

Automatic Car Parking with Empty Slot Detection

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Abstract: To easily find an unoccupied parking space in the larger car park is a problem for many drivers. During the last four-decade, there are many parking models are developed. But, the models still cannot solve the parking problem. The Car parking indicator system could be used for residential buildings, hotels, offices, shopping center and show rooms, universities, government buildings, airports, hospitals, and stadium. The advantages of the car parking indicator system are efficient usage of spaces, slots, proper directioning, automatically allotment of slots, and display of empty and filled parking slots. As soon as car enters, driver gets information of the filled slots and empty slots on big display board. As the driver moves further, he will get a message of allotted parking slot and navigation for that slot on small display board situated in the inner lane. When all slots are full, No slots available message displays on the display board.

Index Terms – Car parking, empty slot, PIC, IR sensor.

I. INTRODUCTION

The automatic car parking system could be used for residential buildings, hotels, offices, shopping center and show rooms, universities, government buildings, airports, hospitals, and stadium. The advantages of automated car parking are efficient usage of spaces; decreasing the land space and increasing the number of parked vehicles, saving time by taking and delivering car in a few seconds; providing security and safety for the car from theft and damages while parking. As multinational cities is suffering from the lack of available parking spots and expensive land prices, especially in vital areas, we were inspired to create an automated car parking system that can counter such a daily basis problem to make life easier. The main objective of this report is to build a prototype of the automated car parking system to park and retrieve cars automatically in an easy and sufficient way. To easily find an unoccupied parking space in the large car park is a problem for drivers. It is because the car on the road increases every year especially in town. On the other hand, it is more difficult to find the parking space during peak time and holidays because this is the time people want to release their stress and to spend time with family. There are not many existing solutions attempting to address the problem. Thus, it is useful to have some technical solutions that can provide information on parking space occupancy. The efficient parking monitoring system must be designed to overcome the problem. During the last four-decade, numerous parking search models have been developed .But, the models still cannot solve the parking problem. In man decision making situations in transportation (modal split, choice of an air carrier, choice of airport, etc.) the competitive alternatives and their characteristics are reasonably well known in advance to the decision maker (passenger, driver). On the other hand, the drivers usually discover different parking alternatives one by one in a temporal sequence. Clearly, this temporal sequence has a very strong influence on the driver final decision about the parking place.

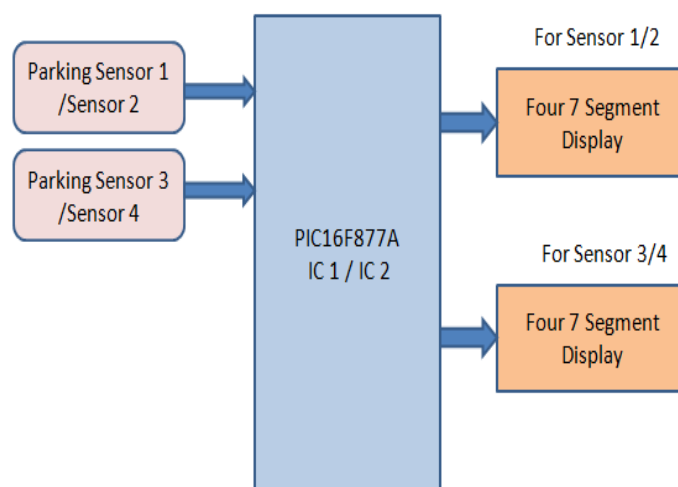


Fig 1. Block Diagram

II. DESIGN

In this section first we are design the transmitter and receiver section. In that section we use IR sensors and photodiode. Transmitter of IR sensor transmit the beam and detect if obstacle present in that slot it will receive by Photodiode and Led will on. For output part we design the parking slot display, in which we use 7 segment common cathode display which indicate 0 when slot is empty and 1 when slot is full and output of controller given to display. Now to count number of vehicle enter and exit we design counterpart. We use separate counter for IN and OUT.

