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"AUTOMATED BUS CROWD MANAGEMENT SYSTEM"

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CERTIFICATE

Certified that the Project work entitled **"AUTOMATED BUS CROWD MANAGEMENT SYSTEM"** carried out by **JERRIN JOY (1EP18IS032), KRUTHIK GANDHI H A (1EP18IS038), MANISH G (1EP18IS043)** is a bonafide student of **East Point College of Engineering and Technology** in Partial Fulfillment of the requirement of **Bachelor of Engineering in Information Science** and **Engineering Visvesvaraya Technological University, Belagavi** during the year **2021 – 2022**. It is certified that all corrections/suggestions indicated for Internal Assessment have been incorporated in the Report deposited in the departmental library. The Project report has been approved as it satisfies the academic requirements in respect of Project work prescribed for the said degree.

Signature of the Guide	Signature of the HOD	Signature of the Principal
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DECLARATION

We, **JERRIN JOY (1EP18IS032), KRUTHIK GANDHI H A (1EP18IS038), MANISH G (1EP18IS043)** student of VIII semester of B.E., Information Science and Engineering, East Point College of Engineering and Technology hereby declare that the project work entitled "**AUTOMATED BUS CROWD MANAGEMNET SYSTEM**" has been carried out by us at East Point College of Engineering and Technology, Bengaluru and submitted in Partial Fulfillment of the course requirements of Bachelor of Engineering in Information Science and Engineering of Visvesvaraya Technological University, Belagavi, during the academic year 2020-2021. We also declare that, to the best of our knowledge and belief, the work reported here does not from part of any other dissertation on the basis of which a degree or an award was conferredon an earlier occasion on this by any other student.

DATE: 20/07/2022

PLACE: BENGALURU

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Any achievement, be it scholastic or otherwise does not depend solely on the individual efforts but on the guidance, encouragement and cooperation of intellectuals, elders and friends. We would like to take this opportunity to thank them all.

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ABSTRACT

The Embedded Technology is now in its prime and the wealth of Knowledge available is mind- blowing. Embedded technology plays a major role in integrating the various functions associated with it. This needs to tie up the various sources of the Department in a closed loop system. This proposal greatly reduces the manpower, saves time and operates efficiently without human interference. This project puts forth the first step in achieving the desired target. With the advent in technology, the existing systems aredeveloped to have in built intelligence. Now a days we come across theft, terrorist attacks on public transportation systems. Many a time it becomes difficult for investigating agencies to track the cases. We are proposing a Centralized bus control system where a passenger needs to fill up the details by submitting required ID & address proof as per Know your Passenger policy and purchase a unique ID Bus pass card having unique number (RFID Tag).

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CHAPTER 1

INTRODUCTION

1.1 Overview:

We come across theft, terrorist attacks on public transportation systems & fraud by Passengers or conductors by reusing the old tickets. Sometimes there is problem for the passenger if he does not have the exact change to purchase a ticket; this trivial issue sometimes leads to big fights between conductor & passengers. Also, we know it becomes difficult for investigating agencies to track the cases in case of accidents or terrorist attacks with the existing system. We are proposing a Centralized bus control system where a passenger needs to fill up the details and purchase a unique ID bus pass card having unique number. Thus, the bus centralized control cell has the passenger's details in their database.

While collecting details the centralized Cell needs to collect the passenger's photo, mobile number, ID proof & address proofs as well. Also this issued card should be valid for only certain time. In our case we are proposing the validity period for 1 year. After Expiry of the card, passenger needs to get the card renewed again in the Centralized cell by paying the prescribed fee. While preparing the data of the passenger, we can use Aadhar number (Unique ID issued by Govt of India) so that unique identity of the Passenger is maintained & hence monitoring & maintenance becomes more easy.

Every time Passenger needs to get that card recharged in the bus stop (Centralized Cell outlets) or in the bus itself by a conductor. With this proposed system existing old system such as the paper ticket can be removed with an e-ticket. Here E-ticket is sent to passenger's mobile number with his journey & amount deduction details in the message. As the E-ticket will have timestamp & journey details, it cannot be reused & it will be passenger specific. There is an issue of exact change to be given to the passenger when he buys a ticket. When the conductor/ passenger do not have the exact change, then it will be problem which sometimes results in fight between them.

Thus by using proposed system by conductor, a RFID reader automatically reads the unique tag number & Processor processes the transaction & deducts the amount from the passengers tag (card). A SMS message which we call here as E-ticket is triggered to the Passenger stating that certain amount for his journey has been deducted from his tag no. This SMS again will be used by a passenger as an E-ticket for that journey as the message will have Timestamp valid for that specific journey only & hence no issue of reuse of it thus preventing the fraud by the passenger.

Thus the proposed system will not only help Indian transport systems such as KSRTC BMTC etc. in preventing fraud but also helps in maintaining the database & helps Security agencies. KSRTC or BMTC can encourage the people for using public transportation system by introducing various lucky draw offers by points system for their journey. Passengers can redeem their accumulated points against their card no for attractive offers or prizes. If the passengers are regularly using the public transport system, to encourage them discounts should be offered. To encourage people occasionally offers need to be given so that they can prefer public transport system over their own vehicles.

In the face of the corona virus outbreak, health officials are advising citizens to avoid crowds whenever possible, and people are increasingly worried about being in close contact with strangers. For those who use public transit, this concern is top of the mind. Health experts know that Covid-19 causes respiratory problems. This virus is similar to the common cold and other respiratory viruses, which usually spread through exposure to tiny droplets from a sick person's cough or sneeze. Scientists have been planning for a pandemic for decades and transport hubs are widely regarded as infection hotspots, with virus transmission rates up to six times higher for those using public transport systems. Airplanes, trains and buses (and the stations and airports you must travel through) provide in many respects the perfect environment for droplet-spread diseases such as coronavirus (Covid-19) to thrive.

Most cities with large transit systems, such as in the US, are doubling down on deep cleaning their subway cars, buses, turnstiles, and handrails. The London Underground, which serves roughly 1.2 billion passengers annually, is a particular hotspot. Many mass transit companies have set up pandemic response teams. If the outbreak gets significantly worse, it is up to transit and local officials to use their discretion and shut down the system or reduce service.

Authorities in Wuhan, China, the epicentre of the outbreak, closed all transportation hubs in an unprecedented quarantine, stopping all trains, ferries, buses, and planes from leaving the city when the disease started to take hold in late January. This drastic step, in retrospect, appears to have been most effective in slowing the spread of the virus.

What measures can individuals and companies take to reduce risk and effectively slow the spread of the virus? Individuals can consider commuting during non-peak hours, using transport other than mass transit systems, or working from home. Many major companies have asked employees to work from home or instituted a staggered work-from-home plan. If you feel sick or belong to the category classified as "at higher risk" of contracting the corona virus (older adults, people with chronic medical conditions, etc

Public Transport system (PTS) remains the major source of income in most of the developing countries like India. However, PTS now faces severe malfunctions and various security problems. First, there is a lot of confusion between the passengers regarding fares which lead to quarrels and chaos. The user friendly automated ticketing and destination announcement system suggested in this paper is not only automatically deduct the passenger's fare according to the distance travelled but also notify the passengers about the next stoppage en-route. This is possible by use of RFID [1- 3] cards and GPS technology [4, 5] that can be used to make the transaction and travelling very precise. This paper deals with the identification and ticketing of the passengers travelling by the bus. In this paper, we have implemented an automated process for ticketing system in the Public Transport, which is mainly based on RFID and GPS technology. A user-friendly app "*SwipeNgo"* has been developed on Android Operating System (OS) [6] to make the whole journey of a passenger enjoyable and hassle-free. This system eliminates the usage of paper-tickets. In the present ticketing system, the conductors manually issue tickets and the fare is calculated mentally before issuing the tickets. The details of the destination bus stop and source bus stop are not mentioned on the tickets. Moreover, after the passenger reaches the destination, the ticket is of no use, and is thrown away. This causes loss to economy. The problem is eliminated with the use of RFID based smart cards, the passenger can take a cashless ride. The passengers carrying smart cards can have access to any bus service in the city and the smart cards are reusable over a particular time period, for a month or a year. So, a much secured journey is ensured for the commuter carrying such cards.

In addition, the Android application, which has been developed as a user interface, has much to offer. The app takes in the tag-ID of the passenger as soon as he/she swipes the card. The system checks whether the passenger coming in has valid credentials corresponding to the tag ID, then checks for the balance amount left. If it is below the permissible amount to ply on bus, the passenger is not allowed to enter the bus. So, only after the first stage of verification process completes, the passenger is allowed to enter the bus. Moreover, the GPS location of the entry stoppage of the passenger corresponding to that tag ID is stored automatically in the database (refer to as SQLite database [6]). As soon as the next stop arrives, the GPS location gets updated, notifying the next stoppage of the bus via passenger announcement system. Now, when the passenger wants to off-board the bus, the passenger again swipes his /her RFID card in the card reader. The GPS location of his exit-stoppage is noted eventually. According to the route distance between departure & destination, the fare is calculated and debited from the RFID tag based ticket electronically using a specifically developed android app "*SwipeNgo"*. The complete algorithm is described in details in section III. This whole transfer of passenger data from the smart card setup to the driver's phone occurs via Bluetooth. We have separately placed a Bluetooth module in the hardware setup which communicates wirelessly with the phone and does all of its necessary operations as mentioned above. We also have kept separately a destination announcement system where the upcoming and reached destination's name will

be announced over a particular interval of time. This system works on the principle that whenever a particular location is reached, it checks the GPS coordinates of that particular location from the database or look-up table. If it matches, it plays a specific audio file to announce reached destination's name and the upcoming destination's name. This is really helpful for passengers or tourists who don't know the exact route of their journey.

