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Smart Bus System for Automatic Ticket Collection and Passenger Information Display using IoT and RFID Technology

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Abstract: ***Buses are an integral means of conveyance in India. In metropolitan cities like Mumbai, Bangalore, Chennai and Delhi, 10-15 million people travel through public transport buses daily. Today, within the era of Digital India (a campaign launched by the govt of India) and Cashless Economy, conveyance must adapt the technology advancement. Even though the general public transport buses are providing fairly satisfactory services, there's a requirement for smart and reliable system. The major problems experienced by the passengers are undue waiting time at bus stops, non-refund of balance, negligence to supply seat to other passengers, etc. Thus, to provide an agile and smooth ticketing experience, we have proposed the smart application that will automatically shows the seat to passenger and mode of payment will be cashless there by promoting digitalization and smart cities initiatives. The user can check the availability of seats. Keyword: Cashless Economy, Public transport, RFID and IOTI.***

I. INTRODUCTION

India is the second largest country in population with 1.2 billion people. All developing countries facing many crises like environmental pollution, noise, traffic fatalities and injuries, congestion, and mobility problems. Severe among them is transportation facility. Developing countries have several factors in common that contribute to the severity of their transport problems. Overall increase and increasing urbanization have led to the especially rapid climb of huge cities, which are overwhelmed by the sudden jump in travel demand. The supply of transport infrastructure and services, by comparison, has lagged far behind demand. Public sector finances, generally, are so limited that funding for transport improvements is woefully inadequate. Most transport facilities are used far beyond their design capacity products provide us by processing these raw materials. Rapid growth, low incomes, and extreme inequality are among the most underlying causes of transport problems in developing countries. Although the character and extent of transport problems obviously vary from one country to a different, virtually all developing countries suffer from the subsequent. Unplanned, haphazard development at the suburban fringe without adequate infrastructure, transport, and other public services. Limited network of roads, often narrow, poorly maintained, and unpaved. Extremely congested roads with an incompatible mixture of both motorized and non-motorized vehicles traveling at widely different speeds. Rapidly increasing ownership and use of personal cars and motorcycles. Inadequate roadway accommodations for buses and non-motorized transport.

II. RELATED WORKS

According to the Auto-ID quoted from Xian, Internet RFID (Radio frequency dentification) to achieve intelligent recognition and network management. It was first proposed by the Auto- ID lab at MIT (Massachusetts Institute of Technology) in 1999. Their ultimate support technology is wireless. Sensor networks using radio frequency identification technology [1]. According to Mazhar, intelligent transportation is one component that is an important part of a smart city. Other opinions say, good vehicle traffic information is one of the most important sources for smart cities [2]. John Puchera, NishaKorattyswaropama, NehaMittala, NeenuIttyerah wrote an article about Urban transport crisis in India, which summarizes key trends in India's transport system and travel behavior, analyzes the extent and causes of the foremost severe problems, and recommends nine policy improvements that might help mitigate India's urban transport crisis [3].

S. P. Manikandan, P. Balakrishnan presented, the real time query system for public transport service using Zigbee and RFID is suitable to passengers demand and provide information such as bus location, bus number and number of persons inside the bus in real time. This system provides efficient as well as low cost public transport system [4] G. Raja, G. V. Karthik , proposed bus position monitoring system to facilitate the passenger.

The wireless communication technologies like GSM & GPS are used to send the information about number of seats available in the bus to the bus station and current location of bus on the route respectively. Real time passenger information system uses variety of technologies to track the location of bus in real time and generate the prediction of bus arrival at stops along the routes[5].