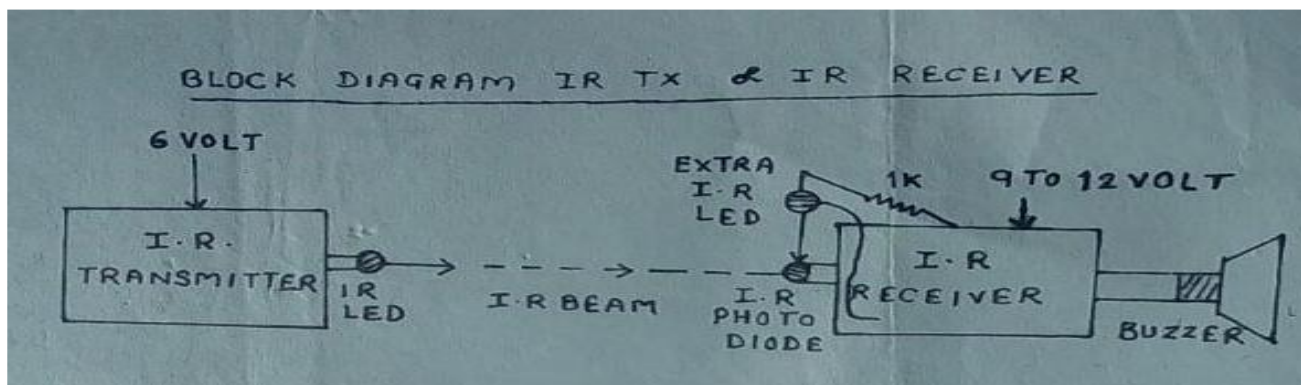


Fig 2. Transmitter and Receiver

Our counter will count maximum count up to 99. At the last we design final project PCB. First we draw PCB layout then etch that PCB in Ferric Chloride solution then drill the PCB. Then mount all component and interface all part properly to the PCB. Then we gives 5 volt supply to the circuit and it will gives required output. We also make Counterpart for IN and OUT gate entry. These will work to count how many car is enter in the parking and how many are exit in this way it works. We use counter up to 99.

III. FLOW CHART

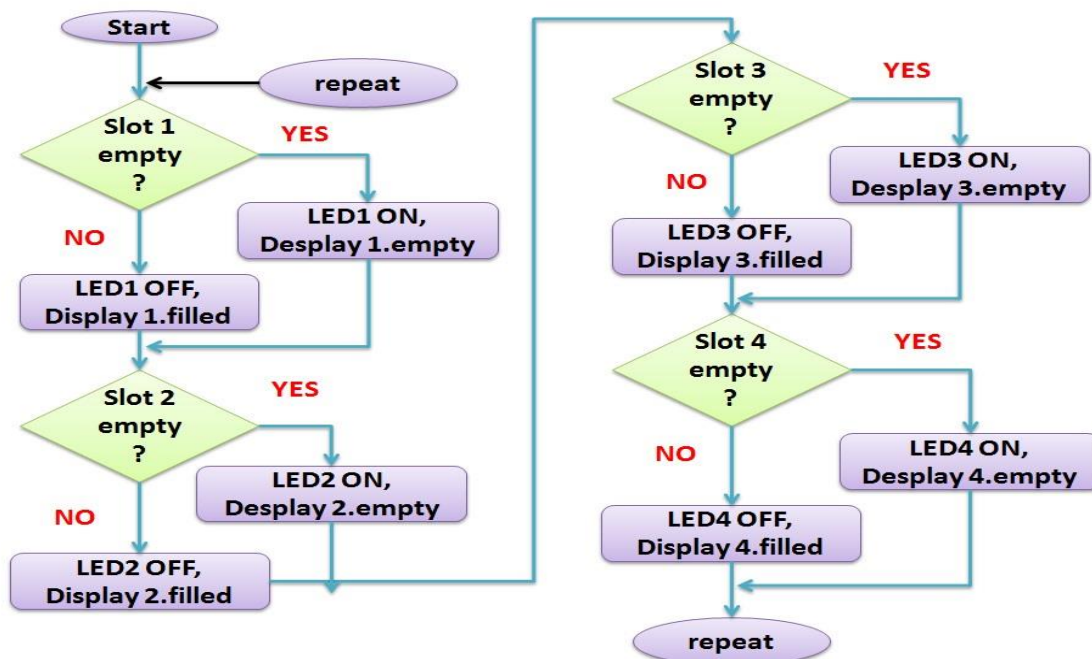


Fig 3 Flow Chart of designed system

In this work, Four Parking sensors (Infrared Sensors) are placed in Parking Zone at different locations to detect the parking status. Due to Port Pins number Limitation, Two PIC controllers are used where two Sensors are connected to PIC Controller. PIC 16F877A is selected as Controller. Parking status is displayed on four 7 Segment display for each Sensor. PIC Controller continuously checks the Sensors output, when Output is High, PIC Controller display FULL Text on four 7.Segment Display otherwise it will display SLOT text.