Having hundreds of vehicles in a public transportation system employ numerous resources to keep them functional and efficiently serving the public's needs. However, the efforts of these entities are thwarted by inappropriate trip scheduling, which see the companies suffering substantial losses and commuters largely inconvenienced. Without adequate and proper scheduling, there are empty buses idly parked at termination points awaiting rigid departure times while potential passengers crowd bus stops due to unforeseen circumstances. This scenario results in having stranded passengers and a loss for the bus company in the form of wasted fuel and other resources. In addition to inappropriate trip scheduling, the issue of ticketing also bears some passenger inconvenience. This is attributed to the fact, which in respect of the Jamaican Urban Transport Company (JUTC) currently utilizes a combined cash and cashless system similar to that in many countries namely the UK, USA and Australia for the payment of fares and issuing of tickets. With this as basis, we look into the possible ICT applications in Public transportation system The scheduling and tracking of buses will also rely heavily on the capabilities of ICT in order to reflect in real time, the numerous actual events taking place in the field with regard to bus and commuter interaction and to facilitate the mitigation of common problems resulting from the unpredictable nature of the variables involved. With ICT facilitating communication via telephone lines and wireless/mobile signals, the network of buses, commuters and reference points such as bus stops and traffic lights, will be strengthened and widespread, as the capability to function will hold true and be able to cover as much ground as is covered by the existing telecommunications networks. This fosters a more complete picture of the actual environment in which tracking and scheduling will take place. With widespread use of cellular phones, landlines and even the presence of cable television, sending messages within the network will be virtually trouble free. In the event where there are no landline or cable television infrastructure, cell phone towers (base stations) or GPS satellites will take over the task of relaying messages. With a message being sent each time the position of a bus is registered and when a commuter keys in, there is an almost instant notification of that event sent to the respective recipient and depending on the processing requirement associated with the message, a response is issued in a like manner if necessary. This efficient method of message passing is ideal for optimal scheduling of buses, as drivers may be issued updated schedules, informed of anomalies and presented with a view of the wider network with reference to their location and points of interest.

1.2 Objectives:

- To design a system using RFID GPS message to travelling in BMTC BUS.
- Deduct the amount from their smart card according to the How much KM they Travel.
- Message sending to the after completion of the journey.
- Seat availability facility.
- Crowd Management In Buses.

1.3 Purpose & Scope:

1.3.1 Purpose:

With the increasing population density, the public safety is becoming more and more urgent. Using computer simulation to study the law of crowd movement has an important significance. In case of public transports, it is usually noticed that some of the buses are overcrowded and at the same time some of them are half-empty although they are heading towards the same destination at the same time. The problem gets even worse if the bus is late. People try to board the bus that comes first as they have no idea about the upcoming buses. The buses coming thereafter aren't fully occupied. This uneven crowd density in the buses is undesirable. Another problem is that the cost remains the same it is not calculated based on the distance. For this purpose we are going to introduce a crowd management based smart ticketing.Crowd Management in Bus Transport Service provides an easy way to know about the live crowd density present inside the bus to the commuters present at the upcoming bus stop.

1.3.2 Scope:

There being a large scope once digitalized one of the other application which could be implemented is, when there are children below the age of 16 who would be using their discount card to travel to and from there school/ college their parents or guardians could subscribe for a service where in which to let them know when and where their children are. In this manner there is an opportunity to expand and develop using this system.

CHAPTER 2

LITERATURE SURVEY

2.1 Introduction:

The current scenario of public transport is not viable for commuters, especially during peak hours. Most of them face the problem of overcrowding and have little to no idea about the crowd density inside the bus as well as the Realtime location of the bus.There were many works previously carried out related to the automated bus ticketing system using RFID. Some of them are enlisted here. Md.Foisal MahediHasan et.al [1] portrays about the public transport ticketing system, prevailing in the megacity Dhaka (Bangladesh) which introduces severe mal function in the system, malicious argument among public, corruption and most of all traffic- jam. The proposed system emphasizes on conductor-less driving which overcomes all the above defects. Our proposal actually suggests a much more public friendly, automated system of ticketing as well as the credit transaction with the use of RFID based tickets. Saurabh Chatterjee et.al [2] suggest a user-friendly automated traffic control system which will automatically detect a vehicle using the RFID active tag attached to the vehicle and as soon as the vehicle passes by a reader. This process would lead to identification of each vehicle reducing traffic malfunction and also reducing security problems. This system is implemented using RFID technology, ARM processor and GPS system. Our paper suggests building a RFID system using ARM processor that can identify passengers in public transport as well as does all accounting purpose related to travelling expenses. Varun Krishna K.G et.al [3] primarily suggests the use of RFID technology to provide an efficient and enhanced automated ticketing system. Taking into consideration the capital and complexity, this paper suggests the implementation of the ticketing system by making use of a cyclometer that can be coupled to the wheel(s) of the bus to measure the accurate distance travelled by the user. But the use of cyclometer, which is coupled to the wheel(s) of the bus, is both complex and tedious. Much similar work has been carried out in the above papers, also Arul Das [4] has proposed the same idea on Automated public transport fare collection systems based on distance travelled by passenger using smart card instead of RFID, and GPS module. Some tracking systems for public bus transport have also been implemented using these technologies. Vijay Kumar and Dalip [5] have proposed a GPS and GSM based Passenger Tracking System. It tracks the passengers by using ticket number and displays location on Google map. Automated Fare Collection (AFC) System also known as the Transit Smart Card System provides advantages over a manual fare collection system towards lowering labour costs and increasing efficiency in fare collection and management of the respective data so collected. The desire to extract more data than just a deduction of fare from transit smart cards has led to the research efforts in extracting data such as points of origin where a

passengers would board a bus and have these data recorded as the passengers' smart cards are scanned. To achieve this, a Markov chain based Bayesian decision tree algorithm has been developed in this study, wherein the algorithm is verified with the use of public transportation vehicles that are outfitted with GPS tracking and data loggers. Conclusively, it is stated that data collected to represent points of origin when a passengers' transit smart card is scanned, is crucial to the process of transit system planning. In another research the GPS technology is employed towards tracking and scheduling of buses. This has been achieved in Ahmedabad India, where the government has developed and deployed a GPS enabled Bus Rapid Transit System (BRTS) solution to meet its transportation needs in a sustainable fashion. Introduction of the BRTS was motivated by the need for increased reliability and security with emphasis on reduced travelling times. The tracking and scheduling of all buses on all routes is centrally controlled from an integrated control center. Apart from GPS-enabled buses, the system boasts driver assist and automation technologies along with vehicle prioritization and passenger information systems.

RFID technology consists of the following three components: Tag, Reader and the Middleware which interacts with the back-end database. Many applications for RFID technology have been proposed over the years. However, these efforts have been challenged with regard to feasibility, deployment, management, privacy and security. One such research is in applying RFID towards potential passengers passing through a portal in different levels of crowdedness (simulated bus door) rigged with commercial off-the-shelf RFID readers and antennas, passengers as they board and exit the bus. It was found that RFID technology can be effectively used for this type of application, however, it should be noted that in cases of no "line of sight" between smart cards and readers in accordance with the radiation patterns and positioning of antennas, there may be performance fluctuations as these factors are critical to recognition . Research was also focused on how RFID Technology can be used to solve problems faced by public transportation authorities in metropolitan cities by exploring automated tracking of buses that can be used to provide useful estimates of bus arrival times and in turn enhance passenger convenience. A real time tracking and monitoring system is employed which utilizes an Event, Condition and Action (ECA) framework. This aids in efficiently filtering data to remove unwanted or inaccurate instances and then categorizing useful data by aggregation. Also, it is discussed how collected data can be utilized to predict bus movement in an effort to improve the service

Research on open transportation has generally centered around techniques to enhance the effectiveness of the physical transport framework. For example, service scheduling is considered as a critical issue for productive transport activity [7]. Be that as it may, Camacho et al. [3] contend that this point of view is simply inspired by the interests of transport administrators and misses the mark regarding the data needs of travelers in the advanced age. Rather than settling operational transport issues, they recommend to outline traveler driven data framework that can enhance the travelers' journeys.

A critical change of public transport data accessibility has been the improvement of portable transport applications. One Bus Away is the main portable application that brought estimates arrival times of transports on cell phones [6]. The creators indicated experimentally that pervasive

access to expected waiting times essentially expanded fulfillment with public transport administrations. Then, various versatile transport applications have been produced for transport frameworks in numerous urban areas around the globe. Some of these applications use on the inherent sensors of cell phone gadgets to give personalization and setting mindfulness [8], example by utilizing GPS for proposing transport stops in the surroundings of a user. This gives knowledge into the crude context of the user, for example, his present area, however does not catch a more extensive thought of transport setting including the collocated physical transport system, example the bus vehicle and bus line on which a user is riding.

