Intelligent Multilevel Car Parking System Using RFID

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Abstract — **This paper presents an Intelligent Multilevel Car Parking System Using RFID. RFID is the most advanced technology for data transfer, tracking and monitoring because of its quick data transfer rate and small size, and also along with reed sensors which makes the system efficient. In the presented paper, microcontroller 89s52 and PIC16F877 are used for the car parking system, and both these microcontrollers have been combined in the same system which leads to circuit reduction. In addition to the car parking system we have incorporated a license plate recognition system which works on OCV (open computer vision) technology and online availability of parking slots using B/S (browser and server) architecture.**

Keywords — RFID, Reed Sensor, Open Computer Vision (OCV), Parking-lot

I. INTRODUCTION

RFID technology is the most advanced way of tracking information. It is 12-20 times faster than a normal conventional systems and it does not require line of sight to transfer data and its systems can uniquely identify the object to which the tag is attached and can read 1000s of such objects at a time.

The intention of using RFID technology for this research purpose has been empowered in the accompanying routes: by the utilization of RFID innovation, physically accomplished work load will be diminished significantly [1]. RFID innovation is all inclusive, valuable and proficient [2]. RFID innovation expands organization productivity and gives preferences on both organization and customer savvy [3]. RFID innovation is substantially more secure contrasted with different systems [4].
RFID marks assume an essential part as a stock following innovation [5]. RFID innovation is a mechanized vehicle ID framework that is helpful and obliges no staff. Vehicles are recognized and parking area charges are gathered naturally through this framework [7]. The framework affects parking cars, each of these which have the main RFID card, so as to stop in right spaces of parking areas, and deals with data of parking cars there. In view of this, it can likewise help client's inquiry the data put away in database effectively through the web [6]. By means of RFID innovation, a few arrangements are accommodated the issues experienced in parking area administration frameworks up to the present day and few essential results have been collected.

The main contribution of this paper is to design an intelligent multilevel car parking system using RFID. This technology is implemented on some real time application.

Some of the external components or major parts of RFID technology are RFID readers, RFID labels, a boom barrier at the gates and the internal components Microcontrollers 89s52, PIC16f877, L293d, PCF 8563, 7805, LCD, reed sensors. The presented work is more efficient as compared to the existing parking systems [8, 9]. A similar concept on motorcycle parking lot management system based on RFID has been proposed by Horng-Lin Shieh et al [10]. Further the proposed model may be implemented on FPGA as done in [11,12].

This research paper comprised of five sections including Introduction. Section II describes the proposed model and analysis. In Section III the workflow of the proposed model is explained and in Section IV results were discussed in detail. Conclusion of the paper is described in Section V.

II. PROPOSED MODEL

The AT89s52 is low-powered and high-performance CMOS 8-bit microcomputer that consists of PEROM of 4K bytes. It is system reprogrammable or by a conventional system consisting of non-volatile memory programmer. When a car enters the parking system, a RFID sensor senses the RFID card, and enters the timing and opens the boom barrier for the car. For this, an EM 18 UID sensor is used. The EM 18 UID sensor senses the car (the card which the car driver is given) to automatically opens the door and shut down immediately as the car enters the parking place. The entrance Door will open only when an empty space is available in the parking and if there is no space in the parking then the LCD will display a message reading 'NO SPACE'. Total number of parking space occupied is shown by the different LED at the

entrance and one 2 by 16 LCD to display the different message every time.

Magnetic sensors are used for 8 different positions of the parking vehicle and two slow speed motor for opening and closing the door. A step down transformer is used to step down voltage from 220 volt A.C to 9 volt A.C. Output of the step down transformer is further connected to the rectifier circuit. Rectifier circuit converts the Alternating Current voltage into Direct Current voltage. Two diodes are used for rectifying process. Output of this rectifier is further connected to the filter capacitor circuit. Capacitor changes the pulsating DC into smooth DC. The rectifier's output is connected to the 7805 regulator circuit.

Regulator provides a 5 volt regulated output to the circuit. Pin no. 40 and 20 of the controller are connected to the positive supply and the ground pin respectively. Pin no 9 is reset pin and connected to external capacitor and resistance to provide a power on reset logic. Pin no 18 and 19 which is connected to an external crystal oscillator provides a clock pulse to the controller circuit. Input EM 18 UID sensor is connected to the p3.0 to the micro-controller. As soon as a RFID card is Sensed, EM 18 UID provides a signal to the micro-controller circuit.

