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INTELLIGENT BUS MANAGEMENT SYSTEM

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ABSTRACT

This paper highlights the implementation of an Intelligent Bus Management System to curb the current challenges and problems such as overloading and smoking in the bus. RFID-based public transport ticketing systems rely on widespread networks of RFID readers that locate the user within the transport network in real time to be able to verify whether he can travel at that time with the ticket he holds. This system also builds a common platform for integrated monitoring and passengers information services by informing about seat availability and displaying the current location of the bus at the bus station. This paper presents the details of all system components and the system will be beneficent for the people as it will minimize the dependency to use their own vehicles.

Keywords: **Arduino Kit, GPS Module, GSM Modem, RFID Tags and Readers, LCD, Smoke Sensor.**

1. Introduction

Now-a-days the world is encountering several problems such as overcrowding, traffic jams, transportation delay, larger automobile pollution. It is one of the most efficient method to improve public transportation service level and make commercial bus for resolving those problems. As a new conception in modern transportation, Intelligent Bus Management System is a system that is able to act according to the situation without human intervention [11]. By exploiting bus management system, road vehicle can be safer, more efficient, improve economic benefit and more environment friendly. Fare evasion, as distinct from fare avoidance is the act of travelling on public transport in disregard of the law and regulation, having deliberately not purchased the required ticket to travel (having had the chance to do so). It is a problem in many parts of the world, and revenue protection officers operate on many systems. Often ticket barriers, manned or automatic, are in place at stations etc., to ensure only those with valid tickets may access the transport.Fare evasion and fare fraud is generally a crime in most jurisdictions. The fare not paid, compared to potential penalties and hassle, is generally considered “not worth it”.One method of fare evasion is jumping over the turnstiles which mark the entryway into a subway system; hence the term, “turnstile jumping”. Other methods include adults travelling on children’s tickets, or using discounted tickets or free

passes that the passenger is not entitled to. The most extreme method is train surfing Another issue occurs on the bus, passengers would either bypass the bus driver or simply enter through the rear door of the bus. This is commonly found under the indian system which causes its operators to lose millions of dollars a year. In most countries passengers board a bus from any door, validate their tickets at machines and have no contact with the driver thus increasing the potential for fare evasion.

Traffic congestion is a condition on road networks that occurs as use increases, and is characterized by slower speeds, longer trip times, and increased vehicular queuing .The most common example is the physical use of roads by vehicles. When traffic demand is great enough that the interaction between vehicles slows the speed of the traffic stream, this results in some congestion. As demand approaches the capacity of a road (or of the intersections along the road), extreme traffic congestion sets in. When vehicles are fully stopped for periods of time, this is colloquially known as a traffic jam or traffic snarl-up. Traffic congestion can lead to drivers becoming frustrated and engaging in road rage. Many public bus services are run to specific timetable giving specific times of departure and arrival at waypoints along the route. These are often difficult to maintain in the event of traffic congestion breakdowns, on/off bus incidents, road blockages or bad weather. Predictable effects such as morning and evening rush hour traffic are often accounted for in timetables using past experience of the effects, although this then prevents the opportunity for drafting a 'clock face' timetable where the time of a bus is predictable at any time through the day. Predictable short term increases in passenger numbers may be dealt with by providing "duplicate" buses, where two or more buses operate the same slot in the timetable. Unpredictable problems resulting in delays and gaps in the timetabled service may be dealt with by 'turning' a bus early before it reaches it terminus, so that it can fill a gap in the opposite direction, meaning any passengers on the turned bus need to disembark and continue on a following bus. Also, depending on the location of the bus depot, replacement buses may be dispatched from the depot to fill in other gaps, starting the timetable part way along the route.

There is a common cliché that people "wait all day, and then three come along at once", in relation to a phenomenon where evenly timetabled bus services can develop a gap in service followed by buses turning up almost simultaneously. This occurs when the rush hour begins and numbers of passengers at a stop increases, increasing the loading time, and thus delay scheduled service. The following bus then catches up because it begins to be delayed less at stops due to fewer passengers waiting. This is called bus bunching.

