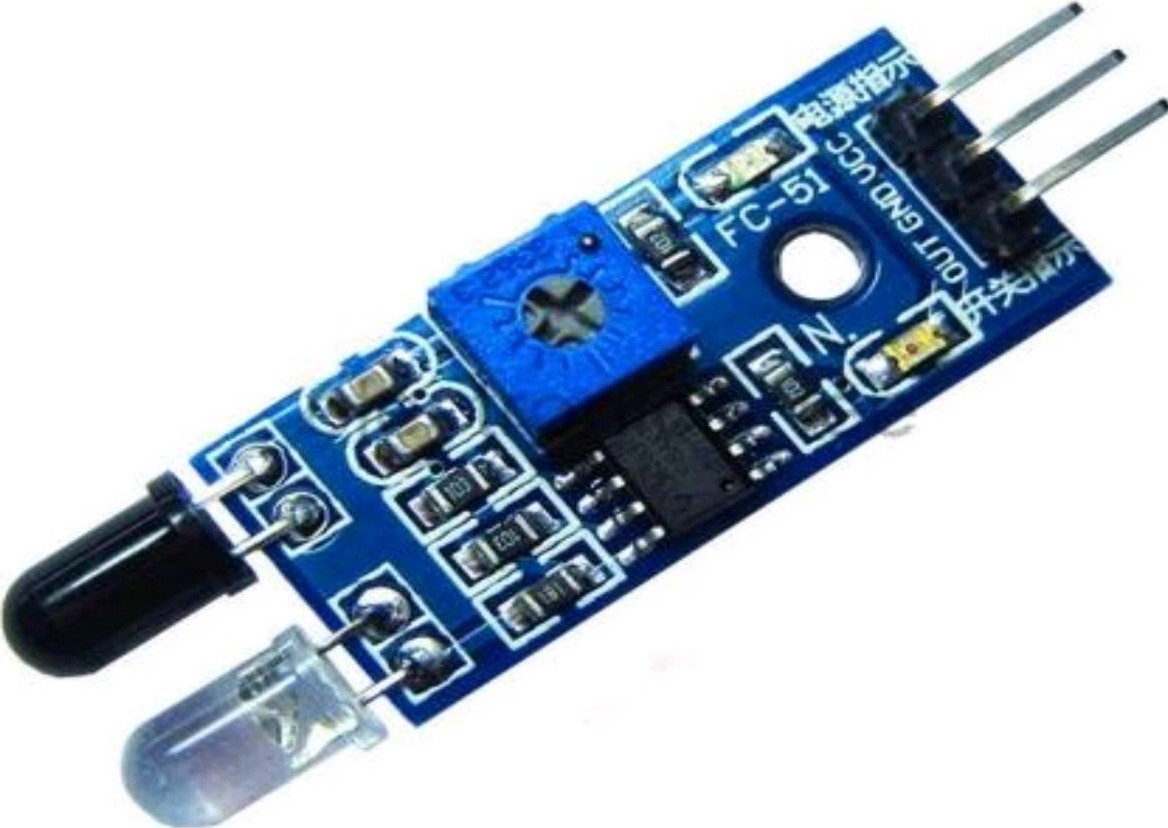


**Fig 3.4.5 Liquid Crystal Display**

###### IR SENSOR

An infrared sensor is an electronic device, that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measures only infrared radiation, rather than emitting it that is called as a passive **IR** sensor. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations. These types of radiations are invisible to our eyes, that can be detected by an infrared sensor. The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photo diode, the resistances and these

output voltages, change in proportion to the magnitude of the IR light received. The resistances and these output voltage, change in proportion to the magnitude of the IR



**Fig 3.4.6 IR SENSOR**

###### RFID TAG (5)

RFID tags can be passive, active or battery-assisted passive. An active tag has an on-board battery and periodically transmits its ID signal. A battery-assisted passive (BAP) has a small battery on board and is activated when in the presence of an RFID reader. A passive tag is cheaper and smaller because it has no battery; instead, the tag uses the radio energy transmitted by the reader. However, to operate a passive tag, it must be illuminated with a power level roughly a thousand times stronger than for signal transmission. That makes a difference in interference and in exposure to radiation. Tags may either be read-only, having a factory­ assigned serial number that is used as a key into a database, or may be read/write, where object-specific data can be written into the tag by the system user.

Field programmable tags may be writing-once, read-multiple; "blank" tags may be written with an electronic product code by the user.



**Fig 3.4.7 RFID TAG(S)**

##### RFIDREADER

RFID systems can be classified by the type of tag and reader. A Passive Reader Active Tag (PRAT) system has a passive reader which only receives radio signals from active tags (battery operated, transmit only). The reception range of a PRAT system reader can be adjusted from 1-2,000 feet (0-600 m), allowing flexibility in applications such as asset protection and supervision. An Active Reader Passive Tag (ARPT) system has an active reader, which transmits interrogator signals and also receives authentication replies from passive tags.



**Fig 3.4.8 RFID Reader**

###### BUZZER

Uses of buzzers and beepers include alarm devices,timers and confirmation of user input such as a mouse click or keystroke. A buzzer is an audio signalling device,which may be mechanical,electromechanical,piezoelectric.



**Fig 3.4.9 Buzzer**

###### SERVOMOTOR

Servomotors are not a specific class of motor although the term servomotor is often used to refer to a motor suitable for use in a closed-loop control system. The motor is paired with some type of encoder to provide position and speed feedback. In the simplest case, only the position is measured. The measured position of the output is compared to the command position, the external input to the controller. If the output position differs from that required, an error signal is generated which then causes the motor to rotate in either direction, as needed to bring the output shaft to the appropriate position. As the positions approach, the error signal reduces to zero and the motor stops. A servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors.

###### FEATURES

* Supply voltage: 5VDC
* Control signal: Analog or Dligital
* High-precision positioning.

###### APPLICATIONS

* Conveyors
* Solar Tracking System
* Antenna Positioning
* Camera Auto Focus
* It is used to measure the speed of the output shaft.

###### RS-232 PROTOCOL

RS-232 is a serial communications interface standard. RS-232 was first defined by the Electronic Industries Association (EIA) in 1962 as a recommended standard **(RS)** for modem interfacing. The most current standard, RS-232D (January 1987), was amended to be compatible with international standards CCITT V.24, V.28, and IS2110.

###### RS-232 PINOUTS

Standard RS-232 pin-outs for IBM compatible computers are shown below. There are two configurations that are typically used: one for a 9-pin connector and the other for a 25-pin connector. The 25 pin connector has some pins that are not used for data transmission. These pins are mainly used for loop-back testing of the post. Typically A/V equipment will also utilize 9 pin connector of RS-232.

###### RTC

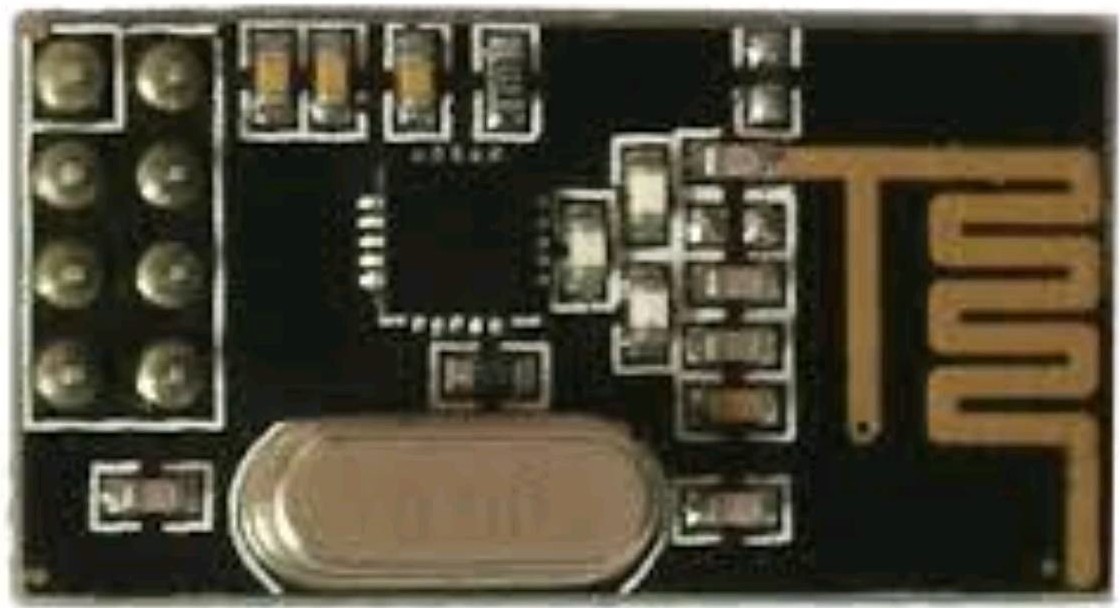
RTCs often have an alternate source of power, so they can continue to keep time while the primary source of power is off or unavailable. This alternate source of power is normally a lithium battery in older systems, but some newer systems use a super capacitor, because they are rechargeable and can be oldered. The alternate power source can also supply power to battery backed RAM·

