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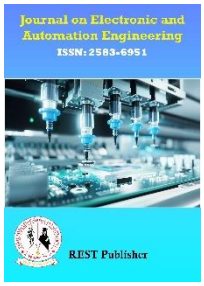

Public Transportation Fare Monitoring System Using Arduino & Fingerprint Sensor

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Abstract. *Fare evasion has become an important issue for public transport companies, especially for those that have adopted proof-of-payment ticketing systems. Recent years have seen strong growth in the publication of studies on fare evasion. This paper reviews 113 studies to identify the characteristics of the research on fare evasion. An overview and classification in five main areas, i.e., fare evader-oriented, criminological, economic, technological, and operational is provided. Next, the status quo of these studies is assessed to support possible unifying research development. To facilitate passenger, know their exact fare according to the distance travelled by them. To facilitate the owner of the bus to know the exact data about the number of passengers travelled and total collected amount. We have designed such a system where passenger themselves can monitor the fare based upon the distance travelled by them. If this system is installed in any public transportation, then passenger should enroll their finger in the fingerprint sensor while entering the vehicle and should enroll it back while leaving the vehicle. When we enroll the finger while leaving the vehicle the display unit in the system shows the total distance travelled and the total fare to be charged based upon that distance travelled. Passenger should not negotiate with bus unit for the fare. We can also further improvement in this project by integrating online payment system in this project.*

1. INTRODUCTION

Public transport refers to shared passenger transportation services like bus, trains, metro, trolleybus etc. There are many challenges that are faced by passengers while using public transportation. The main problem while using public transportation is the fare rate. So, In this project we have designed such a system where passenger themselves can monitor the fare based upon the distance travelled by them. If this system is installed in any public transportation, then passenger should enroll their finger in the fingerprint sensor while entering the vehicle and should enroll it back while leaving the vehicle. When we enroll the finger while leaving the vehicle the display unit in the system shows the total distance travelled and the total fare to be charged based upon that distance travelled. Passenger should not negotiate with bus unit for the fare. We can also further improvement in this project by integrating online payment system in this project.

2. LITERATURE REVIEW

Public transport (PT) in urban areas has gained greater attention in recent years for improving sustainability and the quality of urban life. The economic and environmental performance of cities can be enhanced by connecting resources to destinations effectively and facilitating mass mobility (Bok and Kwon, 2016). During the past two decades, a huge population growth is recorded in developing countries (Buhaug and Urdal, 2013). Increase in population has caused an increase in the demand for mobility. If the transport infrastructure is not capable of meeting the demands, this causes an increase in waiting times and congestion in public transport and streets (Samek Lodovici and Torchio, 2015).

Public transport can be more attractive by providing "Door to door mobility" and development of transportation services is an important factor of social quality ((Jackiva) Yatskiv et al., 2017). Sustainability of transportation, environmental conditions of an area, public health and economic condition of residents can be raised by shifting from private transport to the public transportation, walking and cycling (Elias and Shiftan, 2012). This shifting will happen in the condition that the public transportation is widely available and accessible to the public.

The main aim of the public transport accessibility assessment is to provide better connectivity of people and location in order to decrease the congestion on roads. In simple words, mobility through public transportation provides an opportunity to decrease inauspicious effects of car usages on environmental condition and healthfulness ((Jackiva) Yatskiv et al., 2017). Mobility level of a city can be improved by providing a well-organized transportation system. Hence, accessibility of public transport stops, connectivity of modes of public transport and system mobility should be considered to provide a user-friendly system of public transport (Cheng and Chen. 2015). Service access and urban public transport accessibility have always been a major service issue in urban public transport. In network design of transit services, researchers are often more focused on minimizing the user and operator cost rather than incorporating the issues of equity and access (Murray, 2003). Availability of infrastructure, ease of information, reduced time and cost are imperative factors in providing an attractive public transport with door-to-door access as well as the long-distance travel ((Jackiva) Yatskiv et al., 2017).