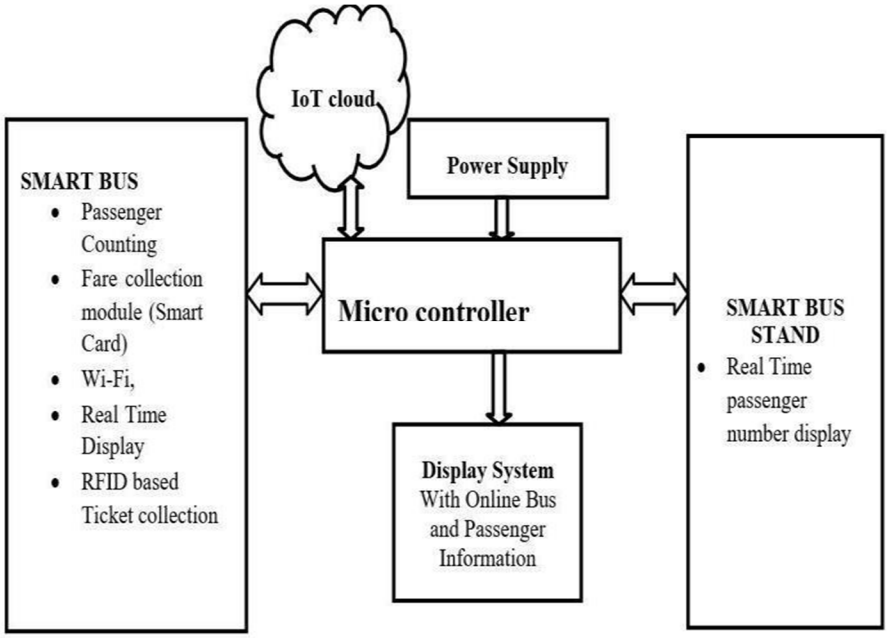
Achmad Nizar Hidayanto, Harjanto Prabowo written a Literature Review about IoT for Development of Smart Public Transportation System. This study explores the opportunities and challenges for the application of IoT on public transport. The results of this study show that IoT utilization till now tends to offer priority to safety in avoiding road accidents but has not yet discussed how intelligent transportation system are often developed by integrating bus scheduling, bus presence detection, and payment efficiency by passengers by booking seat system in order that minimize congestion and reduce wasted time passengers[7].XiaoyaGuo, Emily Huang, Benson Hung ,Lara Juras proposed the design of Smart Bus System(SBS) is a real time. It explores idea of integrating the Transit System with appropriate communication technologies and to develop a corresponding Smartphone app. SBS, users can access real-time passenger information such as schedules, trip planners, bus capacity estimates, bike rack availability and bus stop locations, via Smartphone, on computers and at bus stops[9].Sudhir N.Divekar, Sagar

R. Patil, Satish A. Shelke proposed Smart Bus System includes display and voice announcement system in bus shelters which tells about the bus details with the help of GPS and LCD unit. And the bus identification process involves usage of frequency technology. Here there is an integration between Microcontroller and RF transceiver, GSM and GPS LCD display, Voice announcement [10]. According to Panchal [11] designing a wireless network using IEEE ZigBee technology more responds to emergencies and informs the right individuals in a timely and cost-effective manner. Greater transport efficiency and most importantly increased safety in driving[12].

III. METHODOLOGY

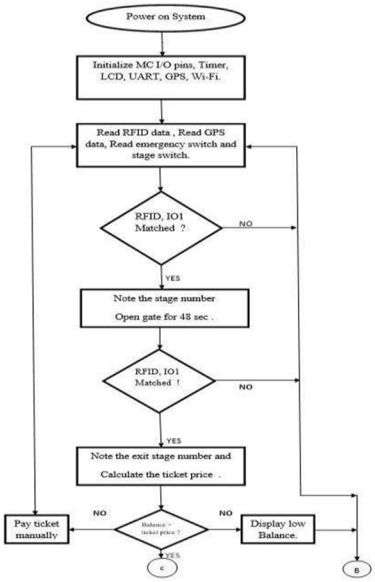
Voice ARM controller is used in the project, RFID, GPS , WIFI, Relay and motor is connected to the controller. As soon as connects power supply to the system Microcontroller I/O Pins, UART and Timer will get initialize. Automatic ticket collection is done using RFID reader. Each person should have RFID card with recharge amount. Driver should change the STAGE to collect the automatic collection of ticket as per the number of STAGE people travelled. Emergency switch is provided to open the gate incase RFID card not having sufficient amount. This switch is controlled by Driver after manual collection of amount. LIVE GPS information is sent to cloud that will be displayed in PC that will be kept in bus stop along with number of vacant seat available in bus. GATE is provided in the bus door, it will open when people swipe there card during their enter and exit time.