###### ZIGBEE PROTOCOL NRF24L01

The nRF24L01+ is a single chip 2.4GHz transceiver with an embedded baseband

protocol engine (Enhanced Shock Burst™), suitable for ultra-low power wireless applications. The nRF24L01+ is designed for operation in the world wide ISM frequency band at 2.400 - 2.4835GHz. To design a radio system with the nRF24L01+, you simply need an MCU (microcontroller) and a few external passive components. You can operate and configure the nRF24L01+ through a Serial Peripheral Interface **(SPI).** The register map, which is accessible through the **SPI,** contains all configuration registers in the nRF24L01+ and is accessible in all operation modes of the chip. The embedded baseband protocol engine (Enhanced Shock Burst™) is based on packet communication and supports various modes from manual operation to advanced autonomous protocol operation. Internal FIFOs ensure a smooth data flow between the radio front end and the system's MCU. Enhanced Shock- BurstTM reduces system cost by handling all the high speed link layer operations. The radio front end uses GFSK modulation. It has user configurable parameters like frequency channel, output power and air data rate. NRF24L01+ supports an air data rate of 250 kbps, **1** Mbps and 2Mbps. The high air data rate combined with two powers saving modes make the nRF24L01+ very suitable for ultra-low power designs. NRF24L01+ is drop-in compatible with

nRF24L01 and on-air compatible with nRF2401A, nRF2402, nRF24El and nRF24E2. Intermodulation and wideband blocking values in nRF24L01+ are much improved in comparison to the nRF24L01 and the addition of internal filtering to nRF24L01+ has improved the margms for meeting RF regulatory standards. Internal voltage regulators ensure a high Power Supply Rejection Ratio (PSRR) and a wide power supply range.



**Fig 3.4.10 NRF24E2**

###### SOFTWARE REQUIREMENTS

* EMBEDDEDC
* ARDUINO IDE
* JAVA
* ECLIPSE

###### EMBEDDED C

Embedded C is most popular programmmg language in software field for developing electronic gadgets. Each processor used in electronic system is associated with embedded software. Embedded C programming plays a key role in

performing specific function by the processor. In day-to-day life we used many electronic devices such as mobile phone, washing machine, digital camera, etc. These all device working is based on microcontroller that are programmed by embedded C.

###### ARDUINO SOFTWARE (IDE)

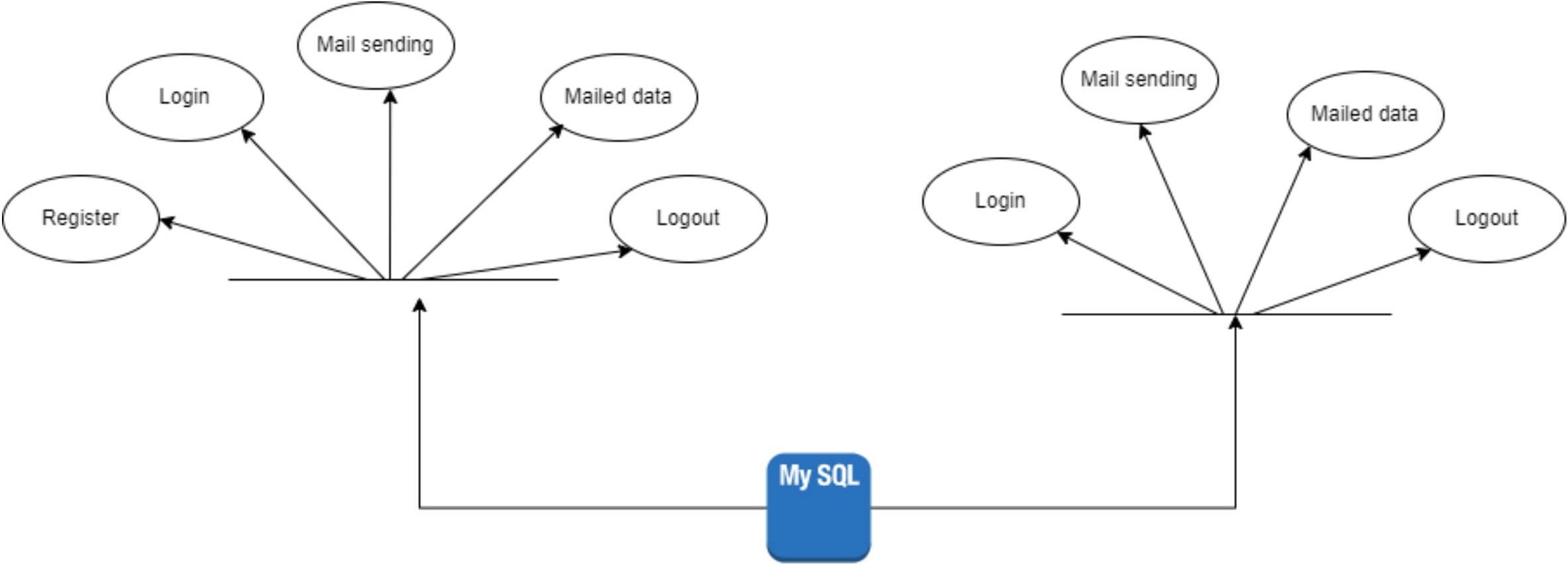
The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them. Programs written using Arduino Software (IDE) are called sketches. These sketches are written in the text editor and are saved with the file extension .ino. The editor has features for cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors.

## CHAPTER4 SYSTEM DESIGN

###### SYSTEM DESIGN

* 1. **ER DIAGRAM**

An Entity Relationship (ER) Diagram is a type of flowchart that illustrates how "entities" such as people, objects or concepts relate to each other within a system. ER Diagrams are most often used to design or debug relational databases in the fields of software engineering, business information systems, education and research. Also known as ERDs or ER Models, they use a defined set of symbols such as rectangles, diamonds, ovals and connecting lines to depict the interconnectedness of entities, relationships and their attributes. They rmrror grammatical structure, with entities as nouns and relationships as verbs.



**Fig 4.1 ER Diagram**

###### DATA FLOW DIAGRAM

A data flow diagram (DFD) maps out the flow of information for any process or system. It uses defined symbols like rectangles, circles and arrows, plus short text labels, to show data inputs, outputs, storage points and the routes between each destination. Data flowcharts can range from simple, even hand-drawn process overviews, to in-depth, multi-level DFDs that dig progressively deeper into how

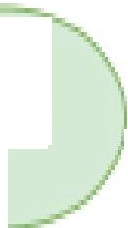
the data is handled. They can be used to analyze an existing system or model a new one. Like all the best diagrams and charts, a DFD can often visually "say" things that would be hard to explain in words, and they work for both technical and nontechnical audiences, from developer to CEO. That's why DFDs remain so popular after all these years. While they work well for data flow software and systems, they are less applicable nowadays to visualizing interactive, real-time or database-oriented software or systems.

###### LEVELO

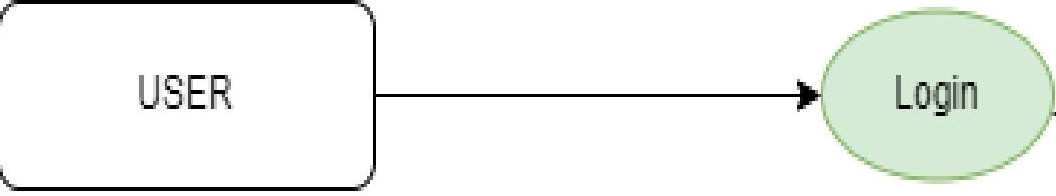
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**Fig 4.2.1 DFD LEVEL 0**