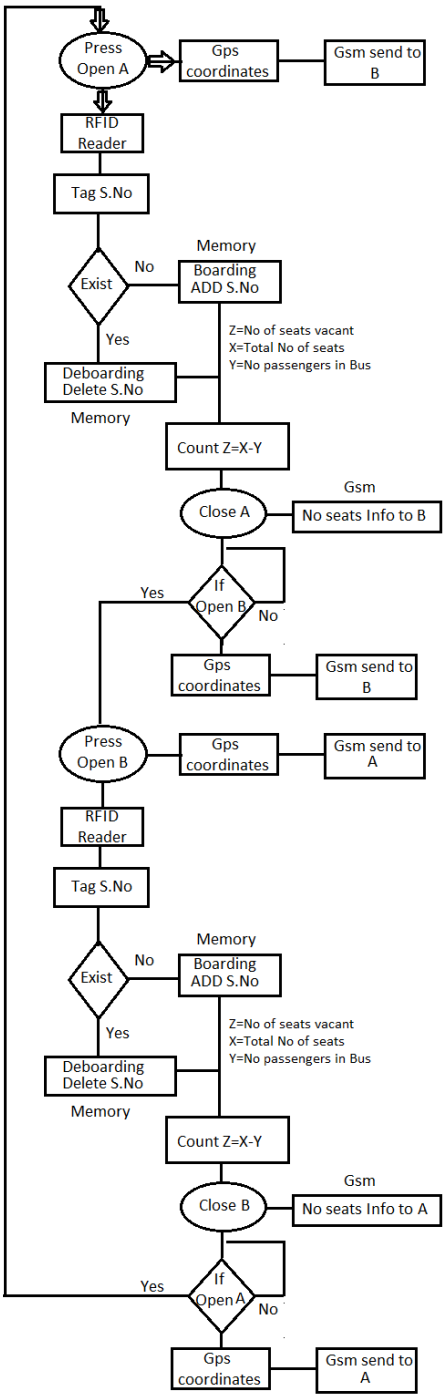
Some services may have no specific departure times, the timetable giving the frequency of service on a route at particular phases of the day. This may be specified with departure times, but the over-riding factor is ensuring the regularity

of buses arriving at stops. These are often the more frequent services, up to the busiest bus rapid transit schemes. For headway-based schemes, problems can be managed by changing speed, delaying at stops and leap-frogging a bus boarding at a stop.Services may be strictly regulated in terms of level of adherence to timetables and how often timetables may be changed. Operators and authorities may employ on street bus inspectors to monitor adherence in real time. Service operators often have a control room, or in the case of large operations, route controllers, who can monitor the level of service on routes and can take remedial action if problems occur. This was made easier with the technological advances of two way radio contact with drivers, and vehicle.The other problem in bus system is bus bunching that is In public transport, bus bunching, clumping, convoying, or platoning refers to a group of two or more transit vehicles (such as buses or trains), which were scheduled to be evenly spaced running along the same route, instead running in the same location at the same time. This occurs when at least one of the vehicles is unable to keep to its schedule and therefore ends up in the same location as one or more other vehicles of the same route at the same time.

The end result can be unreliable service and longer effective wait times for some passengers on routes that had nominally shorter scheduled intervals. Another unfortunate result can be overcrowded vehicles followed closely by near-empty ones. By gathering relevant information from drivers and operators, the measure can improve the quality and reliability of the transport services which will lead to better acceptance and usage of these services by citizens. A machine learning system fed into this system enables the overall system to classify current events own its own.

2. METHODOLOGY

The flowchart below gives a vivid description of how the proposed bus management system works. The main components includes ardiuno, rfid readers, tags,GPS module,GSM module ,LCD. The following system has been programmed using soft skills.



A. Microcontroller

A **microcontroller** is a small computer on a single integrated circuit containing a processor core, memory, and programmable input/output peripherals [5]. Microcontrollers are designed for embedded applications. But using an Arduino simplifies the amount of hardware and software development we need to do in order to get a system running. The Arduino hardware platform already has the power and reset circuitry setup as well as circuitry to program and communicate with the microcontroller over USB. Arduino can sense the environment by receiving input from a variety of sensors and can affect its surroundings by controlling lights, motors, and other actuators. There are tons of object-wrapped libraries to do complex things, like writing to SD cards, LCD screens, parsing GPS. And there's are also libraries to do simple things, like twiddle pins or debounce buttons

