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Improved Car Parking with space modeling

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ABSTRACT : *Day by Day the number of vehicles are increasing on the road. There has been drastic increase in sale of four wheelers and two wheelers since last five years and still the sale of the four wheelers are increasing every year. The increase in number of four wheelers has created many problems and one such major problem is parking space of these vehicles. Due to increase in large numbers of these vehicles, parking has become an headache for users of these vehicles. Many large buildings such as residential complex, malls, shopping market, government offices provides parking to the people coming to these buildings. Moreover the cars comes in different sizes some are big in size and some are smaller in size. If a small car comes to the parking area the space occupied by this car will be small. But since the space occupied by it will be small, the rest of the space near it will be wasted . Moreover the people coming to parking area to park the car face difficulties in finding the space to park the vehicles. So by means of this paper, a concept for space modeling has been brought into the picture. According to the size of the car coming for parking the space will be adjusted so that the wastage of extra space will be avoided. A system is developed for simulation in matlab which will guide the people by providing them with the information where the parking space is available by the means of displaying devices. In this way the concept of improved car parking can also be achieved.*

Keywords: *space modeling, matlab*

I. INTRODUCTION

It has been observed in past five years that the sale of the cars have increased drastically. The car ownership in the world has increased drastically and it is still increasing. In the past decade the ownership of the car was only limited to the rich people. But this has changed in past five years. Now a days the ownership of the cars is not only restricted to the rich people but has also extended to upper middle class people. The people in metro-cities and other cities prefers to use cars as compared to two wheelers. This has created a huge traffic of cars. The increase in number of cars on the road has created a lot of problems. One such problem is parking problem. The number of cars are increasing day by day but the major problem is the limited space available for parking. More the number of cars and less space for parking results in congestion. Now a days large buildings such as malls, offices, supermarkets, theaters etc provides parking space to the people coming to the buildings. Generally the parking spaces are flooded with the large number of cars as the number of cars has increased a lot creating the problem of parking. Generally the major portion of the parking spaces are filled. This creates the frustration on driver to search for the available space for parking. Secondly, the cars comes in variety of sizes some cars are bigger in size and some cars are smaller in size. This results in wastage of the extra unoccupied space by the cars parked in that areas. This creates the problem of congestion and wastage of space. The driver gets frustrated in searching for the available space for parking. Taking all these problems into account , a concept of improved car parking and space modeling has been brought forward. Since the different cars have different sizes, the provision has been made in parking systems which avoids the wastage of the space. The number of slots have been created in parking areas. Once the car is parked in the parking area, the slot is adjusted according to the size of the car so if the small car is parked the slot is adjusted according to its size and the extra space adjacent to it is available for another car. By this the wastage of extra space has been eliminated. This system also assists the driver for finding available space for parking the vehicles by the means of display devices. This eliminates the frustration on drivers to find available space for parking and it also reduces the time of drivers to park the vehicles. This system also reduces the wastage of extra fuel in search of the parking space.

II. LITERATURE REVIEW

Mingkai Chen, Tianhai Chang "A Parking Guidance and Information System based on Wireless Sensor Network" June 2011 IEEE International Conference on Information and Automation Shenzhen, China. The node detects the status of parking space. It also receives commands from information and management center to carry out some procedures. three kinds of nodes, which are monitoring nodes, routing nodes and sink node[1]. Those nodes communicate with wireless channel, and self-organize into an ad-hoc network. The monitoring nodes would detect the status of every parking space, and transmit the information through routing nodes hop by

hop to the sink node. The sink node connects to the information and management center through RS-232 interface. After processing the data, the information and management center will send the message to all the nodes and update the information in LED screen at the entrance of the parking lot[2].

Mingkai Chen, Chao Hu, Tianhai Chang, "The Research on Optimal Parking Space Choice Model in Parking Lots" 2011 IEEE, decision parking model is proposed to help PGIS in the parking lots choose the optimal parking space for drivers , this issue is based on fuzzy multiple attributes decision making. develop a non-standard wireless communication protocol based on Nordic's nRF24L01, which involve physical layer and MAC layer mainly[3][4].