###### LEVEL 1



Database

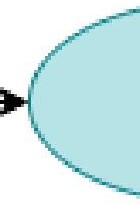
LOCOPILOT

ADMIN

**Fig 4.2.2 DFD LEVEL 1**

###### LEVEL2

ogtn

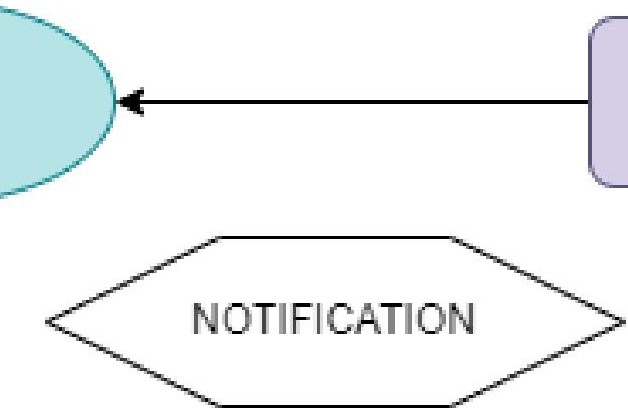


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WCOPILOT

USER



Admin

Database

**Fig 4.2.3 DFD LEVEL 2**

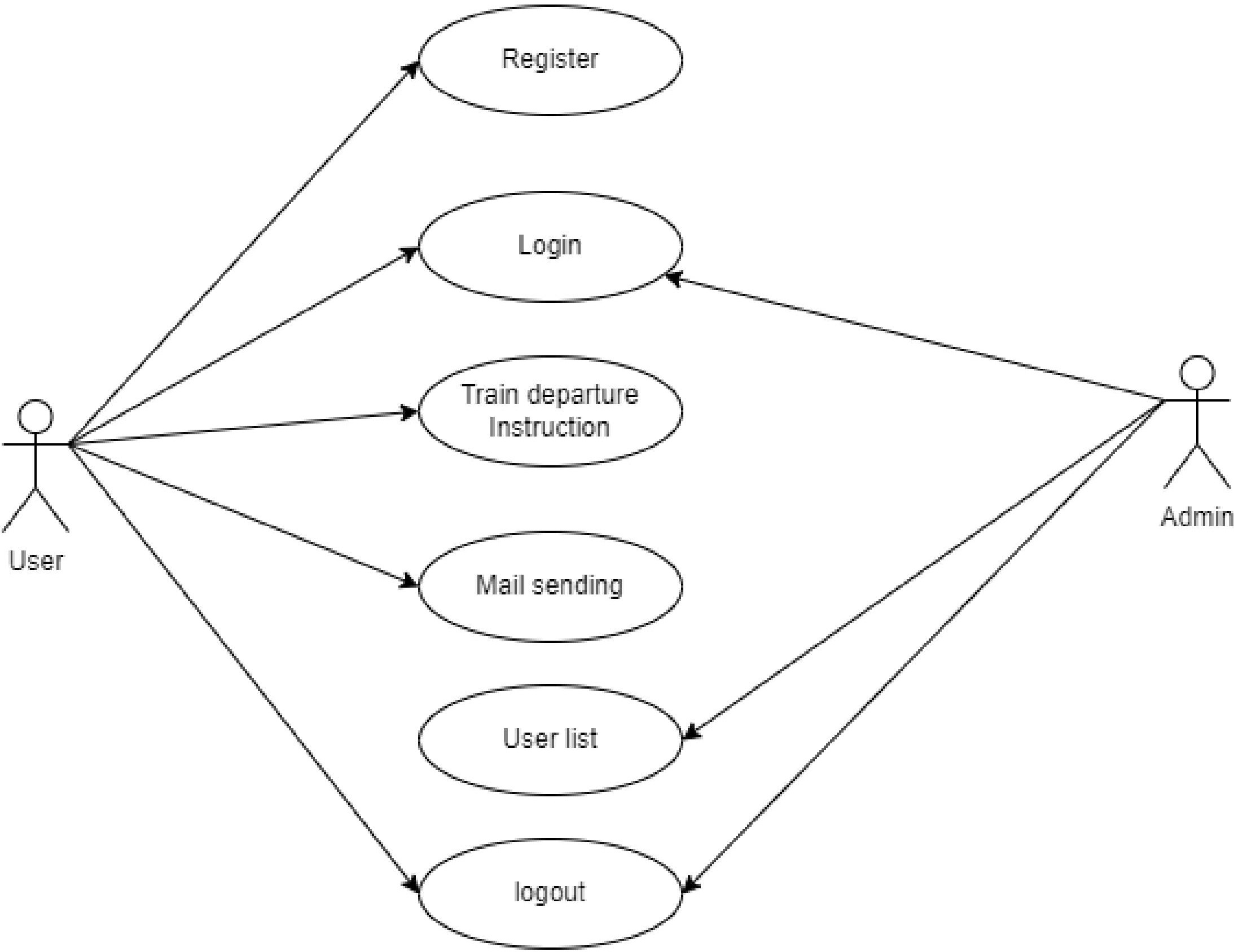
###### UML DIAGRAMS

A UML diagram is a diagram based on the UML (Unified Modeling Language) with the purpose of visually representing a system along with its main actors, roles, actions, artifacts or classes, in order to better understand, alter, maintain, or document information about the system.

###### USE CASE DIAGRAM

A use case diagram is a way to summarize details of a system and the users within that system. It is generally shown as a graphic depiction of interactions among different elements in a system. Use case diagrams will specify the events in a system and how those events flow, however, use case diagram does not describe how those events are implemented. A use case is a methodology used in system analysis to identify, clarify, and organize system requirements. In this context, the

term "system" refers to something being developed or operated, such as a mail­ order product sales and service Web site. Use case diagrams are employed in UML (Unified Modeling Language), a standard notation for the modeling of real-world objects and systems. There are a number of benefits with having a use case diagram over similar diagrams such as flowcharts.



**Fig 4.3.1 Use Case Diagram**

* + 1. **SEQUENCE DIAGRAM**

A sequence diagram or system sequence diagram **(SSD)** shows object interactions arranged in time sequence in the field of software engineering. It depicts the objects involved in the scenario and the sequence of messages exchanged between the objects needed to carry out the functionality of scenario. Sequence diagrams

are typically associated with use case realizations in the logical view of the system under development. Sequence diagrams are sometimes called event diagrams or event scenarios.

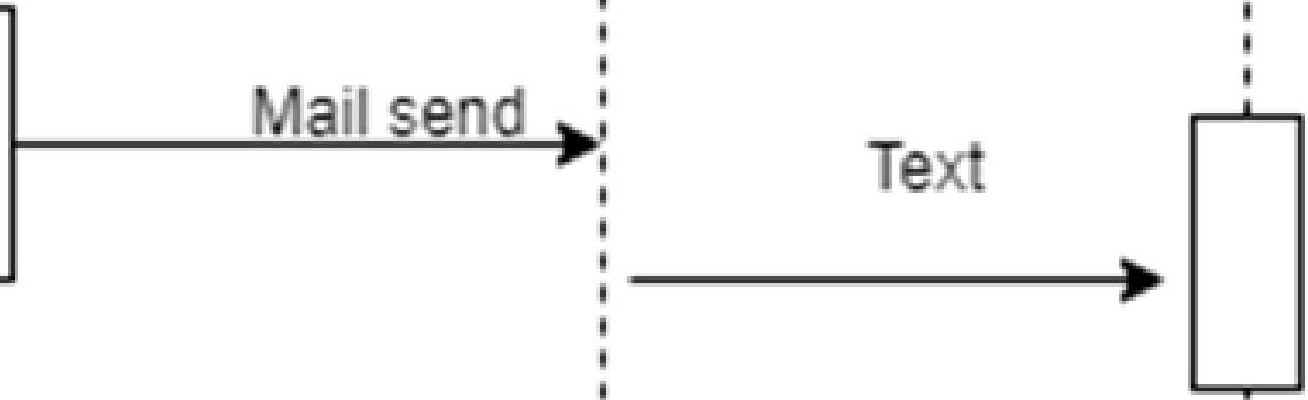
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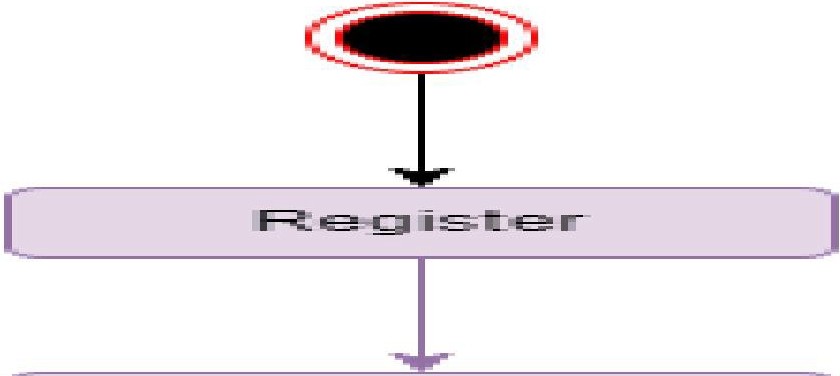


**Fig 4.3.2 SEQUENCE DIAGRAM**

##### STATE DIAGRAM

A state diagram - also known as state chart, state machine diagram *or* state transition diagram - visualizes a sequence of states that an object can assume in its lifecycle. It is used to describe the behavior of a system, subsystem, component, or class. The use of system interfaces can also be specified by state diagrams. Particular attention is paid to the transitions between different states of the object,

the triggering actions and the properties of the object that it possesses or must possess before the state change.

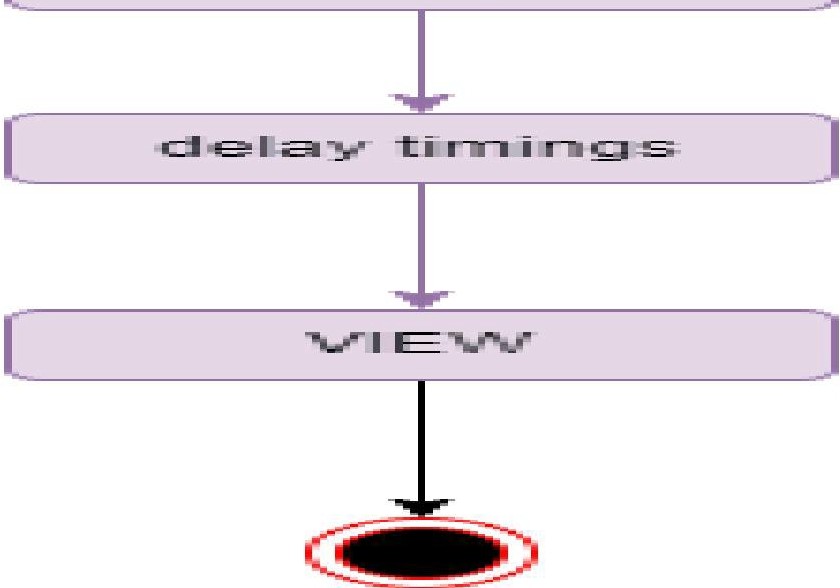


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**Fig 4.3.3 State Diagram**

###### CLASS DIAGRAM

Class diagram is basically a graphical representation of the static view of and represents different aspects of the application. So a collection of class diagrams represent the whole system. The name of the class diagram should be meaningful to describe the aspect of the system. Each element and their relationships should be identified in advance Responsibility (attributes and methods) of each class should be clearly identified for each class minimum number of properties should be specified and because, unnecessary properties will make the diagram complicated. Use notes whenever required to describe some aspect of the diagram and at the end



of the drawing it should be understandable to the developer/coder. Finally, before making the final version, the diagram should be drawn on plain paper and rework as many times as possible to make it correct.