Moreover, current versatile transport applications regularly depend on the vehicle data that is distributed by transport administrators as open information, example in form of the Googles general transit feed specification (GTFS). This information incorporates a depiction of the vehicle network including routes, schedules, and landing times while subjective travel data is absent as a reason for educated travel decisions of transport users. Crowding on public transport framework is a measurement of subjective travel data that is known to have a big effect on travel satisfaction and cause an abnormal state of pressure and inconvenience [9]. To recognize crowd levels on public transport frameworks, some public transport offices embrace mechanized toll gathering framework which can give measurements about the quantity of travelers with advanced tickets [10]. In any case, because of considerable speculation costs these frameworks are just conveyed in chosen urban communities and frequently need combination with explorer data frameworks. Without committed following foundation bolstered by transport specialists, crowdsourcing applications have been produced to secure extra continuous transport data. The possibility of these application is to permit transport clients act in a cooperative way and gather content information about true transport conditions experienced amid their journeys. For example, Tiramisu empowers transport travelers to utilize their cell phones for physically sharing travel encounters, for example, regardless of whether adequate free seats are accessible on transports. In any case, to detect real time crowd data across large-scale public transport networks, completely programmed approaches are required which can work withut steady, manual mediations of transport users. Current traveler data system offer help in singular travel context, example before an excursion is begun, while scanning for a nearby stop or while waiting for a bus. With a specific end goal to offer continuous direction for movement exercises, the possibility of route frameworks has been effectively connected in different portability situations, specifically for people on foot and auto drivers. The equivalent of a navigation system for public transport systems is currently missing as of now. There has been inquire about into

cell phone based frameworks to identify the method of transport of voyaging users. These frameworks can separate transport ride movement from other transport modes by perceiving designs in sensor information acquired from the user's cell phones. However, a route benefit which continually goes with an public

transport client and chooses how to best offer help from begin to end of his adventure is yet an open research challenge [8]. The WI Rover System (WRS) has been running on the buses since April 2010 giving Wi-Fi hotspots to the utilization of travelers. On the review, 17,567 novel customer gadgets were associated with the WRS. This framework gives outline, administration systems for the system. This demonstrates individuals are towards the use of network facilities. The area construct administrations are finished focusing with respect to mobile guides, transport support, assistive innovation and so forth. The necessities openings in every zone are gathered, assessed and applications are spoken to in view of the request of open travel benefit. Those applications that beat the specialized and monetary difficulties are executed for public utilization.

The exploration in Dublin downtown area having two goals i.e., to analyze the feeling of anxiety and to decide solace and reliability level of public transport administrations. This overview demonstrated that pressure was high and solace and reliability level diminished impressively. Thus to defeat this multinomial logic model was utilized to kill crowded and untrustworthy services [2]. Components influencing the reliability of urban transport administrations thinks about twelve urban areas regarding vitality use and ozone depleting substance outflow [GGE]. Every city audited had expanded vitality utilization, GGE, and private vehicle use. Here creator says that private vehicle utilization is expanding since individuals don't bargain on solace and unwavering quality of public transport framework.

Transportation Research Record says that there are a number of factors like traffic congestion, weather conditions etc. which affects the predetermined bus arrival schedule and hence results in increasing passenger waiting time. So there is a need for the system to predict the accurate bus arrival time and hence reduce the passenger waiting time.

Models for anticipating transport delays, says that travel period dependability is a noteworthy factor in public transport framework and led an investigation on estimating of reliability and standard travel times utilizing transport information from Chicago region focuses on nature of administration and reliability offered by open travel administrations. From information gathered for a situation investigation of automated vehicle location (AVL), it displays the Transit Capacity and Quality of Service Manual (TCQSM) strategy for level-of-benefit (LOS) estimation. Other than usability and effortlessness, once in a while the framework is conflicting since the framework does not consider defer sum, does not states the impacts of early flights. The Urban Bus Navigation

(UBN) [1] framework has been incorporated into the metropolitan transport foundation in Madrid, Spain, and is accessible to general society as a free cell phone application that has been utilized by many transport riders. The technical components of the UBN system, give insights into user experiences from real-world field trials and share important lessons have learned in providing a connected transport application for bus passengers. Subjective criticism from genuine transport clients demonstrated diminished intellectual exertion for overseeing bus journeys, increased motivation of using bus transport and better accessibility of travel information.

The existing public bus transport systems have the capacity to absorb large masses of urban travelers, their public image often suffers from a negative perception. From a passengers point of view, bus networks in dense urban areas are often considered as complex and difficult to navigate. In contrast to private modes of transport, traveling on busses offers only a low level of comfort and convenience. Bus journeys lack a sense of personal control and ownership that is valued by car users.

2.2 Summary:

Modified Ticketing System using Radio Frequency Identification (RFID)

Authors: Varun Krishna K.G., Selvarathinam S. , Roopsai V. , Ram Kumar R.M

Publications: International Journal of Advanced Computer Research **Abstract:**

The paper primarily suggests the use of RFID technology to provide an efficient and enhanced automated ticketing system. The principle aim of the paper is to improve the efficiency of the prevailing suggested RFID ticketing system by considering and overcoming its limitations. The prevailing system proposes the installation of RFID reader circuit in each and every bus stop to facilitate the calculation of distance. Taking into consideration the capital and complexity, this paper suggests the implementation of the ticketing system by making use of a Cyclometer which can be coupled to the wheel(s) of the bus to measure the accurate distance travelled by the user (read automobiles).Depending upon the distance travelled, the corresponding cost is automatically deducted from the user's account. The task is implemented by using an automated Database system which makes transactions faster, easier and free ofambiguity. After going through all these papers, we get the idea to propose a RFID and GPS based Smart Bus Ticketing and Destination Announcement System. The idea is to create a system capable of precise location data recording, paper-less ticketing system and easier and faster payment through an android app.

Automated Crowd Management in Bus Transport Service

Authors: Achanta V Meghana, Vedant Sarode, Dhananjay Tambade, Abhidnya Marathe, Nadir Charniya

Publications: Proceedings of the International Conference on Electronics and Sustainable Communication Systems (ICESC 2020), IEEE.

Abstract:

Crowd Management in Bus Transport Service provides an easy way to know about the live crowd density present inside the bus to the commuters present at the upcoming bus stop. This paper presents an Automated Crowd Management System using the algorithms of Machine Learning and IoT Technologies. The crowd density is detectedinside the bus and is classified in to 5 different levels which will eventually be displayed on the LCD screen at the bus stop. The proposed system has an accuracy of 93.09% and the time required to transmit the crowd density to thebus stop is just a few seconds. This thus, provides commuters with a safe journey and helps them know about the live crowd density in a particular bus and help them plan accordingly as to which bus to board or look for an alternative mode of transport.In India, the most widely used public transport system is the ready-to-go-bus facility. However, this 'ready-to-go' facility is not as smooth as the need of the hour, particularly in today's congested metropolitan cities. Standing in long queues at bus stands, quarrelling with conductors for trifle matters make the journey uncomfortable for the passengers. That is why; we have proposed an idea for implementing smart card technology for ticketing the passengers travelling in bus. The smart card is mainly based on latest Radio Frequency Identification (RFID) technology. For this purpose, an interface is built between RFID setup and driver's mobile phone using a specifically developed Android app "*SwipeNgo*". The interface helps to send passenger ID from RFID reader to the driver's mobile phone via Bluetooth. The developed "*SwipeNgo*" app is installed in driver's mobile phone and receives passenger ID from the RFID card reader via interface when passenger get into the bus. Along with the passenger ID, "*SwipeNgo*" also keep records of the stoppage name/no. into database in mapping with the Global positioning system (GPS) coordinates. The exact fare between source and destination is calculated and deducted from the balance when the passenger gets down from the bus. This information regarding balance is also sent to the RFID setup where the fare is displayed. There is a separate announcement system which alerts the passengers prior to the next halt.

A low cost IoT based crowd management system for Public Transport

Authors: Sachin Vidyasagaran, S. Renuga Devi

Publications: Proceedings of the International Conference on Inventive Computing and Informatics (ICICI 2017) IEEE

Abstract:

With the ever growing global population, crowding in public transport is becoming an increasing menace. Public transport systems around the world have remained largely the same over the past several decades although the population they serve has burgeoned. This paper aims to demonstrate a low cost IoT based solution to the crowding problem by using smart seats that can detect and display the seat occupancy status in real time over an internet or mobile application. The feasibility of the project was assessed and simulated using the NETSIM simulation software. The results of the software simulation showed promise and hence a hardware prototype was built using the IEEE 2.15.4 standard on the Arduino - Raspberry Pi – nRF platform. The prototype results are positive and show a fully functional IoT system that can be implemented in buses and trains.Public transportation in many countries is being used as a means of transport for travelling and accordingly people would prefer these public transportation to be scheduled properly, on time and the frequency be increased for commuters to make good use of it. It has been found that quite an amount of research work has been carried out, in this sector, by way of using RFID technology in the public transportation systems towards the tracking of passengers when they board and exit buses. In addition research has also been carried out in using GPS towards the tracking of buses along with RFID technology at traffic lights, bus stops, intersections etc and displaying expected arrival times on LCD screen at bus stops along with their current positions. Taking these aspects into consideration, an intelligent mobile bus tracking system for the Jamaican Urban Transport Corporation as case study has been proposed which enables commuters towards tracking the bus of their choice and also knowing their expected arrival times. In addition to tracking, the proposed system also notifies the passengers on their mobile towards topping up of credit in their RFID enabled smart tickets for traveling, well ahead in time. The above System proposed has been validated using Android in this research which allows commuters towards tracking of buses and knowing the expected arrival time. In addition commuter been reminded on their Android mobile handset towards topping their credit on their ticket towards travelling. The above two solutions would alleviate the challenges faced by commuters in respect of referring to the static bus timetable or looking into LCD display screen which would inform the expected arrival time of the next bus. The implementation of the system has been carried out using Android emulator.

