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Campus Smart Parking System using RFID in Jubail Industrial College

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ABSTRACT: Radio Frequency Identification (RFID) technology uses a considerable amount of reduction in transaction costs and decrease in stock shortage. The technologies provide a solution that has been a problem encountered in JIC parking-lot management. By introducing the RFID automated parking system to the JIC College, it will resolve many issues that are faced by the students and the college. Through allowing parking lots for the students with charged payments account, while benefiting the JIC College by increasing the income. Entering and getting-out will be fast without having to stop the cars, so that, traffic problem in JIC will be avoided during these processes. Student vehicle will not have to make any payments at each check thus a faster traffic flow will be possible. Implementing a car parking system in environment such as JIC College it will improve traffic flow during peak period.

KEYWORDS: RFID, RFID reader, RFID tag, RFID sticker, PC, JIC.

I.INTRODUCTION

RFID is the technology that identifies certain tags with unique information using electromagnetic field. There are two types of RFID, passive RFID, and active RFID. In passive RFID tags there is no need for a power supply. Instead, the electromagnetic signal emitted from the reader will power up the tag circuit. This type can be used in various application that doesn't require high speed, for example: Car entrance inventory management. While active RFID tags requires internal power supply. The internal supply is a battery that has a duration up to several years. This type is way more expensive than passive RFID. [1]

There are two main parts in RFID. RFID reader and RFID tag. RFID reader is a transceiver that emits an electromagnetic signal towards the tag and receives a specific signal. The signal will detect the presence or the absence of something that is needs to be monitored or identified. RFID tag is an object that can be attached to something for the identifying process using radio waves. These tags could be read form a far away. The tag has an electronic chip that contains a memory that stores the related information that will be processed.

II. Literature Review

The RFID car parking system has been done before by a lot of groups such as an example a research paper made by Anusooya G, Christy Jackson J, Sathyarajasekaran K, in the Vellore Institute of Technology University, India. The idea is automation for parking-lots allowing automatic identification for cars to enter the parking lot area and ease the experience for looking for a vacant parking lot before entering the parking area. The check-ins and check-outs will be handled in a fast manner without the need for confirmation of the security guard.

The design and method of the proposed system use infrared transmitter-receiver pairs that are connected to the raspberry pi (inexpensive compact computer) and it will communicate the status of parking occupancy to the raspberry pi. The output of the sensor is sent to the database through the raspberry pi. Once the database is updated the result is displayed on the monitor at the entrance gate. Then the result will display the vacant parking space on the display at the entrance of the parking so that the user gets to know the availability and unavailability of parking space prior to his/her entry into the parking place. [2]

Figure-1 Raspberry Pi Controller of the background

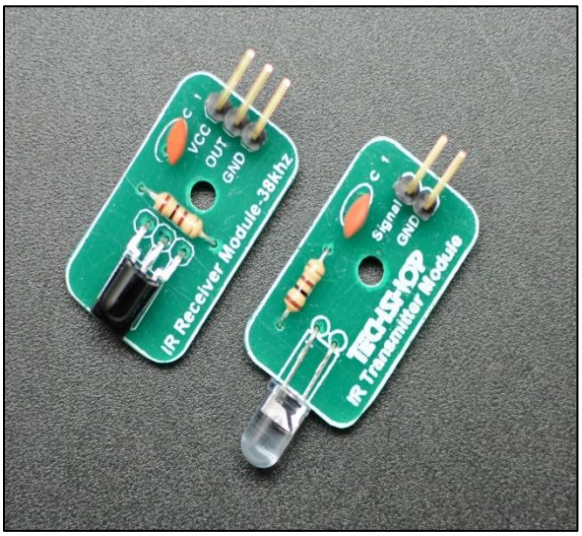

Figure-6 Infrared transmitter-receiver pairs for the sensor part of the background research

In the recent years JIC experienced a consistent growth in number of students. This increased the demand for car parking slots. However, the college couldn't meet that demand since the available spaces are needed for expansion work in JIC campus. The students can't find a parking slot easily due to traffic jam. Moreover, the process of finding a parking spot is time consuming. In some cases, there will be no available slot so the students will be directed to the outside parking space that lacks security and will force the students to walk for fifteen minutes to reach his class.To counteract this issue, we've designed a "RFID based car parking system" that will be applied on a new parking building. This project will provide an extra space that will solve different problems in an efficient and intelligent manner. The new building will increase the car parking capacity which will allow more students to park their vehicles closer to the classrooms. It reduces the time spent in walking especially in Saudi Arabia's harsh weather conditions. Moreover, this parking slots will generate a financial income to JIC. A system of this caliber guarantees a high security level. The RFID technology linked to a database where every related information will be stored.

