

Literature Review on Smart Public Transportation System

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Abstract

Transportation is one of the indispensable things of our day-to-day activities. Buses are the preferred mode for travelling due to their negotiable cost and covering a large area and routes. The major difficulty in their usage is overcrowding and delay in its arrival time. The main goal of this research is to assemble a literature review of studies that assess the passenger benefits of providing real-time information. Crowd estimation techniques are developed in many ways in this publication. The second goal of this analysis is to find out the areas for future research based on remaining gaps in the literature; two key areas that were distinguished to assess the actual behavioral changes of path choice of transit riders and conducting cost-benefit analyses post-implementation of RTI systems.

Keywords: Internet of Things, Public bus transport, crowd estimation

1. Introduction

Many people highly tend to depend on autonomous vehicles with increasing population and pollution, public transport became one of the core topics while contributing a livable society. Accessibility tends to become the focus of transport. Many people opt for public buses, especially for local transportation, which are available at cheap fares and satisfies urban communities rising need for transport services.

Buses are the primary form of transportation for the majority of people in Indian cities because they are convenient as they carry large masses of people and take less space on the road as opposed to 50 cars. It is an efficient way to reduce traffic and pollution also with increased fuel efficiency and mobility. In particular for intra-city transportation, buses are more likely to reach a particular area as opposed to the alternatives like the metro which generally have stops at major locations. So, the reasons are high for the public to opt for bus transportation than other modes of transportation. In the current era, so as to meet the passenger's requirements is becoming a major problem although there are adequate transportation services. There is also a general declension among the public in using public transportation services. People would prefer public transport to be scheduled properly, on time and the frequency be increased for commuters to make good use of it.

Our paper proposes an explication to meet these modern enormous information services using an Internet of Things (IOT) based framework which has great potential to enhance the information facilities provided to the passenger. Such facilities are useful for women and senior citizens who dislike the inconvenience of travelling in badly overcrowded buses. Moreover, it is good for the public transport operators, as it helps captivate more passengers, increases revenue & plan accordingly [1].

2. Tools and Technologies

2.1. Automatic Passenger Counting (APC) Systems:

People counting technology has involved as follows:

Infrared beam counting

In this method we will use infra-red beams at the entrance and exit of the buses. This method is the simplest and most inexpensive method. Two horizontal infrared beams are kept at both entrances of the bus. When a passenger enters into the bus then the beam breaks and automatically the passenger count is increased by one and it is decreased when a passenger exits from the bus. However, “foot-boarding” is common in India. They may break the beam continuously and it gives wrong count. Also, more than one passenger may step into the bus at the same time will lead to reduce in accuracy [2].

Treadle mat sensors

Treadle mats put on the steps of a bus— register travellers as they step on a mat. This arrangement is similar to the APC technologies are produced by various companies operating in the transport industry: the counting system uses treadle mats located in proximity of the vehicle gates, commonly on the access steps [3].

Wi-Fi counting

As an on-going improvement in crowd estimation the creators of this paper [ref to base paper] have proposed a solution of assessing crowd density using smart mobile phones. This strategy includes a Wi-Fi receiver senses the probe request packets sent by the smartphones over IEEE 802.11 protocol on the bus (Wi-Fi). The MAC (Media Access Control) address of the phone is used to recognize unique travellers on the bus. The drawback is that a sizable portion of the travellers in Indian metros and towns don't have smartphones. In addition to that, they can't be expected to have their Wi-Fi activated on their phone. Furthermore, Apple ios9 and Android 6.0 Marshmallow use aggressive MAC rotation schemes, making Wi-Fi counting not practical in the future[4].

Image processing

An automatic traveller counting system which uses the capability of image processing depends on skin colour detection approach. For the skin colour detection, this methodology depends on using the colour content of the hue and saturation colour components. So as to test the capacity of the proposed APC system, the numbers of passengers and the conditions of lighting have been considered. Depending upon the qualitative findings provided in the previous section, it can be seen that the threshold technique has successfully segment the area of interest based on skin colour detection by using the proposed threshold values. Quantitatively, the proposed APC system has effectively provide good counting performance for the overall 25 passenger pictures with counting accuracy of 90.64%[5].