Xiaolong Li Uma Kanth Ranga, " Design and Implementation of a Digital Parking Lot Management System" Technology Interface Journal 2009, A digital vehicle management system using radio frequency identification (RFID) technology[5][9]. This digital vehicle management system will enhance the utilization of parking space and help user check the availability of the parking space remotely since the system is connected to the Internet.

Jatuporn Chinrungrueng, Udomporn Sunantachaikul, Satien Triamlumlerd "Smart Parking: an Application of optical Wireless Sensor Network" 2007 IEEE, The network consist of a server node and a number of sensor nodes. The server node served as the central point for collecting traffic data from all sensor nodes installed at various monitored points. The sensor node was equipped with an optical sensor to detect passing vehicles. The use of optical sensor yielded very accurate count as well as position of vehicles[10][11]. The design of MAC protocol allowed an efficient-power mode of operation. Vanessa W.S. Tang, Yuan Zheng, Jiannong Cao "An Intelligent Car Park Management System based on Wireless Sensor Networks" 2006 1st International Symposium on Pervasive Computing and Applications, WSN-based intelligent car parking system. This system is used low-cost wireless sensors are deployed into a car park field, with each parking lot equipped with one sensor node, which detects and monitors the occupation of the parking lot. The status of the parking field detected by sensor nodes is reported periodically to a database via the deployed wireless sensor network and its gateway[7][8]. The database can be accessed by the upper layer management system to perform various management functions, such as finding vacant parking lots, auto-toll, security management, and statistic report. We have implemented a prototype of the system using crossbow motes. The system evaluation demonstrates the effectiveness of our design and implementation of the car parking system[9][12].

III. HARDWARE IMPLEMENTATION

Hardware Implementation consists of one main controlling unit (MCU) which will check the car entry using Infrared sensors (IR sensors) and monitors the status of the parking areas via Radio Frequency (RF) modules connected to each parking slot areas[9][10]. There is another MCU which will monitor each parking slot and keep sending the status of parking area to main MCU via Radio Frequency (RF) signals. This information sent to the main MCU is used to track the shortest empty area available for parking and can be shown directly on the PC via RS232 communication. As soon as the car entry is detected the system gets activated and it finds out the empty area available for car parking. At the parking slot the system is designed to work on space modelling which will efficiently manage the parking space required by each car[14][15].

The Hardware Implementation consists of seven main parts:-

A Wireless Ultrasonic Sensor:

The Ultrasonics sensor consists of both transmitter and receiver. The Transmitter is installed on the bottom and receiver is installed at the top. The node detects the status of the parking space. The Ultrasonic sensor is wired with the AVR microcontroller. Ultrasonic sensor are smaller, cheaper and smarter.

B Local Microcontroller:

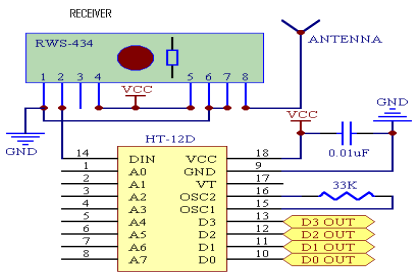

Fig.1: Local Microcontroller

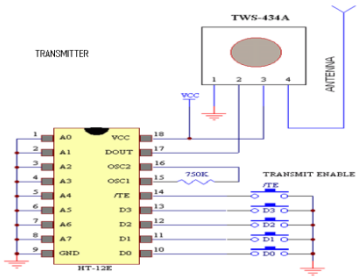

Fig.2: Main Controller

The Local microcontroller receives the data from the ultrasonic sensor node acting as receiver. The Local microcontroller process the data and the result is transmitted to the main controller. On the other hand local microcontroller displays the availability of the parking space on its individual display.

C Main Controller:

The Figure 2 shows below the Main Controller. As shown in the figure many group of transmitters will be connected to central receiving stations. The main controller is generally installed in the monitoring room. The main microcontroller generally collects all the information from the local microcontroller. The information is delivered to the management system.

D Display System:

At the entrance of the parking area large LED screens are displayed. The LED screens displays the available parking space to the drivers. These LED displays also shows the optimal path for available parking space. Thus these LED displays helps the drivers to find the optimal parking space with less time.

IV. METHODOLOGY

The methodology is as follows:-

A Management System:

The management system is responsible for managing and maintaining of the whole system. It processes the data from the UWSN for optimal parking space. Management system is also responsible for calculating the parking fees and also controls the LED screens and locking systems. Management system also detects the status in short time.