Figure-1 RFID based car entry

The parking building automation system will be located inside of Jubail Industrial College. To be specific near the Electrical & Electronics Engineering Department. In figure-4 will showcase the exact location.

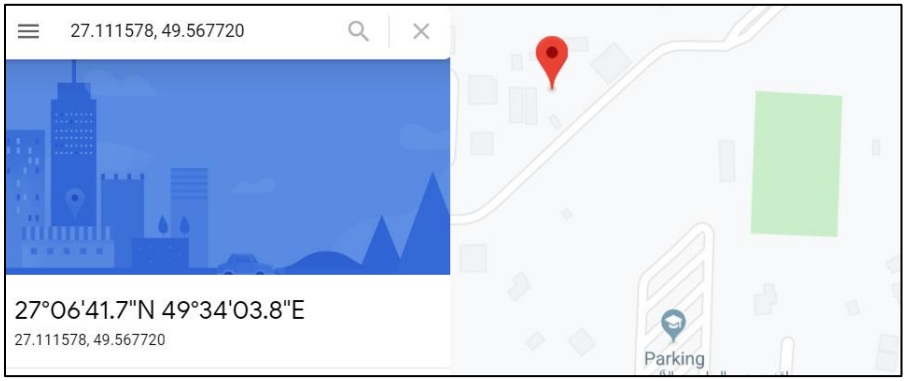

Figure-4: Google map exact location

III. Methodology

The system comprises of two components Parking Allocation and Seamless Parking. The Parking Allocation will have sensors in-front of each parking lot detect a vehicle if taken the spot and it will update the database and the changes are mirrored to the display. The Seamless Parking will consist of the RFID tag attached to the car windshield. Therefore, when the vehicle passes through the entrance gate, the RFID Scanner will scan the tag and stores the timestamp of the entry and at the exit, the tag is scanned again and the total time is calculated and then it is accounted in the user account. Therefore, in the respective of the research paper relation to the group application. There are a several of similarities in the application. There will be a sensor used in the parking lots but not infrared transmitter-receiver it will be proximity switch. The controller will be a PC handling the database of the system. In this application, the students have to subscribe to the college and will be given a certain amount of points. Then will be provided with an RFID sticker for the vehicle, to allow entrance at the gate. There will be an RFID reader at the gate that will scan the incoming vehicle, to check if it registered to the system to allow entry to the gate. There will be a display at the gate telling the information about the availability of the parks inside the parking lots building. The sensing element will be a proximity switch at each parking slot connected to the control system, to display the availability of the parking lots. The control system and storage of the database will be on PC and the software will be developed by the IT department. Block diagram in figure-7 explaining the methodology of this project in a simple way.

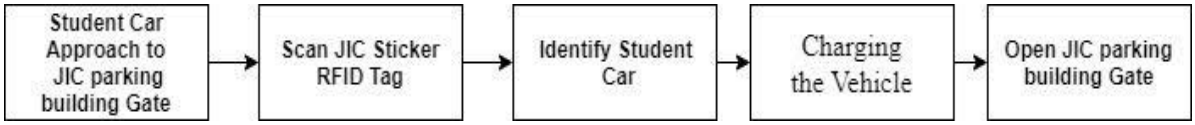

Figure-7: system Block Diagram

Flowchart below explains detailed methodology of the project.