2.2. Ticketing systems

Smart card system

The manner by which admissions, tolls, and different charges for the utilization of a transport administration are gathered is one of the most significant viewpoints in deciding clients' fulfillment with both new and existing transport schemes. Benefits might be accomplished by enhancements in speed and the flexibility of installment itself, if new innovations are utilized. In any case, the extra data on clients' excursions, their profile and inclinations for installment, may likewise open the best approach to offering client

faithfulness what's more, enumerate plans and a superior comprehension of the client's needs and adventure designs[6].

3. Method

To overcome the problems of overcrowding and uncertainty, the passenger will need real-time location and crowd information of buses. To get the information easily we will provide a mobile application for them and by that application, they will get information. For example, people counting using cameras are unsuitable as multiple cameras are required for it and it is very expensive. Additionally, buses in Indian metros will have overcrowded, it may cause damage to cameras and there will be a problem with accuracy. Alternative solutions like infrared beams at the entrance of the bus will have poor accuracy in Indian cities due to foot-boarding passengers i) Issuing the ticket by the help of RFID tags and by tallying the crowd count with the ticket .

4. Hardware Resources and Features

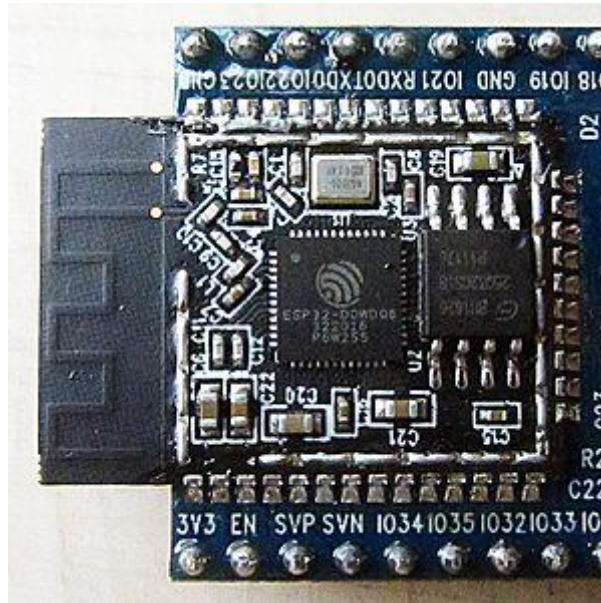
4.1.Arduino Mega:

An Arduino Mega is a microcontroller board and it has ATmega on it. It is costlier than Arduino Uno.It is the large I/O system design with inbuilt 16 analog transducers and 54 digital transducers that supports with USART and other communication modes. Arduino Mega 2560 can be programmed using Arduino Software called IDE which supports C programming[7].



4.2. ESP32:

ESP32 is a user friendly and a low cost wi-fi module and dual mode Bluetooth. It contains SoC(System On a Chip) It also features common microcontroller functionalities like PWM, ADC, DAC, I2C, SPI, and UART. So, with an ESP32 device, you'll have the power to make any IOT device with minimum budget and effort [8].



4.3. IR Sensor:

It consists of an IR LED as a transmitter via which an infrared light is emitted (which comes before the visible spectrum) and as a receiver either a photodiode or a TSOP is used to detect the light. It is used to detect the obstacle[9].



5. Conclusion

Passenger ticketing and counting can be very useful for the management, scheduling and planning of public transport, since it enables to set the transport service according to the observed demand, in order to improve the level of service provided to the users. In the growing need of the transportation systems, the use of technology plays a very crucial role to make it more affordable and efficient. The developments in the ESP32 modules using advanced tools like Wi-Fi made it more practical and adaptable in this environment. This type of ticketing system proposes the use of RFID cards. Here the passenger can conveniently purchase tickets by swiping the card while leaving the bus.

5. References

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