Enhanced Smart Parking System using Sensor Technology

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Abstract – The idea of Smart cities has gained a great popularity around the world nowadays. Parking spaces these days are used by of people at every commercial complex like shopping malls, cinema halls, etc., and finding an empty spot there is a very difficult task, people find it burdensome most of the times. Many face these problems in finding an appropriate slot. So when this comes to large commercial complexes we see people even wasting their valuable time every day. Sometimes it takes hours to find an appropriate parking spot. On removing all these constraints and making everything automated by implementing a computerized system which simplifies the existing problem. Thanks to the advancement of the Internet of Things. To do all this we need to introduce a system which includes proximity sensors, OCR reader, Fare collecting machine which collects the amount to be paid by the user, QR code generator that prints on the ticket that is to a relative vehicle and parking slot allotted to it in the complex and is given to the user. The parking space is allotted depending on the requirements of the mall, concern of the user as well as the availability of the parking space in the complex. As soon as the user goes to the assigned parking space, it is updated in the admin database that it is occupied. Before leaving, QR code is scanned by a QR code reader including the fare collecting machine at the exit gate by the assigned user where he has to pay for the usage of parking lot for that time period and also it makes sure that he exited the slot and now that slot can be assigned to the next user. This whole information is stored and monitored by the database and is displayed to the administrator on a screen.

1. INTRODUCTION

Car parking problem is a major contributor and has been, still a major problem global wide. Searching for a parking space at a particular place is a routine (and often frustrating) activity for many people in cities across the globe. This search burns about one million barrels of the world's oil at a daily rate. As the global population continues to urbanize, without a well-planned, convenience-driven retreat from the car these problems will worsen .With increase in the vehicle size in the luxurious segment, confined parking spaces in urban cities.

Smart Parking systems gets information about available parking spaces in a particular parking space and process is real-time to place vehicles at available positions .It involves using low-cost sensors, real-time data collection, and automated payment systems that allow people to reserve parking in advance or very accurately predict where they will likely find a spot. When deployed as a system, smart parking thus reduces car emissions in urban cities by reducing the need for people to needlessly searching for parking.

The system works collectively in a strategical manner, follows When a vehicle enters the parking entrance it passes through a ticket dispenser at one side of the entrance convenient to that of the parking space. The ticket is generated with a QR Code on it that has already information of the parking spot in it , while the vehicle passes by the camera scans the vehicle license plate for further emergency enquiry need (if necessary).the license plate scanning is done by the help of Optical Character Recognition(OCR) software, and at the back end the data gets stored into a database with a cloud backup pre-embedded in the examination system. A pre-installed sensor at the parking slot gives the information of the availability of the parking spot, and stores the information to the database at the back-end, which subsequently results for the usage of the slot by any other vehicle. The vehicle that occupied the slot is monitored and at the time for the vehicle to leave ,at the exit gate there is a mechanical smart device that reads the QR Code of the ticket generated at the time of the entrance of the vehicle and displays the parking fare that is to be paid by the owner of the vehicle . The smart machine consists of a pre-installed cash vending and collecting mechanism as well as a Card payment system which is to be used for the payment of the parking fare. After displaying the fare by scanning the Qr code the owner of the vehicle inserts the cash into the cash collecting mechanism, and if there is any necessary change that is to be received by the owner's end(i.e., if the vehicle owner gave an amount excess to the displayed fare) then the vending mechanism provides him/her the necessary amount required. Where all this information is loaded into a cloud database, and the emptied slot is assigned to another vehicle if enters next.

According to a report, Smart Parking could result in 2,20,000 gallons of fuels saving till 2030 and approx. 3,00,000 gallons of fuels saved by 2050 , if implemented successfully.

2. SYSTEM ARCHITECTURE

(a) OCR READER:

As a matter of first importance an OCR (Optical character recognition) is picked as that it converts electronic conversion of images of typed, handwritten or printed text into machine-encoded text . Here the OCR reads/recognizes the text on the

vehicle registration plate and the task of binarization is performed as a simple way of separating the text(or any other desired image component) from the background and involves matrix matching in which the image is compared to a stored glyph on a pixel-by-pixel basis by image correlation and pattern matching .This relies on the input glyph being correctly isolated from the rest of the image, and on the stored glyph being in a similar font and at the same scale. The recognized text is received by the database to store in it and is printed on the ticket generated at the entry gate.

(b) PROXIMITY SENSOR:

A proximity sensor that has been utilized in sensing the presence of the vehicle emits a beam of electromagnetic radiation and looks for the return signal. It uses Inductive sensor operating principles for non-contact detection of metallic object of a vehicle. The principle is based on a coil and an oscillator that creates an electro-magnet field in the close surroundings of the vehicle. This detects the presence of the vehicle in the allotted slot.

(c) QR code generator:

QR (Quick Response) code is a type of trademark for a matrix barcode and is generated at the entry gate. It is a unique code allotted for a particular slot in the parking system and assigned to a person. It uses majorly four encoding techniques (numeric , alphanumeric, byte/binary, kanji) to store data efficiently according to its datatype.