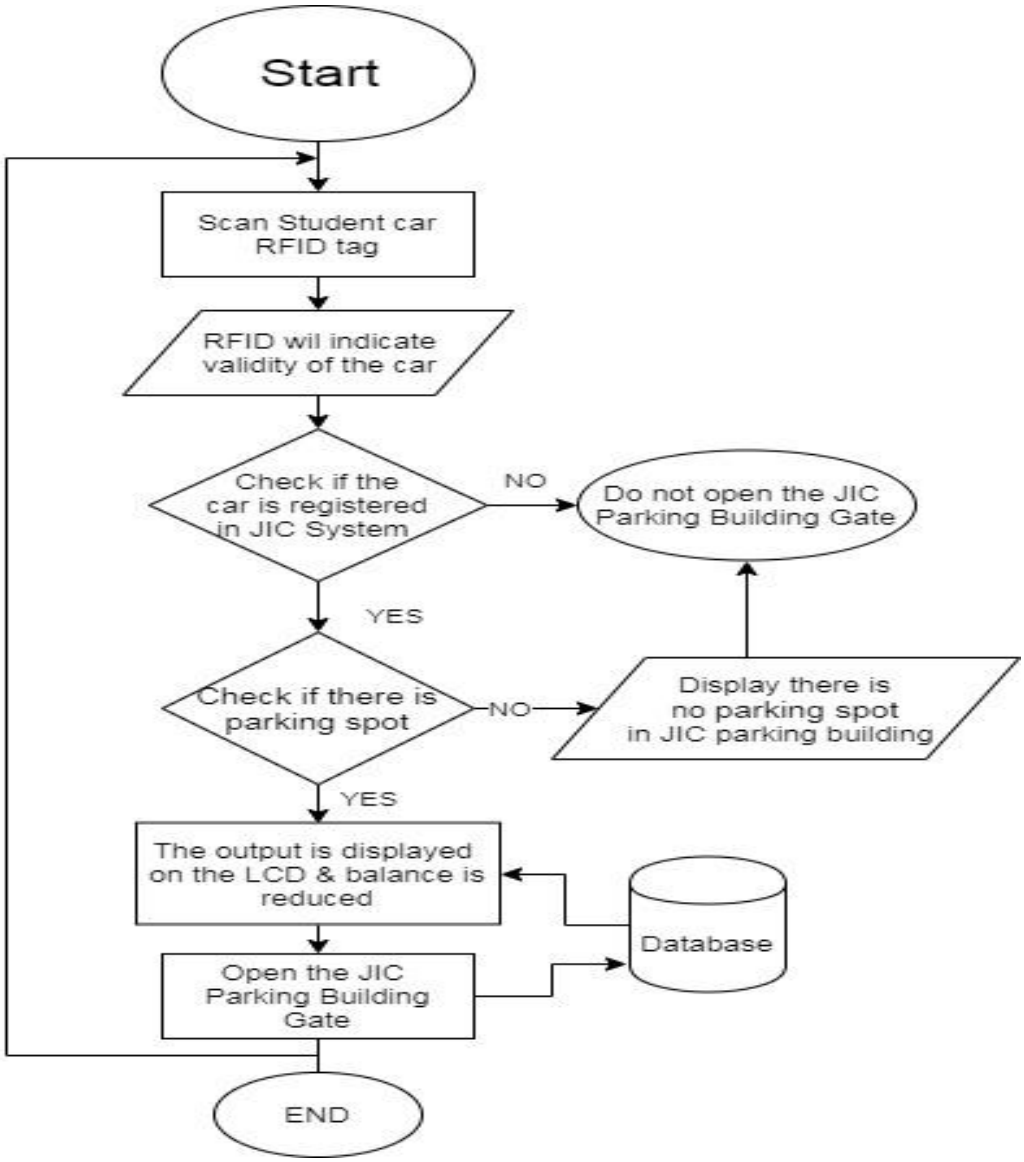

Figure-8: Flowchart Diagram

Figure-9: System components, Sensors, server main controller of the system& monitoring screen

IV. COST ESTIMATION

Name	Cost (SR)
RFID Tag 50pcs	138.00
RFID Reader 6m Long Range Outdoor	1185.00
Proximity Switch for one piece	60.00
PC	1200-1500
Display LCD	302.99
Construction cost for the parking lot building	250,000-600,000

Table-1: Cost Estimation for the components of the project.

V. CONCLUSION

The objective of this project that is "Campus Smart Parking System Using RFID in Jubail Industrial College" was to design a system based on RFID that will change the manual parking system. This project is effective to the students, it will provide parking lots for the students since there is less parking lots are offered to the students. Also, from the college perspective, this will help increase the income since the students will subscribe to this service by payment. Since this project depending on the college finance fund it will damage the college finance. But, in the future, the college will benefit from this automation parking system by the finance income increase by the student's subscription, while in the future the number of students is constantly increasing.

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