B RFID Tag:

The main use of RFID tag is to lock when parking and unlock when receive. The wireless system transfers the data from tag attached to an object for the purpose of automatic identification. Some tags requires no battery and and are powered by the electromagnetic fields used to read them. The tag contains electronically stored information which can be read from up to several meter away.

C Euclidean Distance:

Suppose there are two nodes N1 and N2 are available, Let the nodes be placed at N1(x1,y1) and N2(x2,y2) then, the Euclidean Distance between N1 and N2 is given by D(N1,N2) = Square root of (square(x1-x2) + square(y1-y2)). This would be used by our technique to find the minimum possible distance between two nodes so that we can place the vehicles more efficiently and in lesser amount of time. This would also save petrol of the vehicles (marginally but that would be one of the advantages).

V. OUTPUT SCREENSHOTS

Figure 3 below shows the output results obtained by simulating the above concept in matlab. The big square blocks indicate the slots and small square blocks indicates sensors.

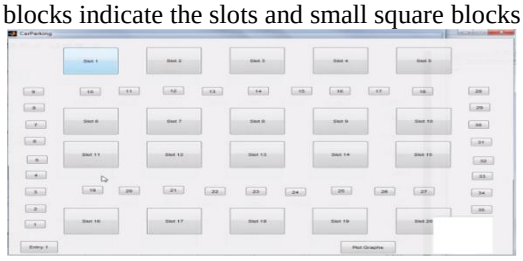

Fig.3: Output Screenshot 1

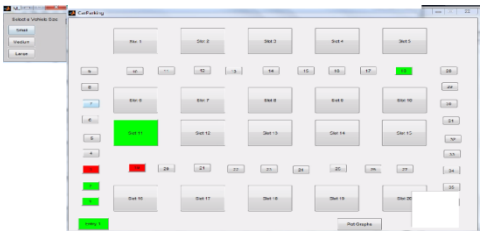

Fig.4: Output Screenshot 2

Figure 4 and Figure 5 below shows the output screenshot 2 and 3. As shown in the figure once the car is entered from entry 1, it passes through various sensors. Once car comes across sensor near the parking slot, the system asks for the size of the car if the size of the car is small, the size of the slot is automatically reduced so that the wastage of extra space is avoided as shown in the Figure 5. If the size of the car is small , the slot size is automatically reduced which can be seen in Figure 5 slot number 11.

Fig.5 : Output Screenshot 3

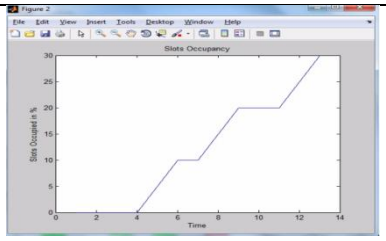

Fig.6: Output graph for

VI. SLOTS OCCUPANCY

If the size of the car is big, the size of the slot is automatically increased which can be seen in Figure 5 slot number 6,16 and 17. If the size of the car is medium, the sot size is adjusted automatically according to the size of the car as shown in above figure slot number 12. Similarly for small size cars, the size of slot is automatically reduced as seen in the above figure slot number 1 and 11. The graphical results are shown in Figure 6 and Figure 7. Figure 6 shows the graph for slots occupancy and Figure 7 shows the Output graph for sensors occupancy.

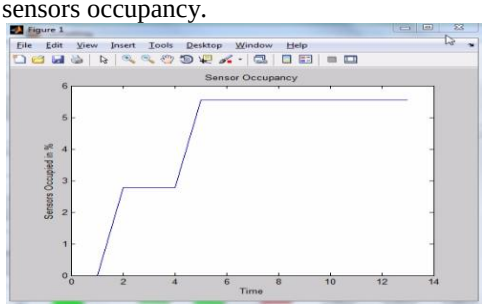

Fig.7: Output graph for Sensor Occupancy

VII. CONCLUSION

The overall result obtained from the concept is that we have achieved the space modeling. The more parking space have been saved by this concept. The wastage of extra space due to different sizes of the car occupying the parking space have been eliminated. Secondly the drivers of the cars can easily find available parking space to park their vehicles by the means of display devices and also the optimal path to available parking space is also shown to the driver.

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