B. Authentication and Identification Devices

Radio-frequency identification (RFID) is the wireless use of electromagnetic fields to move data, for the purposes of automatically identifying and tracking tags attached to substance. The tags contain electronically stored information It was recognised by users in [7] that more information would greatly increase usage of public transports and route planning and real-time information were among the most desired services. Some tags are powered by electromagnetic induction from magnetic fields produced near the reader [9]. Some types gather energy from the interrogating radio waves and act as a passive transponder. Other types have a local power source such as a battery and may operate at hundreds of meters from the reader. Another method are NFC and light dependent resisitor [16]

.NFC is designed for short range wireless communication. It operates in 13.56 MHZ frequency band over a distance up to around 20 centimeters [17]. It offers data transfer rate of 1Mbit/s.For two devices to communicate using NFC one device must have an NFC reader/ writer and one must have an NFC tag. It has disadvantages like data corruption, data modification etc. light-dependent resistor (LDR) or photocell is a light-controlled variable resistor [10]. The resistance of a photoresistor decreases with increasing incident light intensity; in other words, it exhibits photo conductivity [14]. A photoresistor can be applied in light-sensitive detector circuits, and light- and dark-activated switching circuits.LDR Readings are very inaccurate and it has large batch variationsSo we prefer RFID for Automatic Identification and Data Capture [13].

C. GSM Module

A GSM modem is a wireless modem that works with a GSM wireless network [15]. A wireless modem behaves like a dial-up modem. The main difference among them is that a dial-up modem sends and receive data through a fixed telephone line via wireless modem sends and receive data through radio waves [18]. A GSM modem can be an external device or a PC card/ PCMCIA card. usually, an external GSM modem is connected to a computer through a USB cable [19] .

GSM modems support an extended set of AT commands. With the extended AT commands we can check the signal strength. A GSM/GPRS modem is recommended for use with a computer to send and receive messages.This is because some mobile phones have some mobile phones have certain limitation compapring to GSM/GPRS modems [20].We are using GSM SIM 900 in our project for communication between bus and stations.

D. GPS

The Global Positioning System (GPS) is a space-based satellite navigation system that provides location and time information in all weather conditions, anywhere on or near the earth where there is an unobstructed line of sight to four or more GPS satellites [1].The system provides critical capabilities to military, civil, and commercial users all over the world [2]. GPS navigation device is used to acquire position data to locate the bus on the road in the unit's map database . Using the database, the unit can give directions to other locations along roads in its database [4]. Dead reckoning using distance data from sensors attached to the drivetrain and an accelerometer can be used for better reliability, as GPS signal loss and multipath can occur due to urban canyons or tunnels [6].

E. LCD

A liquid-crystal display (LCD) is a flat panel display, electronic visual display, or video display that uses the light modulating properties of liquid crystals. Liquid crystals do not emits light directly. LCDs are accessible to display arbitrary or fixed images which can be displayed or hide, such as preset words, digits, and 7-segment displays as in a digital clock.

They use the same basic technology, apart from that arbitrary images are made up of a large number of small pixels, while other displays have larger elements .LCDs are used in a large range of applications including televisions, instrument , aircraft cockpit displays, and signage.

F. SMOKE SENSORS

A smoke detector is a device that senses smoke, typically as an indicator of fire[8]. Commercial and residential security devices issue a signal to a fire alarm control panel as part of a fire control system, while household detectors, recognized as smoke alarms, usually issue a local audible or visual alarm from the detector itself. We are using MQ2 fire sensor in our project [3]. MQ - 2 is a flammable gas and smoke sensor detects the concentrations of combustible gas in the air and outputs its reading as an analog voltage [12].