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admin

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| regiister logi |
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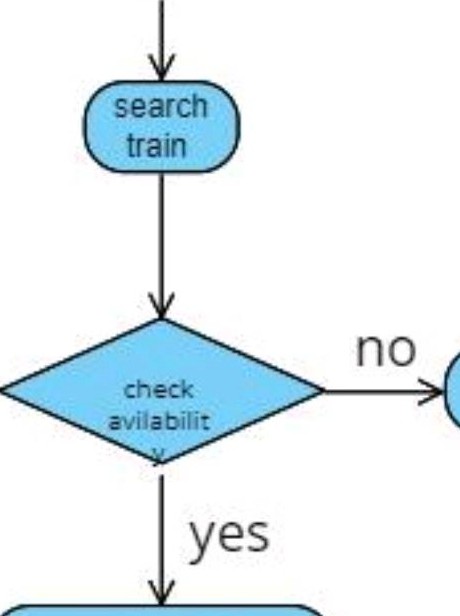
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**Fig 4.3.4 CLASS DIAGRAM**

###### ACTIVITY DIAGRAM

We use Activity Diagrams to illustrate the flow of control in a system and refer to the steps involved in the execution of a use case. We model sequential and concurrent activities using activity diagrams. So, we basically depict workflows visually using an activity diagram. An activity diagram focuses on condition of flow and the sequence in which it happens. We describe or depict what causes a particular event using an activity diagram.

**v1sualP radigm**



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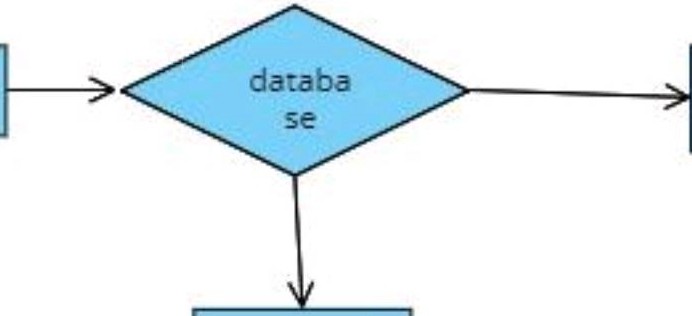
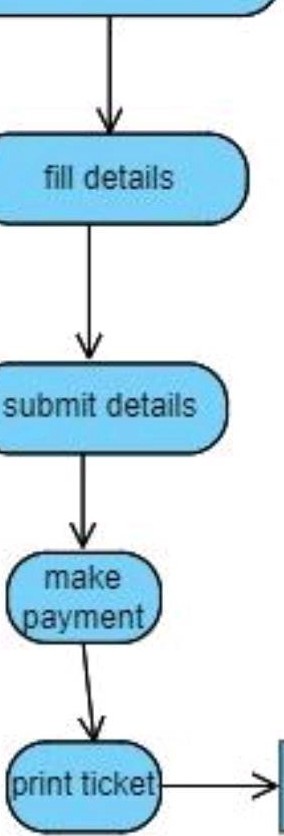
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book tickets



user

locop ot

admin

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mail based on time and track allocation

**Fig 4.3.5 Activity Diagram**

## CHAPTERS SYSTEM ARCHITECTURE

###### SYSTEM ARCHITECTURE

* 1. **SYSTEM ARCHITECTURE**

I POWER SUPPLY I

T-RA-N-SM\_I\_TT\_E\_R I --R-EC-E-IV\_ER\_



WEB APPLICATION

ADMIN Login

USER I



Book train ticket

Train timings

Database

Track allocation mail

Register

Send mail

Loco pilot

**Fig 5.1 System Architecture**

###### HARDWARE ARCHITECTURE

**PO\"\':E.R**

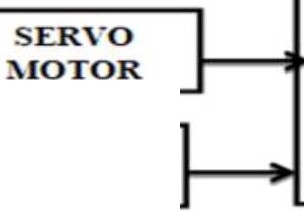
**SUPPLY**

**LC DISPLAY**

RTC

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**B lZZER**

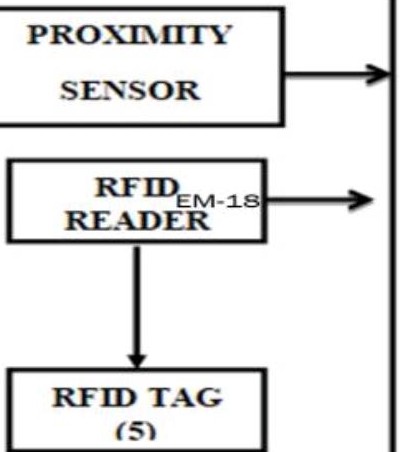
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APPLICATIO::-.



**ARDUINO**

**1\IIEGA**

2560

**Fig 5.2.1 Transmitter**

**PO\'ER**

**SUPPL**

**LCD DISPLA.Y**

**Fig 5.2.2.Receiver**

**ARDUINO**

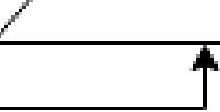
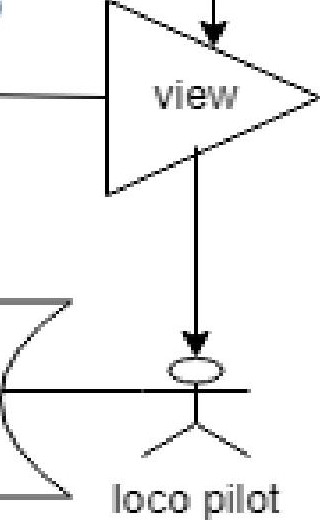
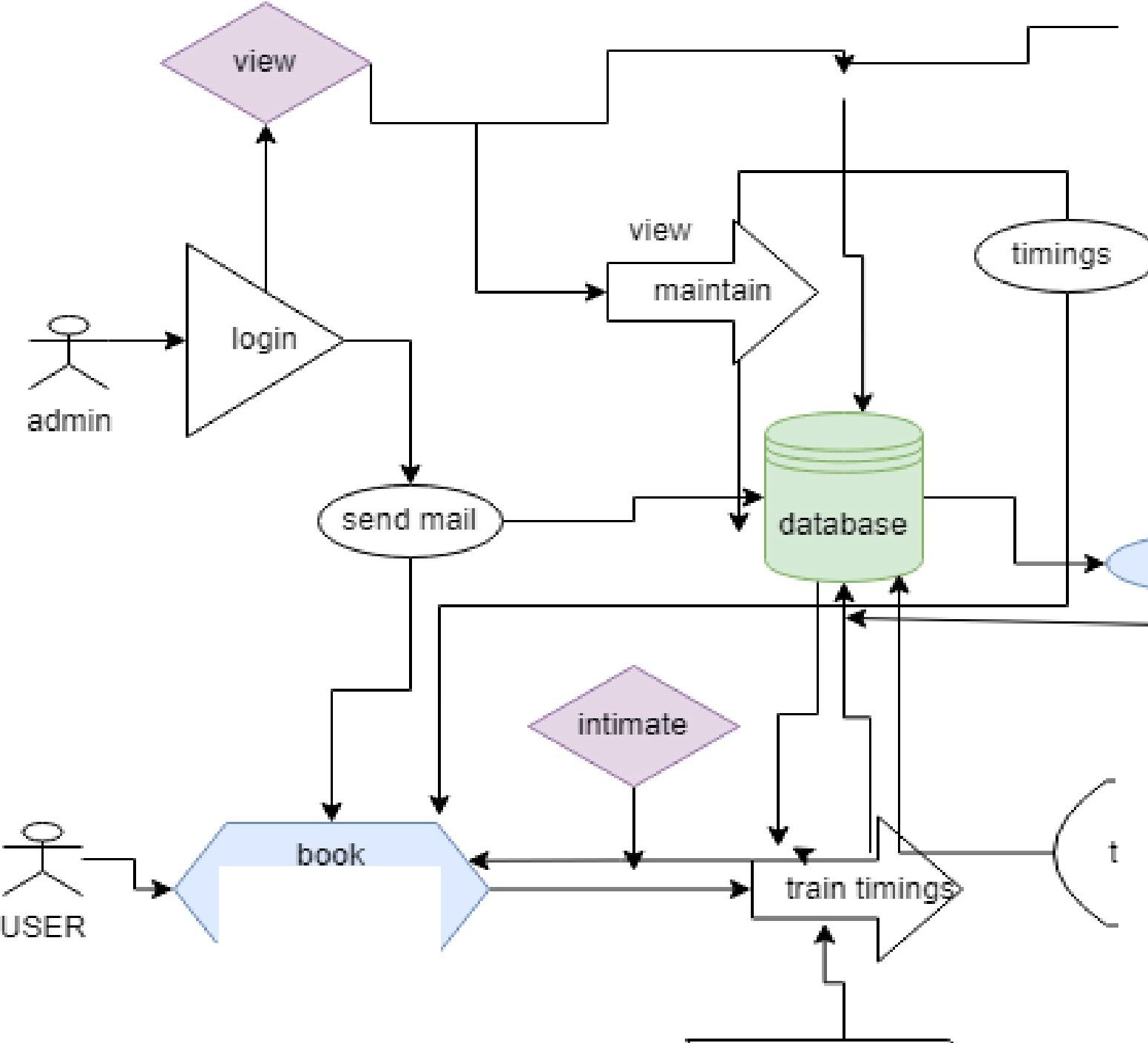
**0**

328P

**ZIGBEE R..'X**

450 mhz

###### SOFTWARE ARCHITECTURE



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ratn

deray Hming:s.