Crowd Counting: A Survey of Machine Learning Approaches

Abstract: Mohamed Abdou, Abdelkarim Erradi

Publications: 2020 IEEE

A Crowd Evacuation Method Integrate into the Emotion Model

Authors: Yan-Bin Zheng, De-Yu An, Bo Li,and Na Li

Publications: International Conference on Instrumentation & Measurement, Computer, Communication and Control

Abstract:

Aiming at the problem of high density crowd evacuation, a crowd evacuation algorithm based on the improved social force was proposed. Firstly, the algorithm is an improvement to the traditional social force model of the problem with all pedestrians variation are same, on the basis of the group form, the optimal speed was set to constrain the speed of the members in the group. Secondly, according to the theory of personality, emotion model was established for all pedestrians, the pedestrian's emotion state was divided into positive emotions and negative emotions, establishing the mechanism of emotion influence through individual influence. Finally, the command strategy was obtained by the individual emotion distribution in the process of crowd evacuation. The simulation results showed that the improved social force model eliminates the turbulence in the narrow channel, pedestrians accelerating or keeping the critical speed was avoided, and provide a basis for when to join the command strategy.

A Successful Approach to Bus Tracking Using RFID and Low Power Wireless Networks

Authors: Dakshinaa Vinod, Ajay Mohan

Publications: 2018 IEEE Region 10 Conference

Abstract:

Heavy dependency on public transport, especially by the middle and lower middle class leading to crowding in buses is a pressing issue in developing countries, that has not yet been dealt with in the right manner. The objective of this paper is the design of tracking and management system for a public transportation system using Radio Frequency Identification(RFID). In each bus is tagged with a unique RFID card which gets detected by the RFID receivers at bus stops. The receivers are attached to a low power wireless communication network which immediately updates its status to the cloud server. Data from the cloud server is made available as a simple user interface in the form of a web page or application. This can help the passengers locate the nearest approaching buses which can take them to their destination in the shortest possible time. The scheme can also aid the scheduling authorities to closely monitor the route of buses.if implemented properly,it help minimize the rush in buses at peak hours.system is not only beneficial to the public but crucial to the transport industry in avoiding operational losses.

Smart Card technology is used to getting the ticket by withdrawing money from passenger's e-wallet inside the smart card instead of transaction of direct money, loss of coin change is prevented. The smart card is scanned using the app by the conductor and after entry of passenger details the device will generate the tickets and money will be directly debited from their E-wallets. This technology is processed by the module in which the fare calculations are programmed. In addition to this a new feature is added that is if the passenger doesn't buy the tickets within a specific time a beep sound will be emitted and the particular person must buy the tickets. By this many frauds can be stopped.

The aim of this paper is to provide a comfort tension free and easy way of travelling and also to reduce the man power. This paper involves the combined usage of smart cards and GPS to make travelling smarter. In our paper, Smart card which has become a common thing now, holds the data of the card holders and GPS which is an efficient tool in many fields like surveillance and tracking, which is used in here to find the distance travelled by the user. The smart card can be used by the user for entering and leaving the bus. Depending on the distance travelled, the money which has been paid in advance will be deducted from the card. This paper includes implementation of the Microcontroller which controls the entire system. It works effectively with GPS and smartcard. This study also stresses the need to make this system practical and the result that we will obtain is explained in this paper.

In the general way, every bus is controlled by a conductor. The conductor will collect money from each passenger and issue ticket. Initially, printed papers or tokens are used as tickets. Nowadays, handheld machines are used to print tickets. This system has many disadvantages. The passenger have to carry the ticket till the end of travel, the conductor should ensure that everyone has got the ticket, the time taken for ticketing is comparatively more and more amount of paper is needed to print the Ticket. Nowadays conductors are trained to operate the handheld ticketing machine.

2.3 Drawbacks of Existing System:

- The existing systems determines only the density of the crowd in the bus.
- In the existing system, the bus tickets are provided by the bus conductor and monitoring the traffic and bus routes are done.
- Information about the location of the bus is sent to the bus information server. The location of the bus is monitored and the location will be viewed on our mobile and also the crowd level can be detected to avoid bus crowds.
- The disadvantages of the existing system are possibility of over fare on ticket charges, the system is applicable only for comfort journey, not for secured journey, the exact count of passenger in the bus is not provided and advanced accident alert system is absent.
- Using webcam for crowd management is not a good option and it is less efficient.

2.4 Problem Statement:

In traditional paper based ticketing, everyday tickets are being printed and sealed with the date manually by the bus conductor travelling in the bus. After finish travelling, the passengers usually throw away the used paper made tickets here & there which ultimately pollutes the environment. Trees are being cut as to make papers and the current system uses the paper based ticketing. Our proposed system uses the RFID tagged card carried out by the passengers and does everything automatically and eventually reduces the complexities faced by the commuters. Some benefits of RFID based ticketing framework over conventional system (both paper based tickets & magnetic tickets) .

2.5 Proposed Solution:

Public transport system using GPS, wifi and RFID is designed for user friendly applications and also LCD is interfaced in order to display the messages, IR sensor are used to identify whether the passengers is carrying the card or not. Here the RFID is used for ticketing purpose, Wifi and GPS is used for mobile data transmission and tracking location.

The design and development of this project is due to its tremendous scope in public transport system. The aim of this project is to design and develop and check the crowd and if the crowd is more it will intimate to the Bus depot to send another bus to the same route. Here the Smart ticketing is done to make the fares to be error free. It provides an easy option for seat availability checking for public in a easy way.

we introduced a smart bus card ticket system using QR code in android application which is user friendly. Now the conductor can scan the QR code in the smart card by the application. The Generated Fare gets deducted from the centralized E-wallet Database. Which is generally monitored and maintained by the head of the Ministry. Here each and every Data's are Answerable to Government records. We have also added some additional features which includes the use of a buzzer within the Conductor application. The technology used is based on where the passenger must buy the tickets within the stipulated time otherwise the buzzer goes off with a beep sound and he must buy the ticket as soon as possible and the conductor can cross check with his records and if frauds if found, fine can be imposed immediately. Another benefit of this system for passengers who do not travel daily, is the alternate cashless cards which are prepaid and can be used just like the Local Train Smart Cards.

The minimum refill of these cards is Rs.100. A Benefit of this cashless cards is obviously the time saving feature which occurs with the hurdle of getting exact change of fares. E-ticket issued is all same, and additional details about balanced amount inside this cashless card is printed along with journey details. The database has all the details related to the specific person and by scanning the QR code it gets validated and the details are displayed on a separate page inside the app. He can view his balance and also can load money into his E-wallet. The database is programmed using SQL (Structured Query Language). About card recharge, just like Pre-paid passes, refill of this cashless cards can be done at any of the bus depots / online using your Credit / Debit cards. Some of the very important benefits of Automations Cashless transactions, Real Time Data available for decision making. Eco-Friendly, saving time, and cost of overall infrastructure used during old ticketing system.

A high-resolution camera is used to capture the frames from a video. Since the surveillance cameras are already installed in the platforms the step becomes easier to implement in real time. Once the image is captured it is processed using an image processing algorithm. The platform used to process the image is OpenCV-python. Once the processing is completed the count obtained is categorized into 3 classes of low, medium and high. Based on the division appropriate messages are sent to the controller using the Twilio as the medium of communication. The controller will take the necessary actions and inform the drivers of that particular bus. For crowd detection we are using Convolution Neural Network such as Tensorflow where crowd detection is achieved by mapping those visual features. Tensorflow's Object Detection API provides pre-trained models for object detection, which can recognise roughly 90 different classes (objects), with people being one of them. To achieve real time application, we make use of raspberry pi along with integrated camera to capture the live data and to obtain the output via a digital screen this Model is trained with the help datasets. The mentioned system was created to meet the need for human crowd estimation. The estimation and control of crowds in bus stops can lead to good bus management

that provides passengers with a comfortable journey. According to the study, there was a need to design a new efficient system, and this project is an attempt to meet that requirement.

numerous estimating strategies available are timeconsuming and produce unsatisfactory outcomes in practise. The proposed system is much simpler and easier to comprehend. The results were satisfactory, and they may be implemented on a limited scale in real-time scenarios. The accuracy of the mentioned system ranges from 80 to 90%. The frequency of buses is controlled, it promotes travel convenience. The detecting method is complicated since the photos recorded must be preprocessed in order to produce correct results. The field of image processing for human detection is continually evolving, and no 100 percent results have yet been achieved. When the number of persons increases, however, the accuracy of the results declines. The accuracy ranges from 12 to 18 people, but as the number increases, the accuracy drops. This could be due to the camera's resolution or the region covered by the camera. Furthermore, because the system is still in development, the chances of achieving 100 percent accuracy are slim.More field study is required to acquire complete results.The current system is confined to a single bus stop. This can be expanded to all of the bus stops along a specific route, and the data can be transmitted over the cloud. Bus frequency can be regulated by taking an average count from all bus stops.

The proposed framework has a navigation system for bus travelers that encourages the bus travelers to consistently interconnect with the real time public bus foundation. The proposed system comprises of an embedded bus computing smartphone system to detect the presence of passengers on buses, backend computing infrastructure and a mobile smartphone app for passengers that provides real-time navigation over the complete course of a bus journey. This proposed framework additionally has a web application for concede in the head office, clients can enlist any grievances, any crisis issues can be alarmed with the assistance of this application by conductors and also travelers. There is no need of regular ticket checking by getting into the bus instead this can be done by being seated in head office by checking ticket counts on the web server.