- **Working**

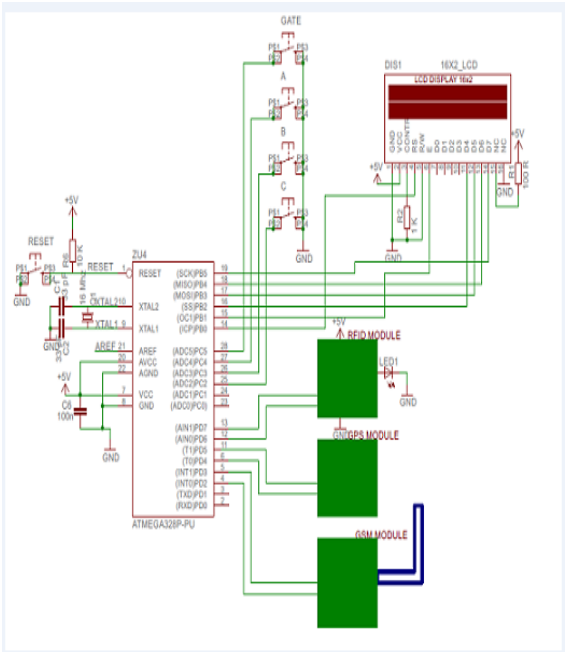


Fig 2. Circuit Diagram of IBMS

The proposed system architecture for the intelligent bus system consist of black box and smoke sensor attached in bus and gsm system at bus station as shown in figure. A gsm system at bus station includes gsm module, microcontroller , Lcd, and black box equipped with gps ,gsm module, rfid and controller in the moving bus, suppose the bus reaches at a bus station, the driver will open the gate of bus using switches and the scanning of rfid will get started. The number of scanned rfid tags will be stored in the memory of the microcontroller.

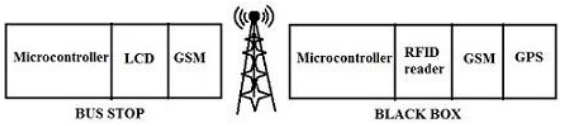


Fig 3. Architecture of IBMS

As each rfid is scanned then, the microcontroller will compare each rfid serial number with its memory, if the serial

number does not exist in the memory then that serial number will be added in the memory(we consider the rfid tag as boarding) . now the driver will close the doors.

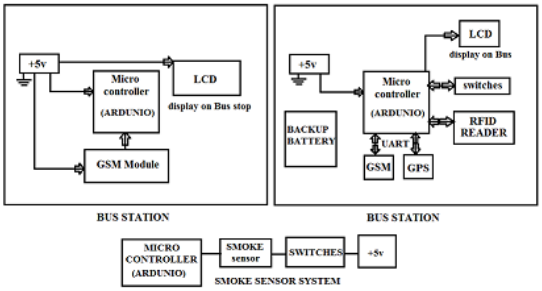


Fig 4. Block Diagram of IBMS

After the door is closed the microcontroller will count the empty number of seats and this information will be sent to the next station . Until the bus reaches the next station the controller will gain the coordinates of the bus and will send them to the next station with the help of GSM module within equal intervals of time. As the bus reaches the next station the controller will again compare the rfid serial number with its memory and if it finds that serial number in its memory it will delete that serial number from its memory (will consider that rfid tag as deboarding). The whole procedure will be repeated in series with sequence.

3. Conclusion

The results of this review have shown that Intelligent Bus Monitoring System is a broad field which covers many technologies and they play a significant role in this tech savvy era. Intelligent Bus Monitoring System deployments have the possibility to offer the following benefits: improved safety, competence, mobility, accessibility.

The intelligence implemented in the bus monitoring system can be achieved by compiling and feeding all the proposed theories and algorithms for RFID and other sensing technologies into the system. The capability of the system to act on its own can reduce the manpower required at the monitoring centre. Hence we have overcome the major problems of overcrowding, smoking, ticket cheating, availability of seats , location of the bus etc are overcome by this system.

4. Future Scope

The hierarchy introduced in this dissertation provides a natural guide to future research. As this system uses a combination of processing elements: PCs, Mobile Phones etc., there is a threat of the overall system malfunction due to a particular type of attack, it is termed as Denial of Service (DoS) attack by malicious agents who might try to disrupt the function of the system. We can also use NFC technique instead of RFID with following advantages: Fast transactions, ideal for e commerce systems , versatility , safety. We can interface the entire system with internet. Futuristic approach encompasses two important factors: (a) change will be uneven since current trends may not continue and (b) some things may, in fact, stay the same even though there is a predilection to think everything will be dissimilar. Future safety focus on at least three aspects: operators and passengers, vehicles, and the environment. All three are integral not only to ensuring safety improvements but also to creating a

future in which operators and passengers travel safely, the investment in vehicles is safeguarded, and the roadways are better at accepting prolific vehicles with enhanced technologies. The definition of technology safety will change from simply being the prevention of death and injury to include a demand for additional security. The population is aging and senior citizens experience functional deficits as the aging process takes its toll. These declines will have significant consequences for both the safety and the mobility of senile people . Concern and increased control of the environment to address global warming and other considerations will be advanced. Environmental matters will go beyond air quality and affect the components that make up quality-of-life issues.

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