**Fig 5.3 Software Architecture**

###### MODULE DESCRIPTION

* Detecting The Train
* Time Detecting
* Updating
* Receiver

###### DETECTING THE TRAIN

* + - * In this module detecting of the Train is happen. In this we use IR sensor, RFID reader and RFID tag.
      * We use IR sensors to detect the train that arrives on the platform. The RFID tag is placed in the train to identify which train is coming.
      * The RFID reader is placed in the station to read the RFID tag. This module helps to detect which train is coming.

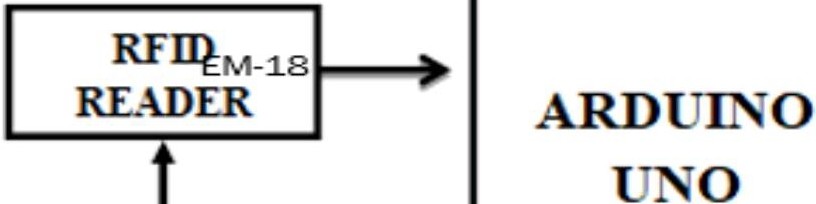
**POWER**

**PL**

**PRO:xn\ITTY**

**RFIDTAG**

**Fig 5.4.1 Detecting The Train**



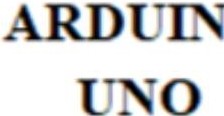
328P

###### TIME DETECTING

* + - * In this module, time detecting process is happen.
      * This includes RFID reader, RFID tag, LCD and RTC.
      * When the IR sensor detects train and gets the ID with RFID tag it then checks the RTC (Real Time Clock) to calculate the arrived time of the train.
      * It also used to get the real time. The RTC is updated visual with the help of LCD.

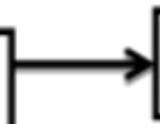
**POWER**

**iPPLY**



**RFIDT.-\G**

**Fig 5.4.2.Time Detecting**

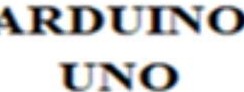


**LCD DISPLAY**

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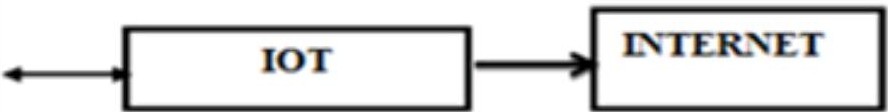
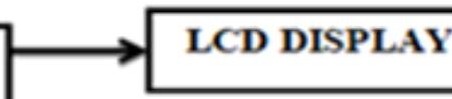
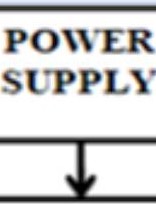
**328P**

###### UPDATING

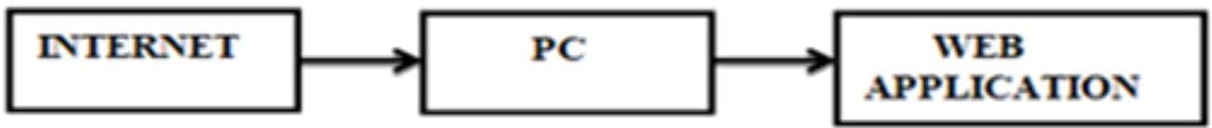
* + - * This module is used to update the information to the web application.
      * This module gets the RTC time when the IR detects train and also gets the id of the trains RFID tag value and updates both in the web page.
      * This module works on the internet connectivity. The process is like it gets

the values and sends it to the pc that contains web application through internet.

* + - * All those mentioned information will be stored in the webpage.
      * Those Information will be helpful to identify which train is arriving ,it also help to arriving time of the trains.



328P

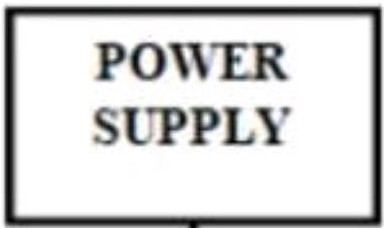


**Fig 5.4.3 UPDATING**

* + - * This module works on the internet connectivity. The process is like it gets the values and sends it to the pc that contains web application through internet.
      * Internet is connected with PC ,Web Application will be connected with PC.

###### RECEIVER

* + - * In this module, the zigbee receiver side is happen.
      * This module is present in train for updating the information to the co-driver. This module sends time through the zigbee module and the train time is updated to the LCD for co-driver.



|  |  |  |
| --- | --- | --- |
|  |  | **328P** |
| **B**  **450 mhz** |
|  |
|  | |

**Fig 5.4.4 Receiver**

* + - * + In Receiver, Arduino UNO is connected with ZIGBEE RX, Power Supply, and LCD.
        + If unexpected train arrives in the same track, this module plays an vital role

in updating all the information about the train to the co-driver in order to prevent the accidents.

## CHAPTER6

**SYSTEM IMPLEMENTATION**

1. **SYSTEM IMPLEMENTATION**
   1. **ALGORITHM**
      1. **SHA-256**
         * SHA 256 is a part of the SHA 2 family of algorithms, where SHA stands for Secure Hash Algorithm. Published in 2001, it was a joint effort between the

NSA and NIST to introduce a successor to the SHA 1 family, which was slowly losing strength against brute force attacks.

* + - * The significance of the 256 in the name stands for the final hash digest value, i.e. irrespective of the size of plaintext/clear text, the hash value will always be 256 bits.
      * SHA-256 algorithm works by taking a piece of information and passes it through a function that performs mathematical operations on the plaintext.

This function is called the hash function, and the output is called the hash value/digest.

* + - * The main reason technology use SHA-256 is that it doesn't have any known vulnerabilities that make it insecure and it has not been "broken" unlike

some other popular hashing algorithms.



Message Length Digest Length Irreversible

**Fig. 6.1.1.SHA-256**

###### 6.1.2.HASHING

* + - * Hashing is the process of scrambling raw information to the extent that it cannot reproduce it back to its original form.
      * It takes a piece of information and passes it through a function that performs mathematical operations on the plaintext.
      * This function is called the hash function, and the output is called the hash value/digest.
      * Cryptographic hash algorithms produce irreversible and unique hashes. The larger the number of possible hashes, the smaller the chance that two values

will create the same hash.

+



**Password123**

**D3%f@g43** I

\*~~\*\*\*~~

Original Data Hash Functiion Hash Value/Digest

**Fig 6.1.2.Hashing**

###### CHARACTERISTICS OF THE SHA-256 ALGORITHM

* + - * Message Length: The length of the clear text should be less than 264 bits. The size needs to be in the comparison area to keep the digest as random as possible.
      * Digest Length: The length of the hash digest should be 256 bits for the SHA- 256 algorithm, 512 bits for SHA-512, and so on. Bigger digests usually suggest significantly more calculations at the cost of speed and space.
      * Irreversible: By design, all hash functions such as SHA-256 are irreversible. You should neither get the plaintext when you have the digest beforehand nor should the digest provide its original value when you pass it through the hash function again.

###### STEPS IN SHA-256 ALGORITHM

**PADDING BITS**

* + - * It adds some extra bits to the message, such that the length is exactly 64 bits short of a multiple of 512. During the addition, the first bit should be one, and the rest of it should be filled with zeroes.

**Original Message** + **Padding Bits**

Total length to be 64 bit's less than multiple of 512

**Fig 6.1.4.Padding Bits**

###### PADDING LENGTH

* + - * We can add 64 bits of data now to make the final plaintext a multiple of 512. You can calculate these 64 bits of characters by applying the modulus to

your original cleartext without the padding.

