RSPG – RFID Based Smart Payment Gateway

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ABSTRACT

The use of smart technology is more widespread at present. Indian Government is insisting more on online transactions rather than cash payment. Use of applications like paytm wallet, free charge and other payment gateways are trying to establish our country in this Digital Era. The present scenario needs a working internet connectivity to establish such a digital environment. This can be possible in urban areas whereas in rural background it is more questionable. To handle such situations and to set up connectivity even in rural areas without internet, a novel smart handheld device has been proposed in this project. The device has been developed to handle multi inputs from three different application environments like supermarket billing system (SBS), toll fare collection (TFC) and public transportation system (PTS). The device can be installed anywhere in any one of the above said modes and it can handle the application. Radio Frequency Identification helps in identification and payment without the help of internet connectivity. Location sensor has been used to track the attached device nodes. The advantage of the proposed system is, it can be helpful to the people those who are residing with poor network signals, initiates easy payment thereby making the country more digitized.

KEY WORDS*:* payment gateway, RFID, Internet connectivity.

1. INTRODUCTION

The present payment mode that is widely present is through direct cash. Payments are done manually by the consumer for the products and services used. Starting goods exchange we have reached payment through wireless connection. Payments gateways such as Paytm, Free charge, Airpay, Bit pay are e-commerce application service providers which allow credit and debit card payment through online retailer. As per reports, cashless transactions through credit card, debit card, NEFT and online wallets comprised of INR 92 lakh crore. The total transaction amount in India excluding cash payment reached $2.76 trillion in 2015. All these transactions need internet connectivity which is well established in the urban and metropolitan areas in our country. But the residences of rural areas suffer from weak and irregular internet connection. This makes such modern technologies like online transaction, E-payment difficult to be accessed by the people of rural areas. Our country has higher rural population when compared to the urban population. The proposed system holds a universal handheld reader device and Smart card (RFID). The reader has the capacity to change its work mode based on the areas in which it has been installed. The Smart cards are used by the people for payment procedures. Solutions for three areas – Ticket-free Public Transportation system, Supermarket Auto-billing system and Automatic Toll fare Collection have been explained in this project.

Drawbacks of Existing system: The present tollgate fare collection is done manually by the officials. Travellers need to wait one after the other for their turn to pay the fare. The payment bills are produced using an application installed at their sites. This causes congestion due to longer waiting time. Similarly, the prevailing supermarket billing system also consumes time since a queue must be formed to bill the products in the cart. These make customers restless and decide on other retail stores. In existing PTS, tickets are used to authorize passengers willing to travel and use the service of PTS. The tickets are generated using a machine by the bus conductor. The destination must be specified in order to determine the due amount to be paid. The payment is widely done using cash since ticket cost very less. There occur many malpractices where passengers don't get the tickets, travel long but pay for less distance. Overcrowding is also a major issue in public transport vehicles. The method used to pay the bill is mostly cash or very rarely credit and debit cards. Usage of such cards will be affected when there is no internet connectivity and loss of electricity. Technical issues or natural calamities might affect the internet connection causing distress in using the cards. The RFID technology also involves a reader and a smart card. But it does not require internet connectivity and electricity. They are activated with the help RF signals emitted by the reader. Nowadays, this idea has been implemented in various scenarios. RFID cards have been implemented for payment and identification procedure. Popularity of its usage has steadily increased but they are not used universally. This is because the cards are used only for a single scenario. The programmed reader differ from place to place. Development of different readers is time consuming and less efficient. All these drawbacks can be overcome by using the proposed system.

Literature Survey: Piyush Chandra (2014), discuss that RFID can help the present Public Transportation System (PTS) in multiple ways. Present PTS uses paper tickets, has no destination specification, unorganized and ticketing process is time-consuming. It is also a victim of many malpractices. Service can be used only by entering the destination location on keypad attached to the bus. By using the proposed automated system we will save time, have a higher authoritative inspection and reduce chaos and confusion on the road.

Sainath (2014), state that now a days purchasing at bigger shops has becoming a daily activity which has been time consuming. The proposed project Automated Shopping Trolley introduces automated shopping baskets and

trolleys in every supermarket and hypermarket. This system places a barcode scanner in every trolley which will scan the barcode of the products placed inside it for its cost. After purchase, the total payment must be paid at the counters.

Aung Myint Win1 (2014), discuss that in Myanmar manual transaction is carried out in all the toll collection system. Due to the increase in use of vehicles, the streams of traffic multiples and congestion occurs. This problem can be approached by reducing the time taken by each vehicle. To overcome the above problems, Radio Frequency Identification (RFID) Based Automated Toll Collection System is proposed. The objective of this paper is to transform manual transaction to automated toll collection with the help of RFID technology.

Udita Gangwal (2013), stated that the proposed project implements a reliable, fair and cost efficient Smart Shopping Cart using Wireless Sensor Networks in retail stores. It helps greatly to reduce man power and to create a better shopping experience for its customers. Long queues for billing and payment process will be avoided. Along with this ability, the system design also ensures detection of cases of deception invoked by dishonest customers.