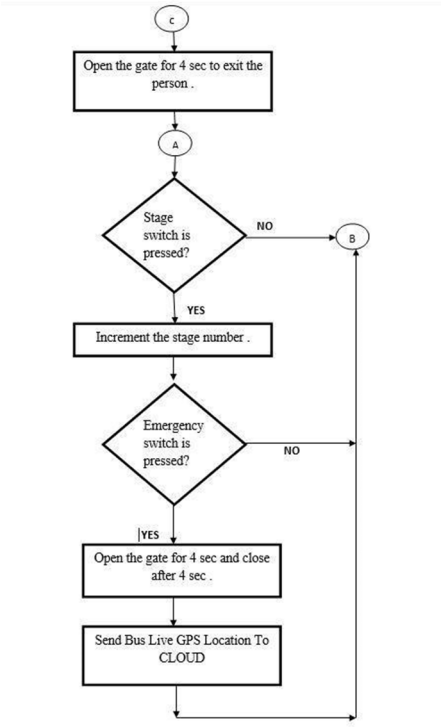
Block Diagram



All IoT devices in a Smart Bus stand are connected to city internet backbone through fiber- optic network. Wi-Fi hotspot and USB charging facilities may be provided at the bus stand. This bus stand will be solar powered with rooftop panels. Smart buses will stop at the smart bus stands present throughout the route. More than one different route pass through a bus stand. In Fig 3.1 Different display boards for each of the routes through a bus stop are placed in prominent places. Each of the display screens will show live smart bus position in a map with whole route marked in another color. All the buses that are on the road will be shown in the map with their current location. As an added feature commuter sat smart bus stand can view details of the dynamically scheduled buses that are ready to depart from smart bus stands. Also how much seat is vacant in a particular bus can also bequeried online.

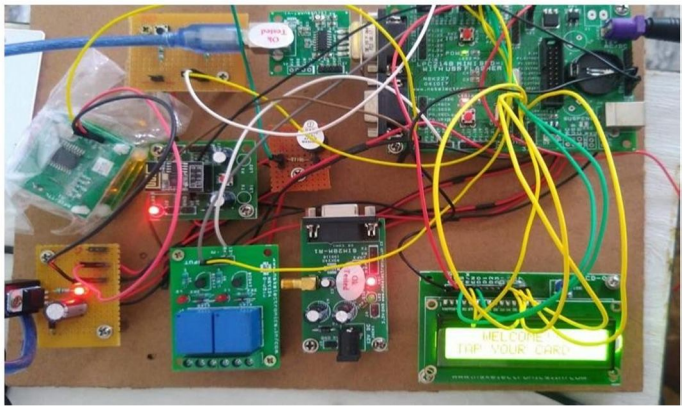
IV. FLOW CHART





Power on the system Initialize or Start the microcontroller input pins, Timmer ,LCD,UART, GPS and Wi-Fi. Read RFID data ,Read GPS data, Read emergency switch and stage switch. Check RFID and I O 1 are matched If Yes note the stage number and open the gate for 4 second. Again check RFID and I O 1 are matched If Yes note down the Exit stage number and calculate the ticket price If No go back to previous stage .Check balance is greater than the ticket price If Yes open the gate for 4second to exit the person If NO Rise the alarm of display to low balance and move to section B or pay the Bill manually to the driver and move to next, switch is pressed If YES increment the stage number If NO move to section B Emergency switch is pressed If YES Open the gate for 4 second and close for 4 second If NO move to section B Send the bus line GPS location and passenger to cloud.

V. EXPECTED RESULT



The online monitoring of waiting passenger queue at different bus stops along with vacant seats in the on-road buses, This will help to utilize resources efficiently. Bus capacity utilization can be improved drastically One very important aspect of SBS is that it will make whole process cash free. All money transactions will be done online through bank. So it is much more transparent and chances of corruption reduce significantly. During any emergency situation smart buses can be sent to affected area or can be evacuated quickly from central facility at bus stand by monitoring available best routes for them. If any accident occurs to any smart buses, control operator immediately gets update and also emergency services like hospital, police, fire brigade is alerted simultaneously with exact location coordinates, number of affected passengers. Smart Bus Stops and Smart Buses have potential for providing advertisement space to commercial parties. Moreover public address systems can also be used for advertising in spare time (during gaps between two announcements). So a part of the maintenance cost will be recovered.