**Original Message Padding Bits** + Modulus Value

Final Data to be Hashed as a multiple of 512

**Fig 6.1.5 Padding Length**

###### INITIALISING THE BUFFERS

* + - * To initialize the default values for eight buffers to be used in the rounds as follows,

a = **Ox6a09e667**

**b** = **Oxbb67ae8S**

c = **Ox.3c6ef.372**

**d** = **OxaS4ffS.3a**

e = **Ox510e527f**

**f** = **Ox9b05688c**

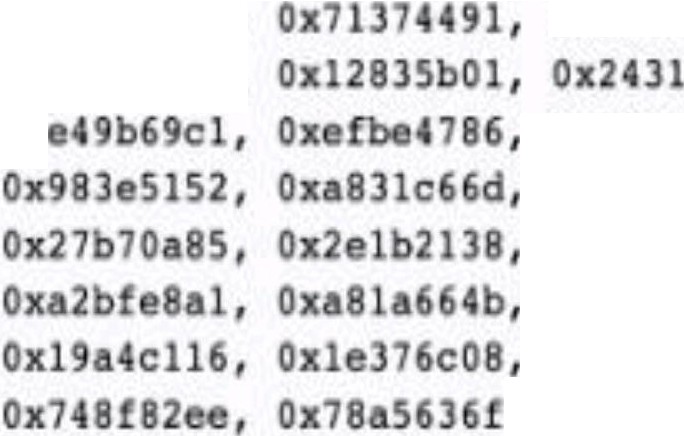
**g** = **Oxlf8.3d9ab**

**h** = **OxSbeOcd19**

**Fig 6.1.6 Initializing the buffer**

* + - * In order to store 64 different keys m an array, rangmg from K[O] to K[63].They are initialized as follows,

[ O.. l :

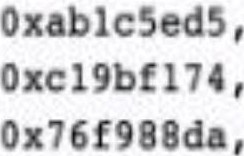
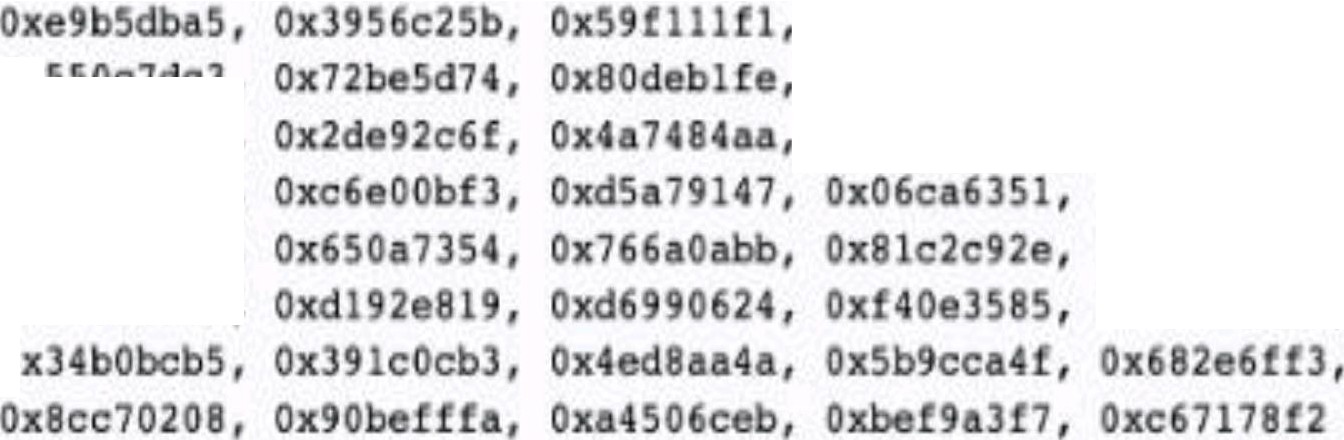
Ox 2842 981

Oxd807aa 8,

Ox

0 cO b 5b

86, dc



e;

e, Ox 6, Ox

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*IO* 84

Fig 6.1.7.Initializing the buffer (64-key)

### CHAPTER 7 PERFORMANCE ANALYSIS

###### PERFORMANCE ANALYSIS

* 1. **UNIT TESTING**

Unit testing is a level of the software testing process where individual where units/components of a software /system are testing process. The purpose is to validate that each unit of the software performs as designed. It is a method by which individual modules are tested to determine if there are any issues by the developer himself. The main aim is to isolate each unit of the system to identify, analyze and fix the defects. Typically written and run by software developers to ensure that code meets its design and behaves as intended. Its goal is to isolate each part of the program and show that the individual parts are correct.

###### ADVANTAGES

* + - * Reduces Defects in the newly developed features or reduces bugs when changing the existing functionality.
      * Reduces cost of testing as defects are captured in very early phase.

###### INTEGRATION TESTING

Integration testing is a level of testing where individual units are combined and the connectivity or data transfer between these units is tested. The main aim of this testing is to recognize the interface between the modules. The integration testing strategy determines the order in which the subsystems are selected for testing and integration. Common approaches to perform system integration testing are Incremental, Top-down, Bottom-up, Sandwich, Big-bang.

###### ADVANTAGES

* + - * All the modules of the software are combinedly tested.
      * Improved test reliability and better test coverage.

###### TESTCASES AND REPORT

**MODULE NAME: DETECTING THE TRAIN**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **TEST CASEID** | **TESTCASE NAME** | **INPUT** | **EXPECTED OUTPUT** | **ACTUAL OUTPUT** | **RESULT** |
|  |  | IR sensor, RFID  reader, RFID Tag | IR sensors | IR sensor |  |
|  | Train | should detect | detects the |  |
| TCOl | Detection | the train that | train that | Pass |
|  |  | arrives on the | arrives on the |  |
|  |  | platform.  (Ser 2.1) | platform.  (Scr2.l) |  |

**Table 7.3.1 Detecting the Train MODULE NAME: TIME DETECTING**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **TEST CASEID** | **TEST CASES NAME** | **INPUT** | **EXPECTED OUTPUT** | **ACTUAL OUTPUT** | **RESULT** |
| TCOl | To detect the train and mail the passengers about the early arrival of train | RFID Tag, RFID  reader, RTC, LCD | Train along with time should be detected and passengers should receive mail from admin  (Ser 2.3) | Train along with time is detected and passengers received mail from admin (Ser 2.3) | Pass |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| TC02 | To detect the train and mail the passengers about the  delay arrival of train | RFID tag, RFID  reader, RTC, LCD | Train along with time should be detected and passengers should receive mail from admin (Scr2.4) | Train along with time is detected and passengers received mail from admin (Scr2.4) | Pass |
|  |  |  | Train along |  |  |
|  | To detect the | RFID tag, | with time | Train along |  |
|  | train and mail | RFID | should be | with train is |  |
| TC03 | the passengers | reader, | detected and | detected and |  |
|  | about the On- | RTC, LCD | passengers | passengers |  |
|  | Time arrival |  | should receive | received mail | Pass |
|  | of train |  | mail from | from admin |  |
|  |  |  | admin | (Ser 2.5) |  |
|  |  |  | (Ser 2.5) |  |  |

**Table 7.3.2 Time Detecting**

#### MODULE NAME: UPDATING

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **TEST CASEID** | **TEST CASE NAME** | **INPUT** | **EXPECTED OUTPUT** | **ACTUAL OUTPUT** | **RESULT** |
| TC0l | To Update the information (Train Time, ID) TO THE  WEB APP | RTC, RFID  Tag, RFID  Reader | Information should be updated to web application  (Ser 2.6) | Information Updated to Web App (Ser 2.6) | Pass |

**Table 7.3.3 Updating**

#### MODULE NAME:RECEIVER

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **TEST**  **CASEID** | **TESTCASE**  **NAME** | **INPUT** | **EXPECTED**  **OUTPUT** | **ACTUAL**  **OUTPUT** | **RESULT** |
| TC0l | Updating the Train information (Unexpected train arrives msame track) to the co-driver  through mail | ZIGBEE  **RX,RFID**  Tag,  **RFID**  reader | Loco Pilot should receive mail from admin  (Ser 2.7) | Loco Pilot received mail from admin  (Ser 2.7) | Pass |

**Table 7.3.4 Receiver**

### CHAPTERS CONCLUSION

1. **CONCLUSION**

**8.lRESULT AND DISCUSSION**

The Trains can be identified using the RFID Tag Attached to the train which transmits data to the RFID Reader before few distance away from the Railway Station. RFID tags has a unique number for their detection purpose & Embedded system inside the Arduino takes care of Identifying the Train with the RFID Tag Unique Number. We introduce Automated Railway Signaling System **(ARSS)** which automatically collect the information about the Train. The movements of the train can be controlled based upon the signal which will be automatically generated by the system. Since the Mail ID of the passengers and Loco Pilot including the details will be mentioned in the Java Code, The **ARSS** will take care of mailing to the Loco Pilot as well as passengers. The **ARSS** will mail as the process succeeds as per the schedule. If another train arrives in the same track, it will automatically intimate the Loco Pilot to allocate the track according to their availability in order to send to their respective platform, and also send updates to the Loco Pilot with the help of a ZIGBEE transmitter. Then the Java web application will send Gmail to the persons who are logged into the web application. We are planning to provide a system to automatically collect the information about trains and make the schedule based on track availability.