The proposed Iot system consists of mainly three modules:

The passenger navigation app

The travelers need to enroll and check with their email id and portable number once they login into the app. These data of the travelers will be put away in bus information database at head office.

screenshot of passenger navigation app

App should provide current position and nearby bus stops details as a marker. The navigation app offers multiple routes to avoid traffic, highways, or tolls, and can automatically re-route on command or based on traffic conditions.

This app uses Android's built-in voice search, so you can speak destinations to search them quickly. This app provides Google Street View to display your destination when you arrive.

The navigation app uses Google Maps API like Geolocation API to assess location, Direction Service API is used to route the Directions and to calculate Distance between locations and to find the bus arrival estimation time details to the app passenger.

Figure 2: screenshot of users current location

The app also provides several menu options like:

Search buses

The source location is resolved through GPS; user needs to choose his desired destination. The server ought to give the transports points of interest progressively, which are arriving in next 15-20 mins. The recovered points of interest may contain single bus data or numerous buses to reach the destination. Once these details passenger got, he can choose among them which suits him better. When he selects one of the options: It should display current bus location on map, current crowd information, bus arrival estimation time details. In case of multiple buses, it should provide time gap between the buses, and total time to reach the destination. Once the user is done with the choice of bus, the seat selection and E-payment from wallet is to be done. If the user cancels the ticket the deducted amount should be refunded.

Choosing boarding and destination location

Wallet info

Add cash to the wallet with the assistance of credit card,debit card or net banking an account. Data on included cash and expenditure on travelling will be updated.

Payment details

This will display the detailsabout the payment done for tickets till now and the current wallet balance.

Track journey

This option will give information like next bus departure, prepare for alighting, missed alighting, wrong bus checketc.

Figure 4: tracking passenger's journey

Emergency option

This option allows passenger to alert the driver, in case of any medical issues with passengers while travelling or any other emergency like traffic or curfew in the city etc.

Complaints/feedback

This options allows passengers to register any complaints about the problems faced by them while travelling in respective buses, any complaints with the bus facility or feedback about the proposed system.

Sign-out

This option allows the user to log out from his account.

The bus information server

The bus information server contains all the information about the buses in the city, the passengers who have registered in the app as well as real time information about the bus, its current location in real time and the bus stops in the city.

Interactive Polyline Encoder Utility algorithm is being used here in order to send multiple lat lag ana at a time to google maps. This utility uses the Google Maps JavaScript API. Specifically, encoding and decoding of paths are handled by the static methods encodePath() and decodePath in the google.maps.geometry.encoding namespace.

Polyline encoding is a lossy compression algorithm that allows you to store a series of coordinates as a single string. Point coordinates are encoded using signed values. If you only have a few static points, you may also wish to use the interactive polyline encoding utility.

The encoding process converts a binary value into a series of character codes for ASCII characters using the familiar base64 encoding scheme: to ensure proper display of these characters, encoded values are summed with 63 (the ASCII character '?') before converting them into ASCII. The algorithm also checks for additional character codes for a given point by checking the least significant bit of each byte group; if this bit is set to 1, the point is not yet fully formed and additional data must follow.

Additionally, to conserve space, points only include the offset from the previous point (except of course for the first point). All points are encoded in Base64 as signed integers, as latitudes and longitudes are signed values. The encoding format within a polyline needs to represent two coordinates representing latitude and longitude to a reasonable precision. Given a maximum longitude of +/- 180 degrees to a precision of 5 decimal places (180.00000 to – 180.00000), this results in the need for a 32 bit signed binary integer value.

The network enabled ticket machine

The network enabled ticket machine has its own unique identification and fixed routes details about bus stops. It contains two main things sensor for counting passengers notification screen for the driver. The network enabled ticket machine is connected to the server in real time sharing useful information to the driver. It should have retrieved the no of passengers booked the tickets and display into the driver screen, he can cross verify the total count of passengers and sensor count to find non ticket taken passengers. It should provide voice notification for blind peoples about bus stops and traffic jam information to driver to take shortcut routes wherever possible.

CHAPTER 3

REQUIREMENT ENGENEERING

3.1 Software and Hardware Tools:

3.1.1 Software:

1. Arduino IDE
2. Embedded C

3.1.2 Hardware :

1. Arduino
2. LCD
3. IR Sensors
4. RFID
5. Nodemcu
6. Motor Driver

3.2 Software Requirements Specification

Arduino IDE

A program for Arduino may be written in any programming language for a compiler that produces binary machine code for the target processor. Atmel provides a development environment for their microcontrollers, AVR Studio and the newer Atmel Studio.

The Arduino project provides the Arduino integrated development environment (IDE), which is a cross-platform application written in the programming language Java. It originated from the IDE for the languages Processing and Wiring. It includes a code editor with features such as text cutting and pasting, searching and replacing text, automatic indenting, brace matching, and syntax highlighting, and provides simple one-click mechanisms to compile and upload programs to an Arduino board. It also contains a message area, a text console, a toolbar with buttons for common functions and a hierarchy of operation menus.

A program written with the IDE for Arduino is called a sketch. Sketches are saved on the development computer as text files with the file extension Arduino Software (IDE) pre-1.0 saved sketches with the extension.

The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub main() into an executable cyclic executive program with the GNU toolchain, also included with the IDE distribution.

A minimal Arduino C/C++ sketch, as seen by the Arduino IDE programmer, consist of only two functions:

- **setup():** This function is called once when a sketch starts after power-up or reset. It is used to initialize variables, input and output pin modes, and other libraries needed in the sketch.
- **loop():** After setup() has been called, function loop() is executed repeatedly in the main program. It controls the board until the board is powered off or is reset.

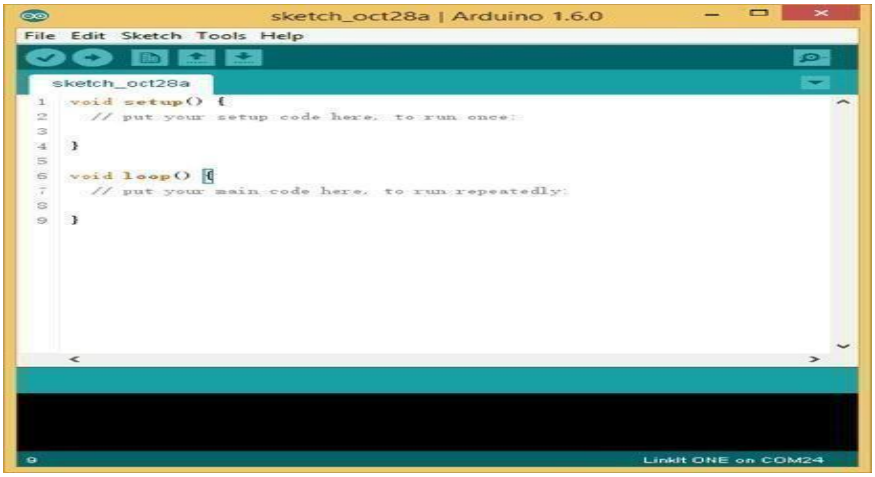


Fig: 1- An Arduino Sketch

Embedded C:

- When designing software for a smaller embedded system with the 8051, it is very common place to develop the entire product using assembly code. With many projects, this is a feasible approach since the amount of code that must be generated is typically less than 8 kilobytes and is relatively simple in nature. If a hardware engineer is tasked with designing both the hardware and the software, he or she will frequently be tempted to write the software in assembly language.

- The trouble with projects done with assembly code can is that they can be difficult to read and maintain, especially if they are not well commented. Additionally, the amount of code reusable from a typical assembly language project is usually very low. Use of a higher-level language like C can directly address these issues. A program written in C is easier to read than an assembly program.

- Since a C program possesses greater structure, it is easier to understand and maintain. Because of its modularity, a C program can better lend itself to reuse of code from project to project. The division of code into functions will force better structure of the software and lead to functions that can be taken from one project and used in another.

- Thus reducing overall development time. A high order language such as C allows a developer to write code, which resembles a human's thought process more closely than does the equivalent assembly code. [25]The developer can focus more time on designing the algorithms of the system rather than having to concentrate on their individual implementation. This will greatly reduce development time and lower debugging time since the code is more understandable.

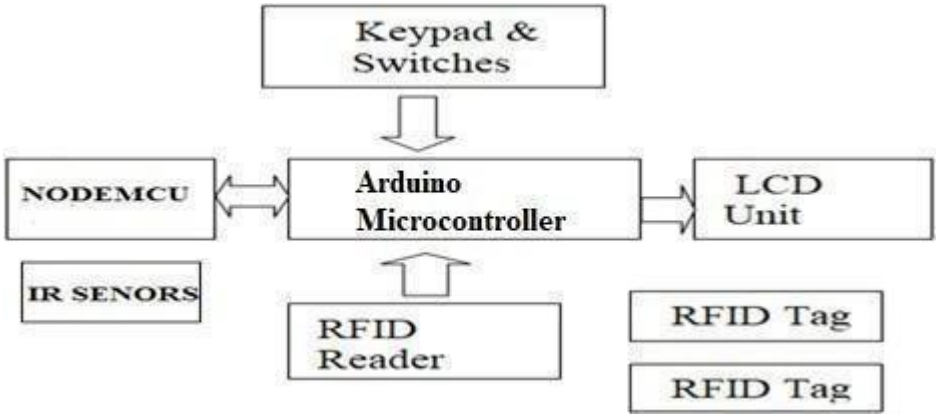
- By using a language like C, the programmer does not have to be intimately familiar with the architecture of the processor. This means that someone new to a given processor can get a project up and running quicker, since the internals and organization of the target processor do not have to be learned. Additionally, code developed in C will be more portable to other systems than code developed in assembly. Many target processors have C compilers available, which support ANSI C.