At this time micro-controller circuit checks the availability of the parking space and if the space is available then the micro-controller shows a message on the LCD.
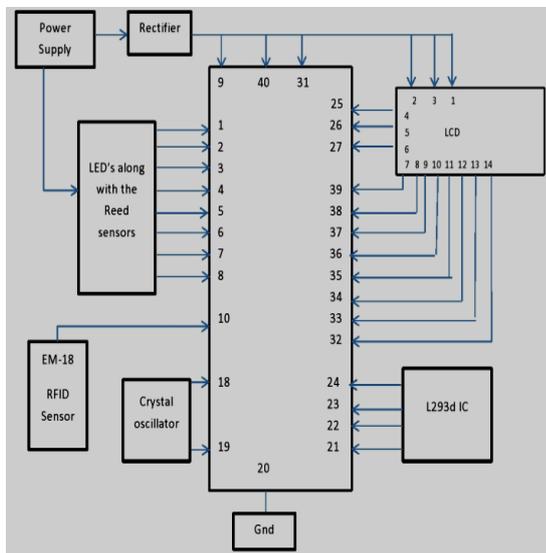

Fig. 1 Circuit diagram of the multilevel car parking system

The PIC16F877A is used as a microcontroller in license plate recognition system. System provides a high level of security in reservation of cars. The reservation is done by sending the license plate number of vehicle and, to the parking entrance through SMS. The data is obtained

using a GSM module which is placed in the parking system and the image process is explained using OCV technology. It is used to designed and enhance the computational efficiency. Fig. 2 shows the passing of the information within the OCV technology [8].
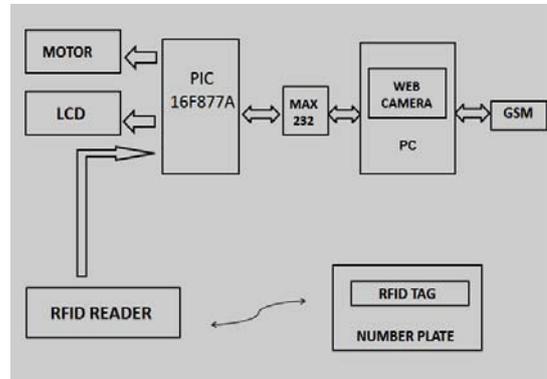

Fig. 2 Block Diagram of the OCV technology

Open Compute Vision provides a simple and convenient computer vision infrastructure which helps people to build vision applications. Pre-process conversion to gray scale and binary are two important pre-processing steps which involves two processes; Resize and gray scale conversion. If the segmentation fails, a character can be improperly divided into two pieces, or two characters can be improperly merged together. Fundamentally the procedure of partitioning a digital image into numerous segments is called as segmentation.

The main equipment of the control framework of the system at the entrance consists of: controlling computer, antennas, card readers, programmed card giving machine, and automated railing component.

It acts as follow: as the RFID tag comes in the scope of EM wave discharged by the antennas, the card reader reads the data stored in the tag, which contains a unique electronic serial number. At that point of the parking spot, in which the same
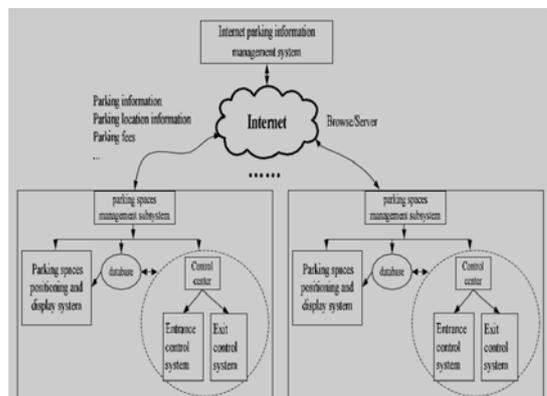

Fig. 3 Block diagram of internet information parking system

serial number is given with the tag in the computer; it will be dispersed at the entry of car, and implementing the administration of "one car, one card, and one parking spot".

B/S (browser and server) structure is utilized to make a web parking information data management stage, which is used to help clients to get data of the parking spots in parking areas all over through web.

The structure outline of web stopping data administration framework (Fig.3) stage to show on the sites continuously, which incorporates parking spots, parking area, parking expenses, and so forth[7].

Clients simply skim the website pages before going to take in the parking spots accessible of all the parking areas, which gives accommodation to clients to build up their own particular travel plans.

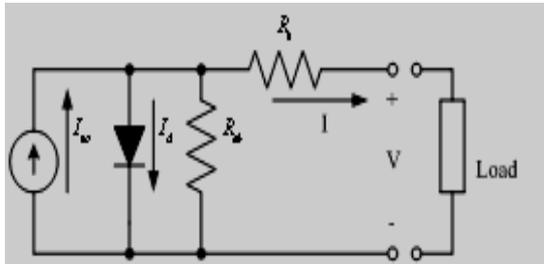In Fig 4, a comparable circuit for a PV module is indicated [9].