###### 8.2 CONCLUSION AND FUTURE ENHANCEMENTS

Rail transportation 1s acknowledged as an energy-efficient (though capital­ intensive) and environmentally friendly mode of transportation. This project focuses on improving train schedules on railway networks with busy complicated stops. We attain our goal with the aid of an embedded system. The sensor approach is used to create this paradigm. This device detects the arrival of the train using sensors. Railways may be made more appealing to travellers by lowering waiting times, accidents, and increasing the number of services and timeliness i.e punctuality. Used to detect the train arriving time to the stations and update to the webpage. It is helpful to check whether the rail arrives to the station on time. And also helps to update the information with respected id's. In future we can add alert if the train is delay. And also we can make the whole system is controlled by Al.

### APPENDICES

**APPENDICES**

**APPENDIX 1. CODING**

* 1. **CLIENT-SIDE CODING**

**Ticketbooking.java**

package servlet;

import java.io.IOException; import java.sql.Connection; import java.sql.PreparedStatement; import java.sql.SQLException;

import javax.servlet.ServletException; import javax.servlet.annotation.WebServlet; import javax.servlet.http.HttpServlet;

import javax.servlet.http.HttpServletRequest; import javax.servlet.http.HttpServletResponse; import javax.servlet.http.HttpSession;

import dbcon.dbcon; @WebServlet("/ticketbookdetails")

public class ticketbookdetails extends HttpServlet { private static final long serialVersionUID = IL;

public ticketbookdetails() { super();

}

protected void doGet(HttpServletRequest request, HttpServletResponse response) throws ServletException, IOException {

}

protected void doPost(HttpServletRequest request, HttpServletResponse response) throws ServletException, IOException {

String name=request.getParameter("fname"); String ename=request.getParameter("age"); String pname=request.getParameter("email"); String number=request.getParameter("phone"); String from=request.getParameter("from"); String to=request.getParameter("to"); HttpSession train=request.getSession(); train.setAttribute("fromname", from); train.setAttribute("bookto", to);

String date=request. getParameter("date");

int reg=0;

Connection con=(Connection) dbcon.create(); try {

PreparedStatement ps=con.prepareStatement("INSERT INTO train.trainticket VALUES(id,?,?,?,?,?,?,?)");

ps.setString(l, name); ps.setString(2, ename); ps.setString(3, pname); ps.setString(4, number); ps.setString(5, from); ps.setString(6, to); ps.setString(7, date); reg=ps.executeUpdate();

} catch (SQLException e) {

e.printStackTrace();

}

if(reg==l){

response.sendRedirect( "trainnames.jsp");

}

else{

response.sendRedirect( "error.jsp");

}

}}

##### SERVER SIDE CODING ADMINLOGIN

package servlet;

import java.io.IOException; import java.sql.PreparedStatement; import java.sql.ResultSet;

import java.sql.SQLException;

import javax.servlet.ServletException; import javax.servlet.annotation.WebServlet; import javax.servlet.http.HttpServlet;

import javax.servlet.http.HttpServletRequest; import javax.servlet.http.HttpServletResponse; import com.mysql.jdbc.Connection;

import dbcon.dbcon;

@WebServlet(&quot;/Adminloginservlet&quot;) public class Adminloginservlet extends HttpServlet {

private static final long serialVersionUID = IL; public Adminloginservlet() {

super();

}

protected void doGet(HttpServletRequest request, HttpServletResponse response) throws

ServletException, IOException {

}

protected void doPost(HttpServletRequest request, HttpServletResponse response) throws

ServletException, IOException {

String email=request.getParameter(&quot;email&quot;); String pass=request.getParameter( &quot;pass&quot;); Connection con=(Connection) dbcon.create();

boolean log = false; try {

PreparedStatement ps=con.prepareStatement(&quot;SELECT \* **FROM**

train.admin where Email=? and password=?&quot;); ps.setString(l, email);

ps.setString(2, pass);

ResultSet rs=ps.executeQuery(); log=rs.next();

}

catch (SQLException e) { e.printStackTrace();

}

if(log==true){

response.sendRedirect(&quot;adminmainpage.jsp&quot;);

}

else{

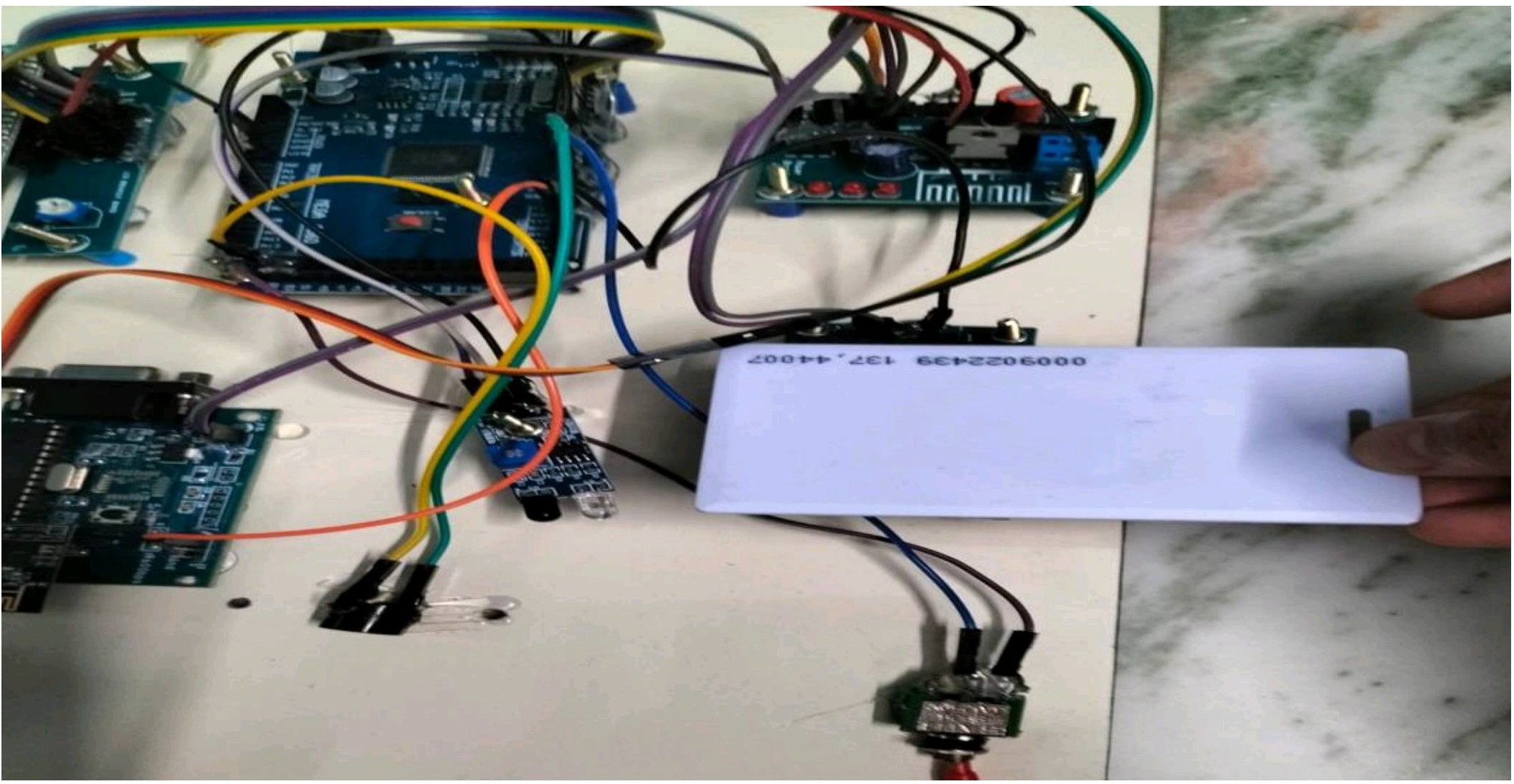
response.sendRedirect( &quot;error.jsp&quot;);

}

}

}

###### APPENDIX 2. SAMPLE SCREENSHOTS



**Ser 2.1 Screenshot of Train Detection**

, MySQL Query Browser• Connection: root@localhost3306 / test **0** X

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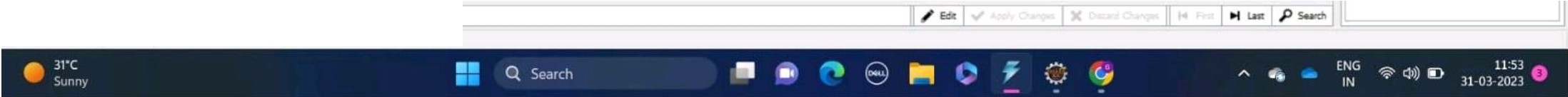