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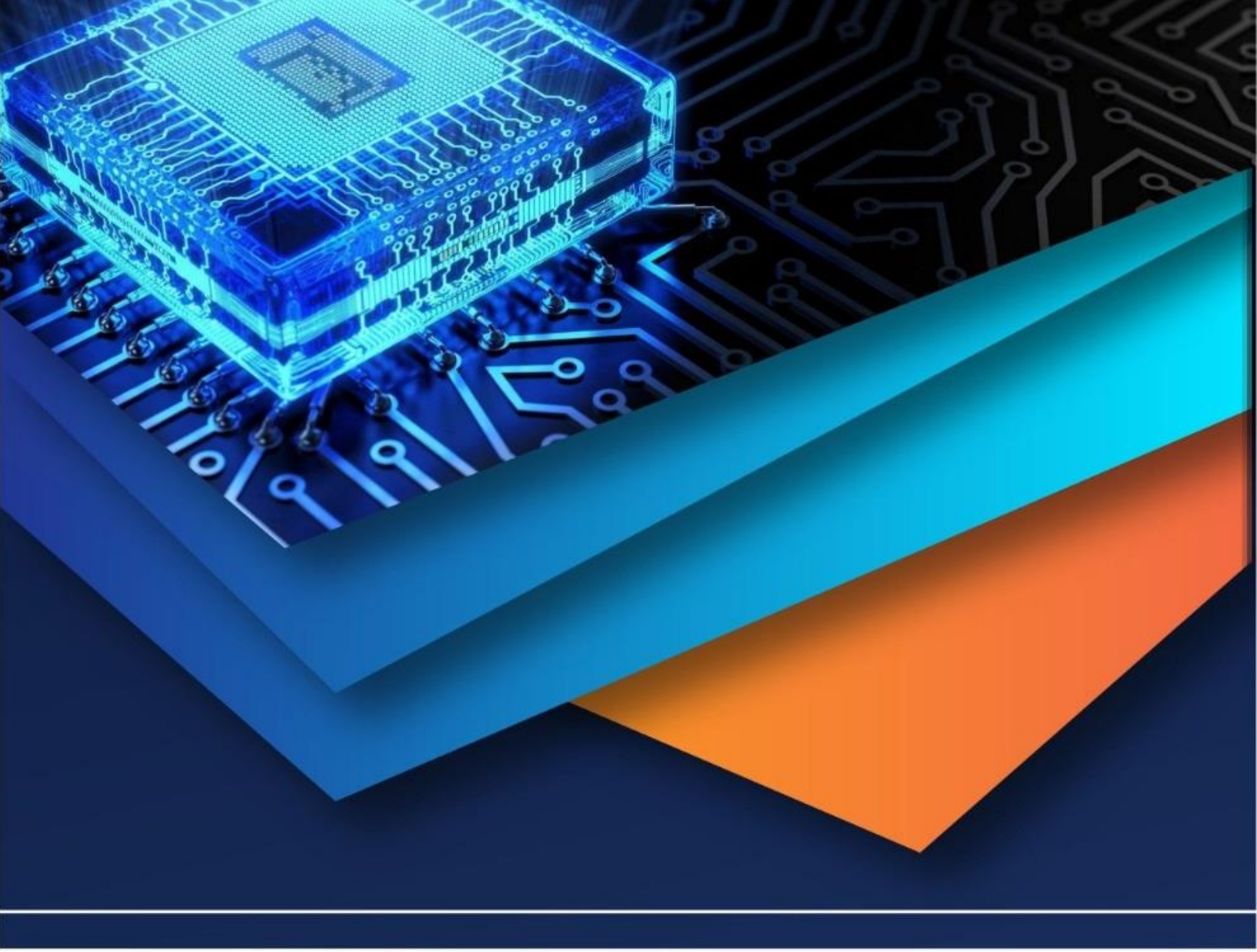

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