- All of this is not to say that assembly language does not have its place. In fact, many embedded systems (particularly real time systems) have a combination of C and assembly code. For time critical operations, assembly code is frequently the only way to go. One of the great things about the C language is that it allows you to perform low-level manipulations of the hardware if need be, yet provides you the functionality and abstraction of a higher order language.

CHAPTER 4

SYSTEM DESIGN

4.1 System Architecture:



4.2 Component Design:

Arduino:

Arduino/Genuino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP headerand a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer witha USBcable or power it with an AC-to-DC adapter or battery to get started.

You can tinker with your UNO without worrying too much about doing something wrong, worst-case scenario you can replace the chip for a few dollars and start over again. "Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the referencemodel for the Arduino platform; for an extensive list of current, past or outdated boards see the Arduino index of boards.[1]

Fig: 2- Arduino

Arduino specification:

Microcontroller	ATmega328P	
Operating Voltage	5v	
Input voltage	7-12v	
Input voltage limit	6-20v	
Digital I/O Pins	6	
Analogue input Pins	6	
DC current perI/O pins	20 mA	
DC current for 3.3v Pin	50 mA	
Flash Memory	Of which o.5KB is used	
SRAM	2 KB	
EEPROM	1KB	
Clock Speed	16MHz	
Length	68.6mm	
Width	53.4nm	
Weight	25g	

Table

Arduino programming:

The Arduino/Genuino Uno can be programmed with the (Arduino Software (IDE)).Select "Arduino/Genuino Uno from the Tools > Board menu (according to the microcontroller on your board). The ATmega328 on the Arduino/Genuino Uno comes preprogrammed with a boot loader that allows us to upload new code to it without the use of an external hardware programmer. It communicatesusingtheoriginalSTK500 protocol (reference, C headerfiles).

We can also bypass the boot loader and program the microcontroller through the ICSP (In-Circuit Serial Programming)header using Arduino ISP or similar.The ATmega16U2/8U2 is loaded with a DFU boot loader, whichcan be activated by:

- On Rev1 boards: connecting the solder jumper on the back of the board (nearthe map of Italy) and thenreseing the 8U2.
- On Rev2 or laterboards: thereisa resistorthat pulling the 8U2/16U2 HWB line to ground, making it easier to put into DFU mode.[1]

Warnings:

The Arduino/Genuino Uno has a resettable poly fuse that protects your computer's USB ports from shorts and overcurrent. Although most computers provide their own internal protection, the fuse provides an extra layer ofprotection. If more than 500 mA is applied to the USB port, the fuse will automatically break the connection untilthe short or overload is removed.

Differences with other boards:

The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2(Atmega8U2upto versionR2) programmed as a USB-to-serialconverter.

Power:

The Arduino/Genuino Uno board can be powered viathe USB connectionor withan external power supply. The power source is selected automatically.

External(non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the GND and VIN pin headers of the POWER connector.

The board can operate on an external supply from 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may become unstable. If using more than 12V, the voltage regulatormay over heatand damagetheboard. Therecommended range is 7 to 12 volts.

The power pins are as follows:

- VIN. The input voltage to the Arduino/Genuino board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). One can supply voltagethrough his pin, or, if supplying voltage via the power jack, access it through this pin.
- 5V.This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either fromthe DC power jack (7 - 12V), the USB connector (5V), or the VIN pin of the board (7-12V). Supplying voltage via the 5V or 3.3V pins by passes the regulator, and can damage your board.We don't advise it.
- 3V3. A 3.3 volt supply generated by the on-board regulator .Maximum currentdraw is 50 mA.
- GND. Groundpins.
- IOREF. This pin on the Arduino/Genuino board provides the voltage reference with which the microcontroller operates. A properly configured shield can read the IOREF pin voltage and select the appropriate power source or enable voltage translators on the outputs to work withthe5V or 3.3V. [1]

Memory:

The ATmega328 has 32 KB (with 0.5 KB occupied by the boot loader). It also has 2 KB of SRAM and 1 KB of EEPROM(which can be read and written withtheEEPROM library). [1]

Input & Output:

Each of the 14 digital pins on the Uno can be used as an input or output, using pin(), digital write (), and digital read () functions. They operate at 5 volts. Each pin can provide or receive 20 mA as recommended operating conditioned an internal pull- up resistor (disconnected by default) of 20-50k ohm. A maximum of 40mA is the value thatmust not be exceededon any I/O pin to avoid permanent damageto the microcontroller.

In addition, some pins have specialized functions:

- Serial:0 (RX) and 1 (TX). Used to receive(RX) andtransmit(TX) TTL serial data. These pins areconnected to the corresponding pins of theATmega8U2USB-to-TTL Serialchip.
- ExternalInterrupts: 2 and 3. These pins can be configured to trigger an interruption a low value, arising or falling edge, or a change in value. See theattachinterrupt() functionfor details.
- PWM: 3, 5, 6, 9, 10, and 11. Provide 8-bit PWM output with the analog write() function.
- SPI: 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). These pins support SPI communicationusing the SPI library.
- LED: 13. There is a built-in LED driven by digital pin 13. When the pin is HIGHvalue, the LED is on, when the pin is LOW, it's off.
- TWI: A4 or SDA pin and A5 or SCL pin. Support TWI communication using the Wire library.

The Uno has 6 analog inputs, labeled A0 through A5, each of which provide 10 bits of resolution (i.e. 1024 different values).By default they measure from ground to 5 volts, though is it possible to change the upper end oftheir range using the Arifin and the analog reference () function.
There are a couple of other pins on the board:

- AREF.Reference voltage for the analog inputs. Used with analogReference ().
- Reset. Bring this line LOW to reset themicrocontroller. Typicallyused to add a reset button toshields which block the one on the board. [1]

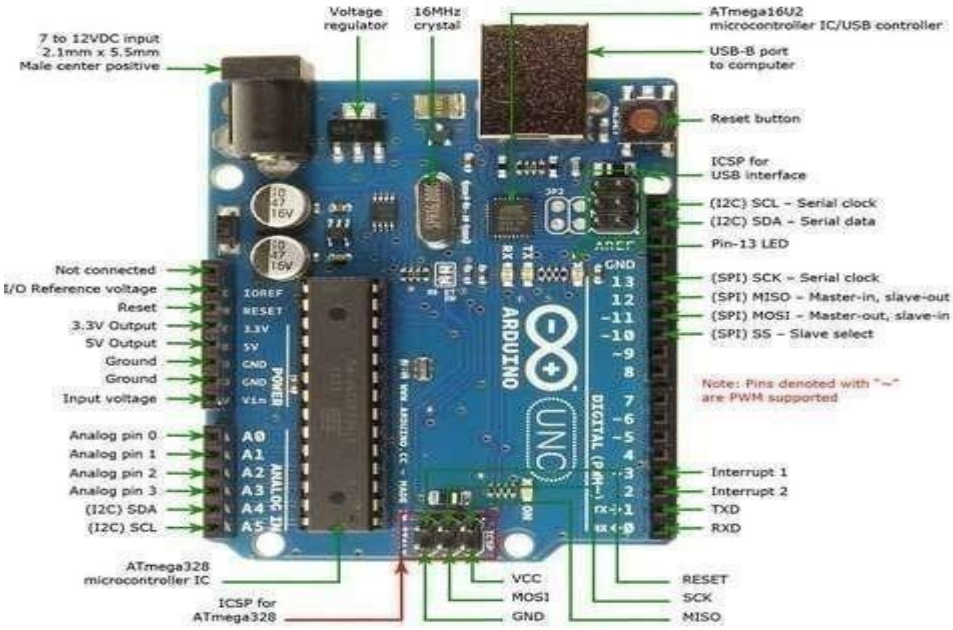


Fig: 3- Pin Specification

Communication:

Arduino/Genuine Uno has a number of facilities for communicating with a computer, another Arduino/Genuine board, or other microcontrollers. The ATmega328 provides UART TTL (5V) serial communication,whichis available on digitalpins 0 (RX) and 1 (TX). An ATmega16U2 on the board channels this serial communication over USB and appears as a virtualcom port to software on the computer. The 16U2 firmware uses the standard USB COM drivers, and no external driver is needed.

The Arduino Software (IDE) includes a serial monitor which allows simple textual data to be sent to and from the board. The RX and TX LED son the board will flash when data is being transmitted via the USB-to-serial chip and USB connectionto the computer (but not for serial communication on pins 0 and 1).