Archana Mala & Leela (2014), discussed that the present Public Transport System (PTS) use paper tickets printed using a small device and keypad. Man power is needed and details about the passenger are not known. The proposed project uses ARM and EEPROM for data storage and execution. A digital card (smart card) has been used as the ticket. The card must be swiped and destination must be entered on the keypad of ARM device containing the execution details. According to the distance travelled, the appropriate amount is deducted. GPS technology is incorporated to notify the user with a buzzer when his destination is reached

Shilpa Mahajan (2013), proposed a system to collect toll fare from the vehicle without making them to halt. The traveller must be given a transmitter card mounted on a car and the data will be stored in the micro controller.

Bos Mathew Jos (2015), stated that The Radio Frequency Identification and GPS technology can used to make the identification of passenger and transaction very precise. The cards being reusable can be much more convenient compared to the paper based ticketing system.

Proposed System: In this paper, a universal hand held device has been designed and programmed as smart card with RFID reader. It can be installed in any scenario and the reader has the ability to accustom itself to the existing application available. Smart cards carried by the user will hold the user's information and payment wallet. Recharging the smart card with money can be done through an authorized bank or at recharge points. The card holds a unique id linked to the Identification card provided by the Government. The card gets activated by the Radio Frequency (RF) signals emitted by the reader. To overcome the security issues, OTP generation has been generated. The users are verified through this mechanism and the due amount has been deducted. The system can be implemented in any of the following three scenarios.

Case.1: Public transportation system: In Ticket-free Public Transportation system, when the passenger gets inside the PTS the reader picks up the RFID tag. Physical contact with the machine is not requirement. The tags can be identified by the reader automatically when it falls under the reader's coverage. Global Positioning System is used to identify the location at which the passengers get in. The destination location will be read when the passengers get down the vehicle. The based on the distance travelled, the due amount will be calculated and will be deducted from the user's smart card.

Case 2: Supermarket auto-billing system: Supermarket auto-billing system provides quicker shopping environment as customers don't need to stand in queues for billing and payment. The shopping cart will hold a barcode scanner that reads the products placed in the cart. The barcode is scanned and sends the data about the products to the supermarket application system. The calculations are done amount to be deducted is sent to the RFID reader. The reader will connect to the customer's smart card and further deduction process occurs.

Case 3: Automatic toll fare collection system: In Automatic Toll fare Collection, the vehicles can avoid standing in the queue for fare payment. The type of the vehicle will be given to the system manually by an official. Accordingly, the fare will be deducted using the reader. This reduces the waiting time for the travellers. Congestion in highway will be highly reduced and will support traffic-less travel.

Implementation: Figure.1, Shows the architecture of the proposed system.

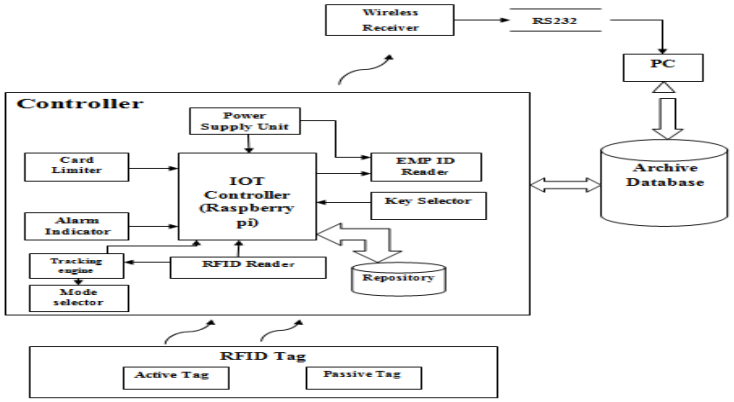

Figure.1. RSPG Architecture

The Radio Frequency (RF) signals are emitted by the RFID reader to active the RFID tags (active or passive). Activated tags will contain a battery within to power them up. Whereas, passive tags don't require battery. They active when RF signals are available in the range. The data regarding the user and balance amount will be read by the RFID Reader. The data read is sent to the IOT controller (Raspberry Pi) and checks the card limiter for the balance in card and indicates the user if balance is less using the alarm indicator. EMP Id and Key Selector are optional data. They store the information about the official who executed and authorized the user for the process. The Mode Selector will change according to the scenario in which the device is placed. The Tracking Engine as shown in fig.2, will hold all the Result Set related to the mode selected. This data will be temporarily stored in the repository. Wireless receiver will receive all the data from all the base stations for storage in the archival database. Comparative study has been done with the existing systems and the results have been presented in Table.1

Table.1. Comparative study

Features	**The existing payment method (paytm, credit card.)**	**RFID smart payment gateway**
Internet connectivity	Needed. Without internet payment is impossible.	Not need
Physical contact	Credit/debit card must be swiped on the reader for payment	No physical contact. Wireless connectivity
Payment speed	Time consuming	Very quick
Security	Less secured. Malpractices occur.	Highly secured
Usage area	Limited area	Any area with RFID range

2. CONCLUSION

The proposed methodology aims at providing an efficient gateway for collecting cash from public in case of Public Transport system, Supermarket billing System and Toll fare collection. Even though the system is functioning properly, the storage memory capacity is to be improved and also in future, this work can be extended by implementing the same system in all possible areas to promote digital India. This enhances the technology usage in urban as well as rural areas. Thus it directly endorses the economic status of our country.

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