3. PROPOSED METHOD

Figure 1 Block Diagram of Public Transportation Fare Monitoring System Using Arduino & Fingerprint Sensor
It has very simple working principle. When the new passenger enters the public vehicle, He/she should place their thumb finger in the fingerprint sensor. After they place the finger, the device makes new registration and provide unique id to that person. At the time of the registration the device also records the pulse generated from Hall Effect sensor as an initial value. Now when the same person reaches the destination, He/she must place the same finger in the device. When the fingerprint sensor finds the registered finger, it understands that person has reached the destination. At this time the device set the final pulse and calculates the distance travelled by passenger by generating the difference between the final pulse and the initial pulse.
We can easily multiply the distance with any constant value to generate the fair as rules and regulation. If you have any discount card like (student card, old aged card), you can press the discount button available in the device to achieve the available discount. The owner of the bus can also calculate the total passenger and total amount of money collected at the end of the day or at the end of each tip by pressing the reset button. After pressing the reset button all the data will be erased from the device and will be saved in Sd card for further data analysis. This device helps the owner of the bus to know the exact idea about the total money collected from the bus.

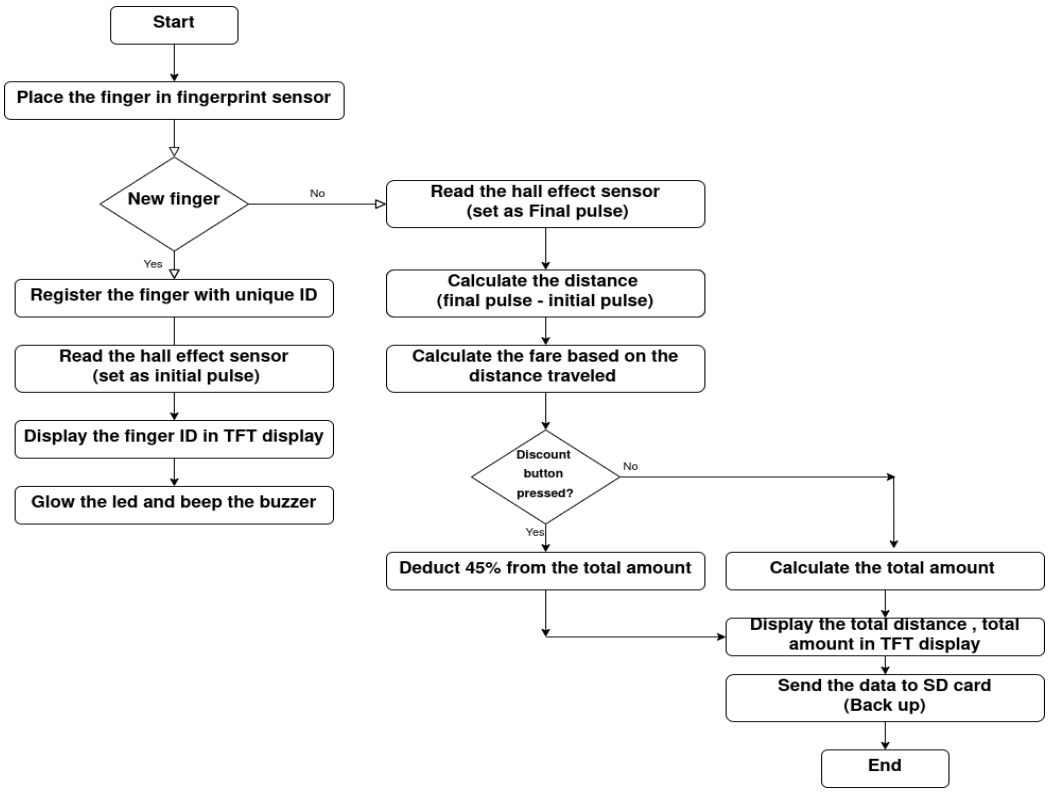

FIGURE.1. Flow Chart of Public Transportation Fare Monitoring System Using Arduino and Fingerprint Sensor