A Software serial library allows serial communication on any of the Uno's digital pins. The ATmega328 also supports I2C(TWI) and SPI communication. The Arduino Software (IDE) includes a Wire library to simplify use of the I2C bus; seethe documentation for details. For SPI communication n, use the

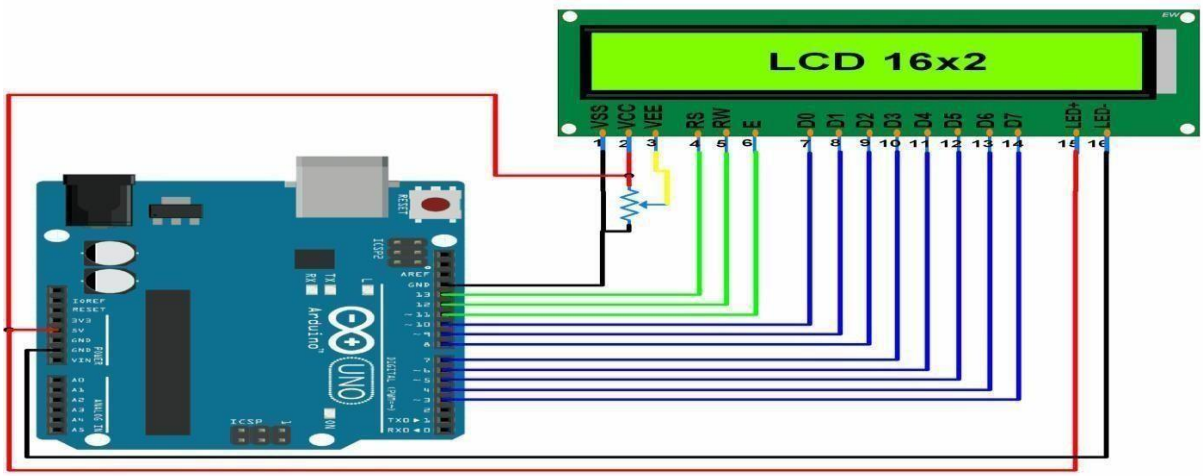
Automatic (Software) Reset:

Rather than requiringa physicalpress of the reset button before an upload, the Arduino/Genuine Uno board is designed in a way that allow sit to be reset by software running on a connected computer. One of the hardware flow control lines (DTR) of the ATmega8U2/16U2 is connected to the reset line of the ATmega328 via 100 nano farad capacitors. When this line isasserted (taken low), the reset line drops long enough to reset the chip. The Arduino Software (IDE) uses this capability toallow you to upload code by simply pressing the upload button in the interface toolbar. This means that the boot loader canhave a shorter timeout, as the lowering of DTR can be well-coordinated with the start of the upload. This setup has otherimplications. When the Uno is connected to either a computer running OS X or Linux, it resets each time connection asadero it from software (via USB). For the following half-second or so, the boot loader is running on the Uno. While it isprogrammed to ignore malformed data (i.e., anything besides an upload of new code), it will intercept the first few bytes of data sent to the board after a connection is opened. If a sketch running on the board receives one-time configuration or other data when it first starts, make sure that the software with which it communicates waits a second after opening theconnectionand before sending this data.

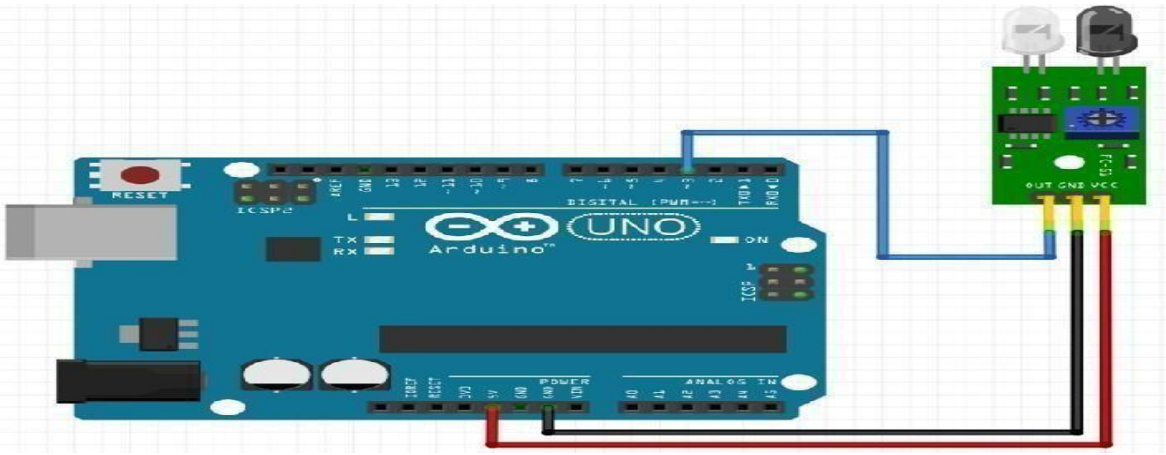
The Uno board contains a trace that can be cut to disable the auto-reset. The pads on either side of the trace can be solderedtogether to re-enable it. It's labeled “RESET-EN". You may also be able to disable the auto-reset by connecting a 110-ohmresistor from 5V to the reset line.[1]