Fig. 4 Equivalent circuit of a PV module

The corresponding circuit current I shown in Fig. 4 can be considered as the short circuit current I_{sc} that subtracts the leaking current of the correspondent diode and paralleling resistance. The relation can be expressed as Equation. (1) [9].

$$I = I_{sc} - I_o \left\{ exp \left[\left(\frac{q(V - R_s I)}{nK T_k} \right) \right] - 1 \right\} - \frac{V - R_s I}{R_{sh}} \qquad (1)$$

The output characteristics of the PV module rendering to insolation and temperature changes are shown in Equation. (2) and Equation. (3) [9].

$$\Delta I = \alpha_{sc} - t \frac{G}{G_{st}} (T_{st} - T) + \left(\frac{G}{G_{st}} - 1 \right) I_{sc-st} \qquad (2)$$

$$\Delta V = -\beta_{OC-T} (T_{st} - T) - R_s \Delta I \qquad (3)$$

Where
I : the output current,
q : the carrier charge of (1.6*10-19C),
V : the output voltage,
Rs : the series resistance,
Rsh : the parallel resistance,
Isc : the short circuit current,
Io : reverse saturation current of the equivalent diode,

Tk : the absolute temperature,
n : dielectric constant,
K : boltzman's constant i.e. (1.38*10- 23Wsec0K-1),
GST: the standard insolation,
TST: standard temperature,
G : environmental insolation,
T: environmental temperature,
αsc-T :the short circuit current temperature coefficient and
βsc-T : the open circuit voltage temperature coefficient.
The prototype model is shown in Fig 5.

Fig.5 Prototype of the system

III. WORKFLOW

The work flow of the system is shown in fig 6.

• A RFID card will be given to every vehicle that needs to be parked.
• A prepaid accounting can be connected to the vehicle RFID tag.
• The tag contains the data about the vehicle, similar to shading, permit information, model, year and parking spot.
• The RFID reader permits the vehicle for the entry, and then notes the entry time, and transmits information back to the server in the control location& compares it with the database, and then the door is activated and the car enters.
• When the vehicle leaves the premises, RFID reader logs the way out time, and discharges the door and transmits the way out information back to the server or the control location.

•The Customer's account is then charged for the time spent in the parking garage or charges the parking services against a credit/debit card.

•RFID readers present at the In & Out doors read the tag and can likewise trigger CCTVs at whatever point a vehicle enters the range & can be seen from the control room.

To legitimately use the parking area & to track the no of vehicles present in the parking area, the quantity of vehicles in the parking area is increased by one for each vehicle entering the area and is decreased by one for each vehicle leaving the lot.
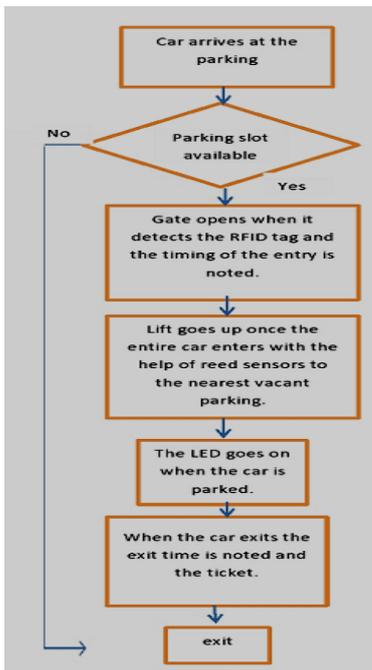

Fig. 6 Flowchart of the proposed system

IV. RESULTS

The proposed model delivers an automatic parking management system eliminating manual labor and time consumption. In the proposed model the magnetic sensors are replaced by more efficient reed sensor. The fig 7 displays the steps in programming a RFID card. The multilevel parking system can manage any number of cars, along with secured license plate recognition and online booking status along with a clean and green technology of solar power to run the tube lights and lifts. The cards can be programmed to store in and out data of the car along with other vehicle related information which creates a database and time is saved. In the presented model the hardware circuitry is reduced as compared to the present day parking system [8, 9]. This research can be implemented commercially which can be proved very efficient and time saving.
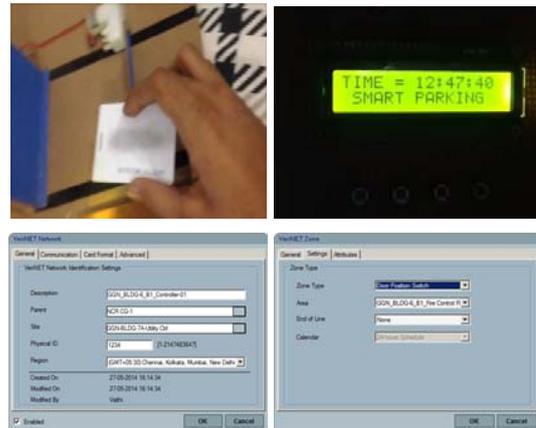

Fig. 7 Programming steps of RFID

V. CONCLUSION

This paper presents an Intelligent Multilevel Car Parking System Using RFID and Reed sensor. In the proposed model, microcontroller 89s52 and PIC16F877 are used for the car parking system, which leads to hardware reductions compared to the earlier published car parking systems [8,9]. The addition to the car parking system we have incorporated a license plate recognition system which works on OCV technology and online availability of parking slots using B/S architecture. The proposed model has been designed keeping commercial usage in mind and represents a very accurate and user friendly representation of a multilevel parking system.

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