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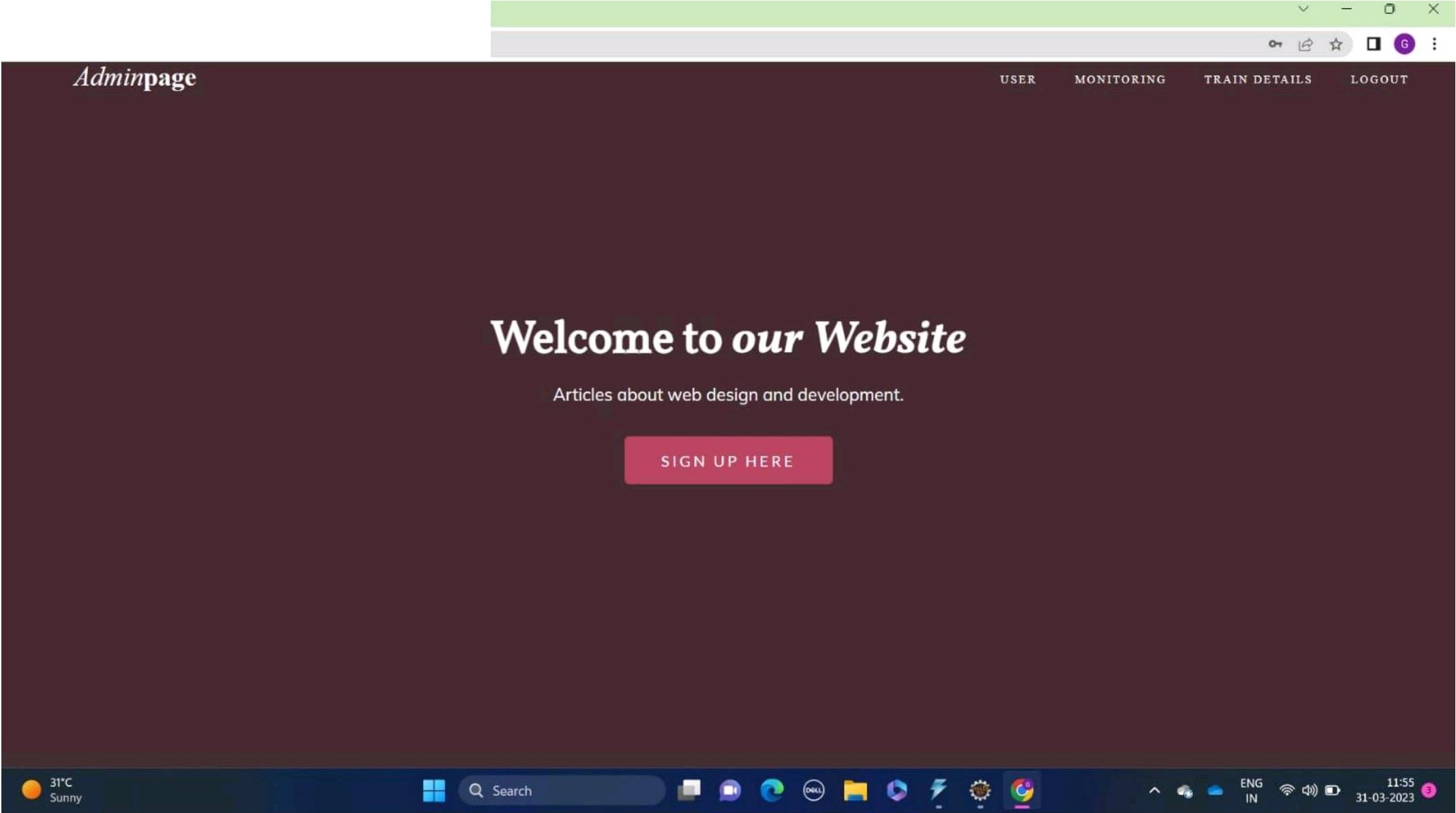
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**Ser 2.2 Screenshot of Train Database**



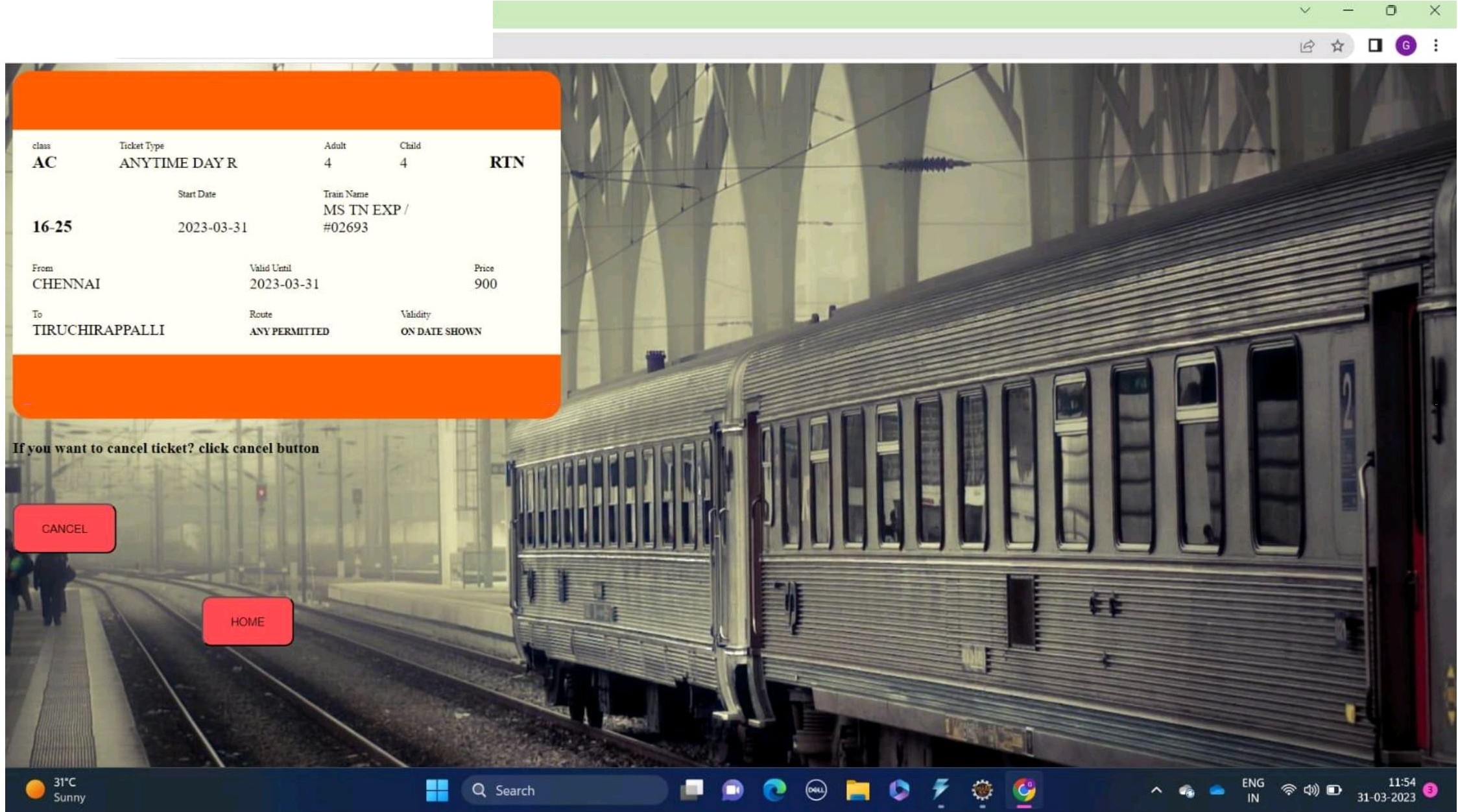
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f- C (D 1ocathost8080/trainproject/adminmainpagejsp

Ser 2.3 Sereenshot of **Admin** Page



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f- C (D localhost8080/trainproject/t.icketjsp

Ser 2.4 Sereenshot of User Booking Train Ticket

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* [smtpmailsendO@gmall.com](mailto:smtpmailsendO@gmall.com) 

YOVflra,nwt1!11ttcailvk>t P11nslhanky0u

[smtpmailsend0@gmail.com](mailto:smtpmailsend0@gmail.com) 

Dear lotapti01 Your train and the ooe In opposlbon are on the same track The Train name rs MS TN EXr 1.u02G93





**Ser 2.5 Sereenshot of Message for Early arrival of Train**

r M OneTimePassword•mlinnetble\_x + .

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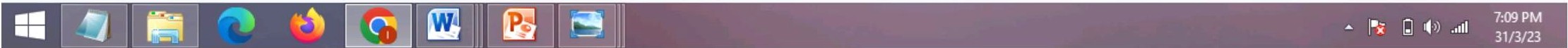
|  |  |  |  |
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| One Time Password '""°'•   * [smtpmailsend0@gmail.com](mailto:smtpmailsend0@gmail.com) |  | 12:02PM(7hoursago} \* | +-, |
| Your Train will get late for 15 mins Thankyou... |  |  |  |



**0**

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**Ser 2.6 Sereenshot of Message for Delay arrival of Train**

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+



**Ser 2.7 Sereenshot of Message for On-Time arrival of Train**

01nsertutlehere **X** + **0** X



f-

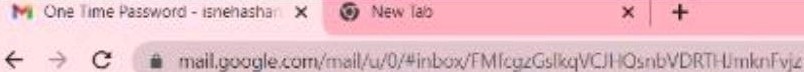
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**Ser 2.8 Sereenshot of Updating Train Information to the Web APP**



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[smtpmoilsendO@gmoll.com](mailto:smtpmoilsendO@gmoll.com) 

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Dear Lota ot Vourtranandtheonein oppos!llOn ere on lhe same track The Train Mme rs MS TN EXl"llir02GQ3

+-i Reply *)* .l,-+ Forward..,,



**Ser 2.9 Screenshot of Updating Track Allocation to the Loco Pilot**

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