4.3 INTERFACE DESIGN

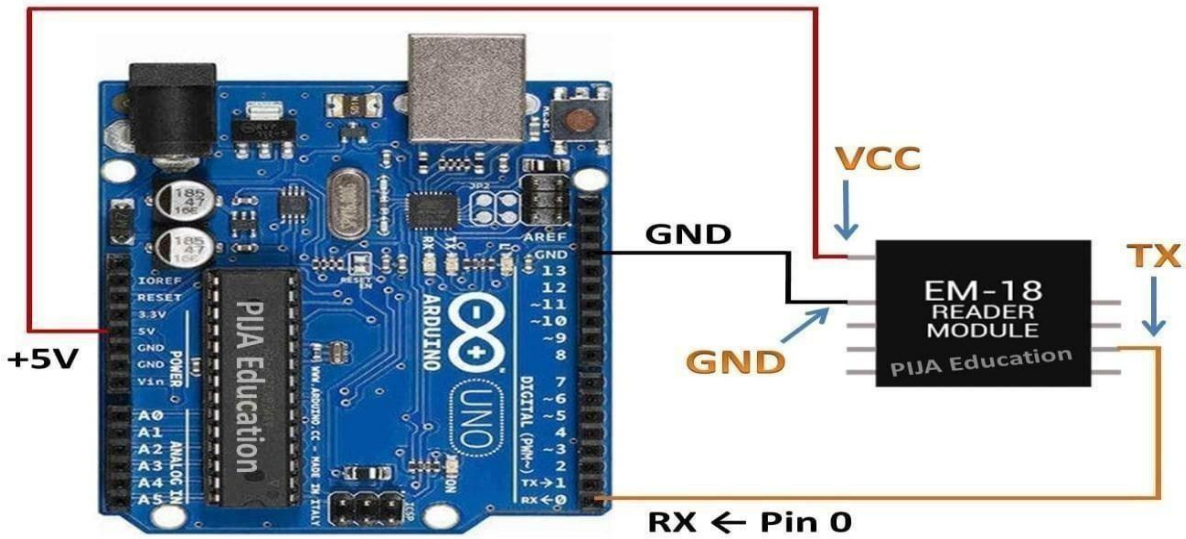
4.3.1 ARDUINO INTERFACE WITH LCD



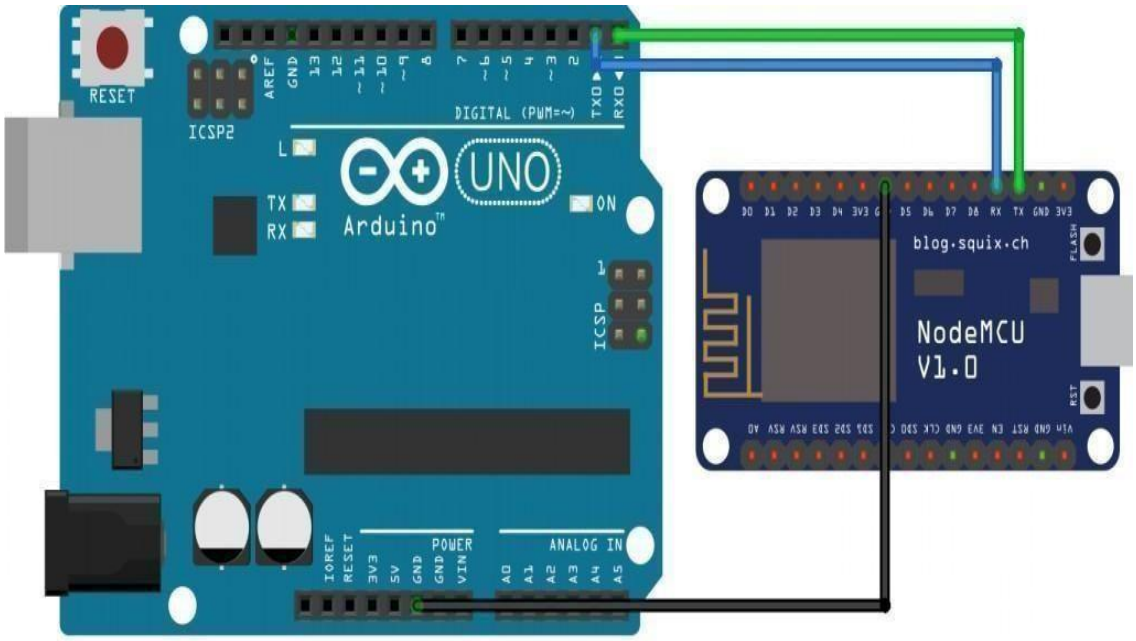
4.3.2 ARDUINO INTERFACE WITH IR SENSOR



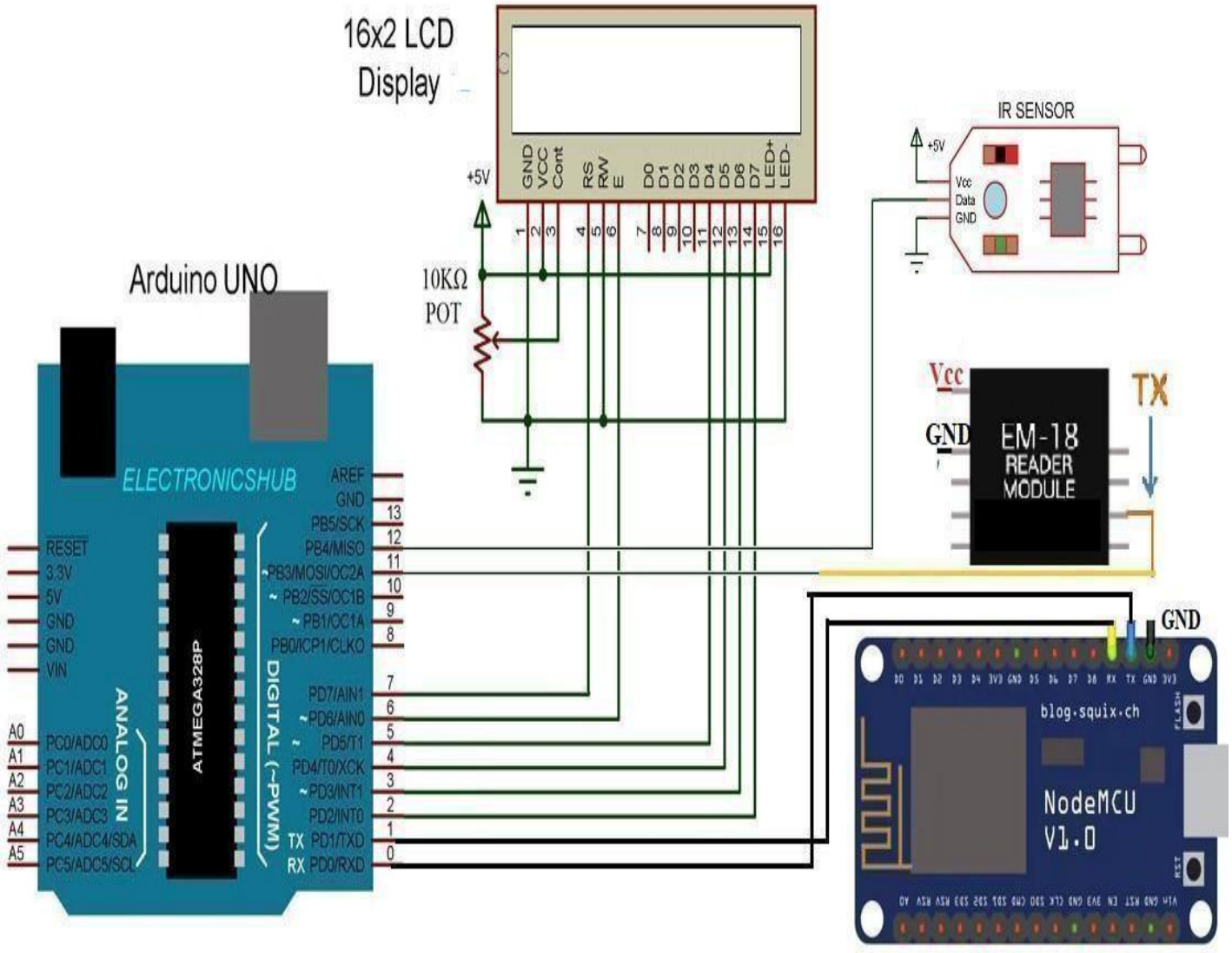
4.3.3 ARDUINO INTERFACE WITH RFID READER

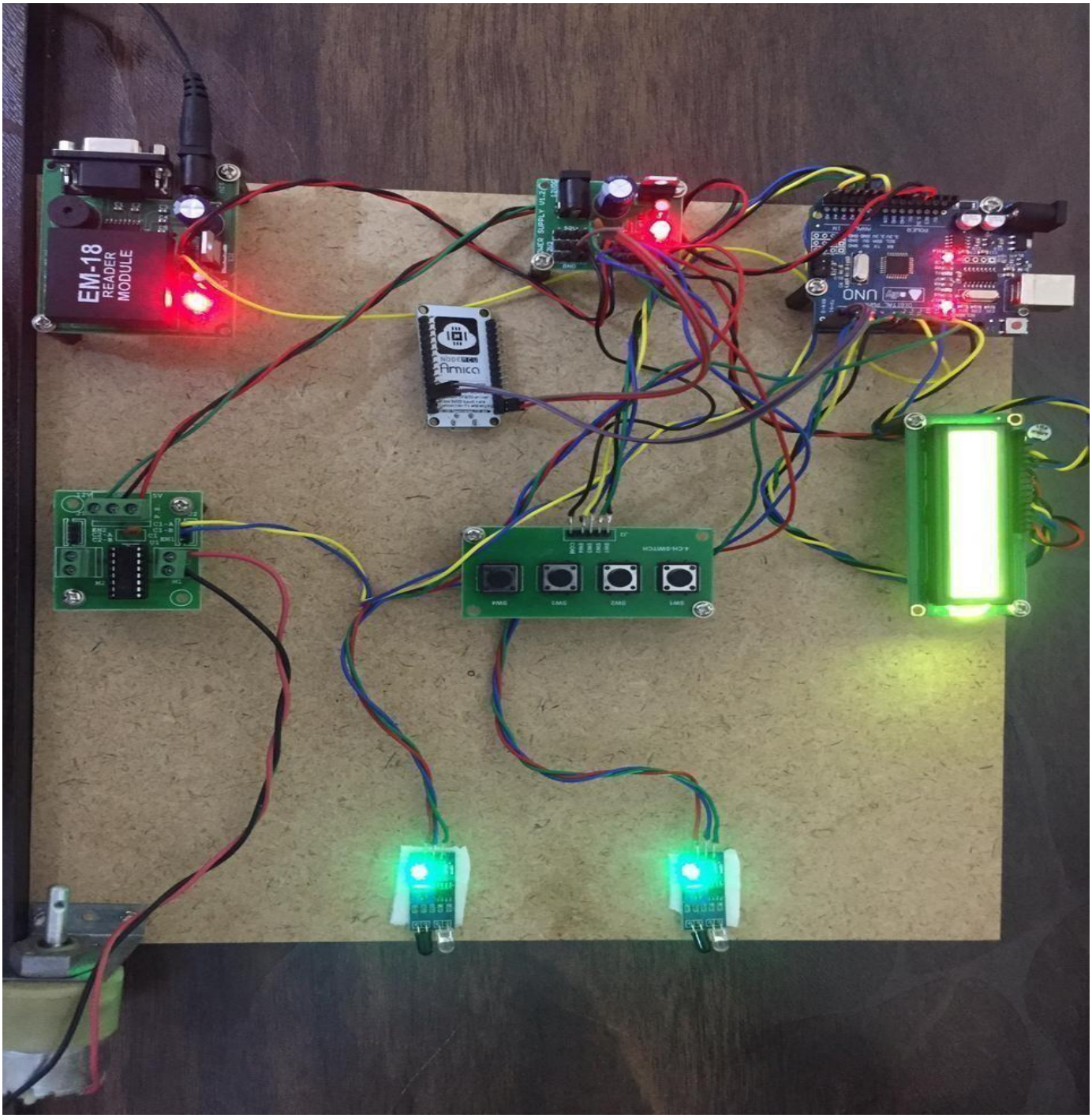


4.3.4 ARDUINO INTERFACE WITH NODEMCU



4.3.5 INTERFACE DESIGN CONNECTION




EM-18
READER
MODULE
Amica
UNO

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APPLICATIONS & CONCLUSION

5.1 APPICATIONS

- BMTC/KSRTC applications
- Human Tracking/children Tracking
- By doing little modifications, this same project can be used for any other Transport system.

5.2 CONCLUSION:

By implementing this project proposal we greatly reduces the manpower, saves time and operates efficiently. This project puts forth the first step in achieving the desired target. This project is helpful in managing the crowd in the bus,if the bus is full it will send a message, Deduct the amount from their smart card according to the How much KM theyTravel and Message sending to the after completion of the journey. These are the major facilities which are included the project so it will helpful to avoid the spreading of the corona virus from one person to other persons.

The system is expected to be fully automated, reliable, transparent and convenient. The whole system can be practically implemented for luxury buses, like airport-bounded buses especially at cities in India. The only limitation with this kind of app-based travel is that passenger cannot get out of the bus as and when he/she pleases, in between two stops, like what happens in the normal public buses. This helps reduce chaos and ensures a smoother travel for passengers on board. The buses for which this app is designed will have distinct stoppage names, not travel in a route which is a loop line. Also the bus would avoid such routes where there are caves and skyscrapers in which GPS signals are weak. The cards/token being reusable, they are much more convenient compared to the paper based ticketing system. The card/token also can be used as a universal travel pass card that will allow any transportation on any route. Any unwanted events can be avoided as all the person carrying RFID tickets are monitored every time they travel. Till date, this type of automated ticketing systems has been implemented in metros and they are functioning smoothly. Hence, through this proposal we suggest “Universal Transport Ticketing System based on RFID”. Reflecting on the benefits of this application, such type of systems would be ready-to time market if they are implemented on public transports as well.

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