Features:

- High capacity encoding of data

- Readable from any direction from 360 degrees

- Structured appending feature

- Error correction

- Can store more information than a conventional barcode

- QR is a 2-dimensional code(vertical and horizontal)

(d) QR CODE SCANNER:

QR code scanner is the foundation in scanning the QR code generated at the entry gate which has the information about the vehicle, parking slot allotted to it and the period of time it has been allotted for.

3. EXISTING SYSTEM

Sensors are not majorly used at the entrance to detect the type of vehicle and automatically generate the ticket. At the end the money is collected and managed manually. No automated system to navigate to the empty parking spots in many busy commercial places.

4. PROPOSED SYSTEM

Automatic ticket generation system is installed at the entrance when a vehicle comes in which gives a ticket which has details including time of entry, type of vehicle, vehicle number, allotted slot along with a QR code with the same details. It optimizes the parking space usage by navigating to the empty spot. At the exit gate the ticket is scanned for the QR code reader and it mentions the amount to be paid and collect it automatically from the user and shows the particular slot as empty for the next user.
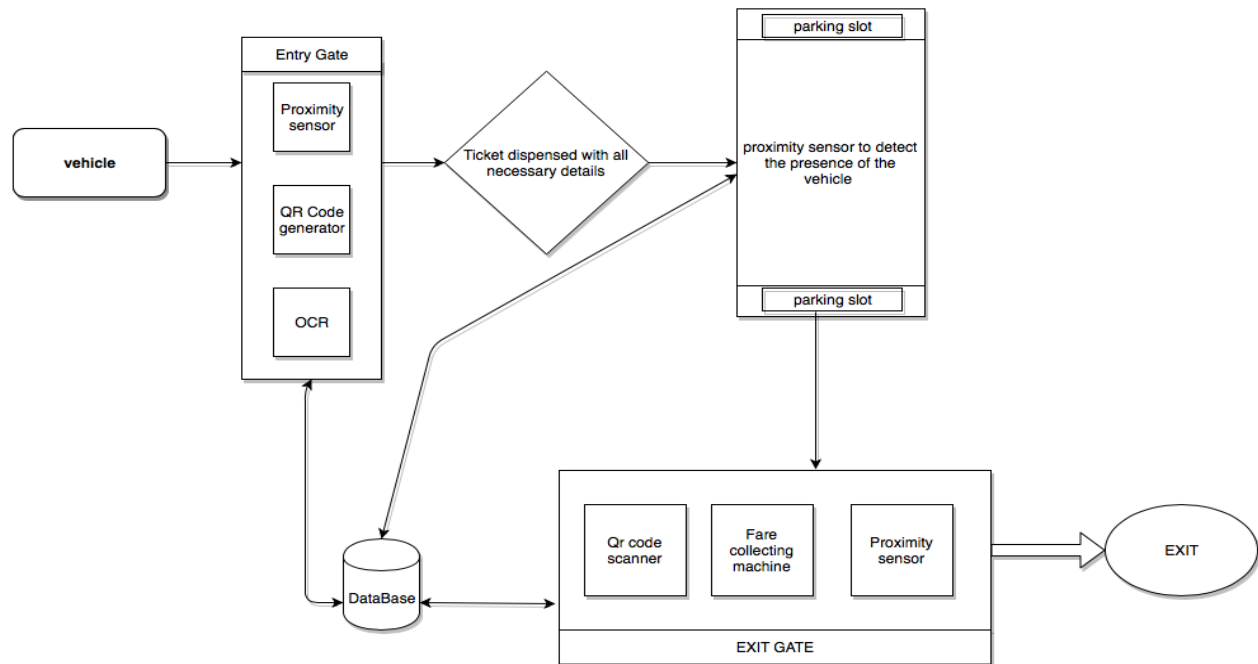

Fig:Work Flow

5. CONCLUSION AND FUTURE WORK

The proposed strategy/system, an idea has been made to implement a QR code based framework for parking efficiency.The portrayed framework uses an encrypted 2-D Quick Response code (QR code), TCRT Arduino, servo motor , TCRT 5000 proximity sensors, LCD display, Resistors of required range. The computation part has been improved of the Arduino, where it includes the components of the mechanism to get included in it. It has been confirmed that the Parking entrance gives an access to the vehicle if there is an availability of space. A program based mechanised barrier of the entrance system installed gives the access to the vehicle to enter the parking space based on the availability. An LCD display has been effectively planned at the parking space for the customers to check the availability. Where it only gets opened if the parking ticket is received at the owner's end, which is further useful for the exit purpose. Where at the exit point the owner gives the amount of parking fare by the scan of QR on the ticket and collects the remaining amount by a cash dispensing mechanism pre-installed in a smart mechanism. Where all this data id to be stored in a cloud database from period to period, including the image of the vehicle's licence number which is scanned at the time of ticket collection by OCR software. On the near chance that this framework is implemented over the existing lattices, the need of man power gets reduced to a greater percentage which makes the system more convenient.

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