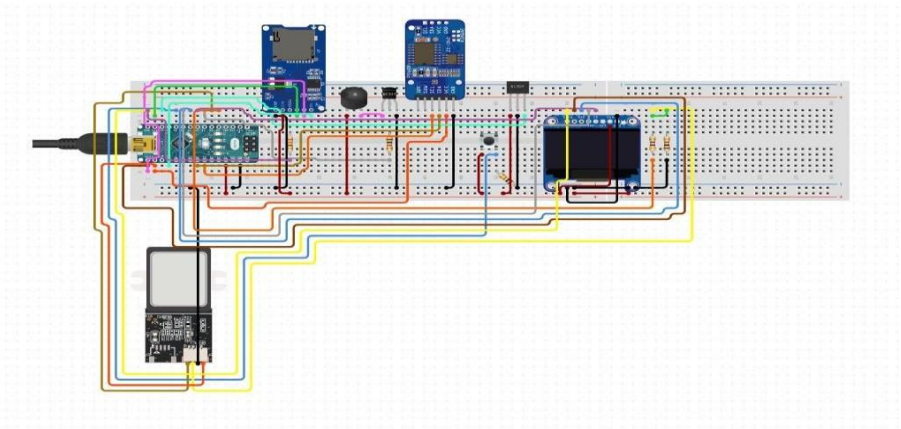

FIGURE.2 Circuit Diagram of Public Transportation Fare Monitoring System Using Arduino & Fingerprint Sensor

4. RESULT

TABLE 1. Collected Fare from Passengers

S. N0	NAME	DISTANCE TRAVELLED	DISCOUNT	PASS	AMOUNT
1	NAZIA	10km	NO	NA	20/-
2	SRUJANA	50km	NO	NA	100/-
3	SANGEETHA	30km	YES	STUDENT	50/-
4	SHIVA NAVEEN	20km	NO	NA	40/-

The above table shows the collected fare from passengers.

The student Nazia, Srujana and Shiva Naveen doesn't not have any pass. Hence, the discount is not applicable for them. Only the pass holders get discount and will not be charged/will be charged less according to the distance travelled by them. So that, Sangeetha get the discount as she has the pass.

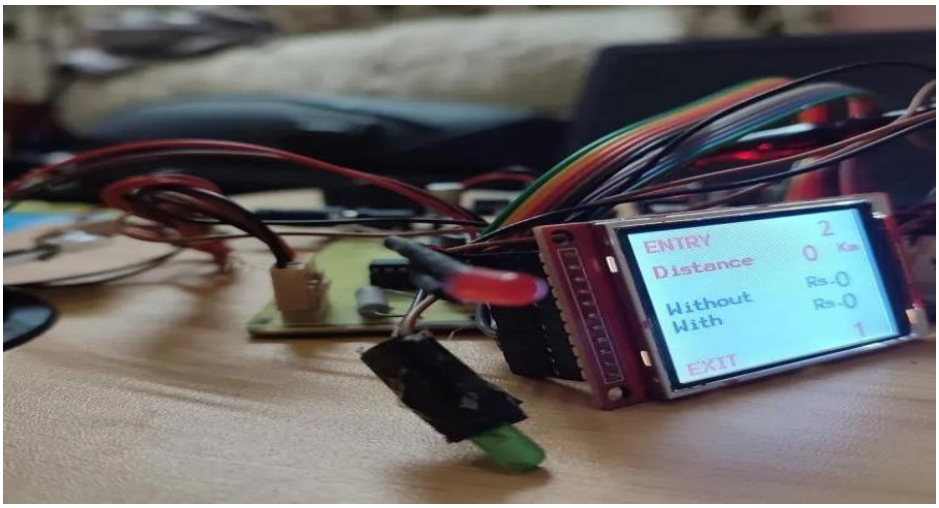

FIGURE.3. Prototyping Model

5. CONCLUSION

This project can play very important role to improve the transportation system. The system can be further improved by adding the payment gateway in the same system. Therefore, we conclude that the tourist commuters are commonly not given the exact amount of change than the other commuters, considering that the mean/average of tourist is 3.50 which is greater compared to the other commuters. Next, to the tourist, regular and senior citizen passengers are also not given an exact amount of change with the average of 2.52 & 2.53 respectively. The student has the lowest frequency that was not given an accurate amount of change with the average of 2.02. It has also been concluded that the Automated Bus Fare Collection System is more accurate than the Traditional System considering that the mean/average of the Automated Bus Fare Collection System of 26.93 is lesser compared to the mean/average score of the Traditional system of only 28.57.

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