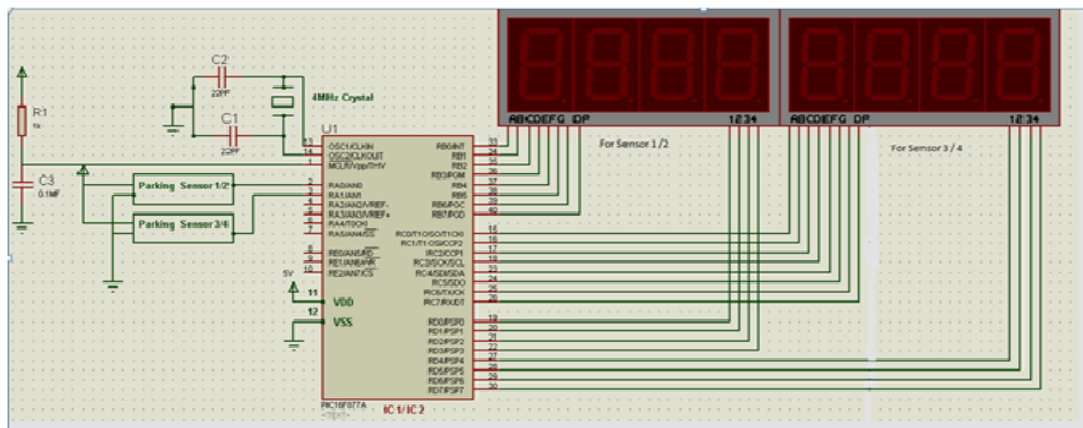


Fig 4 Circuit Diagram

3.1 Transmitter Circuit

This sensor works like a Radar and Sonar. This sensor continuously transmitting and receiving waves. When one of the cars enters and goes through these sensor it shows the information of empty slots, direction to that slot, and blocks the slots.

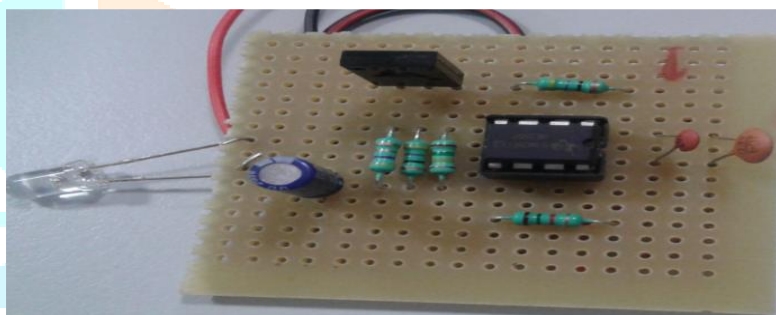


Fig 5 Transmitter

3.2 Receiver section

The original design required the use of sensors mounted in road. This system is usable for the parking slot seeker to know the exact empty parking slot. The sensor operation principle and parking lane in the project. Sensors are mounted in the road and show the empty parking slot and allotted parking slot to the car parker.



Fig 6 Receiver

IV. COMPONENT OF THE SYSTEM

4.1 Infrared detectors

Various types of detectors are used in IR sensors. Important specifications of detectors are photo sensitivity or Responsivity is the Output Voltage/Current per watt of incident energy. Higher the better. Noise Equivalent Power (NEP) NEP represents detection ability of a detector and is the amount of incident light equal to intrinsic noise level of a detection. In addition, wavelength region or temperature to be measured, response time, cooling mechanism, active area, no of elements, package, linearity, stability, temperature characteristics, etc. are important parameters which need attention while selecting IR detectors. Signal processing since detector outputs are typically very small with associated circuitry are used to further process the received signals.

4.2. PIC16F877A Microcontroller

PIC stands for Peripheral Interface Controller. PIC microcontroller is based on Harvard architecture. At present PIC microcontrollers are widely used for industrial purpose due to its high performance ability at low power consumption. It is also very famous among hobbyists due to moderate cost and easy availability of its supporting software and hardware tools like compilers, simulators, debuggers etc. The PIC microcontroller PIC16f877A is one of the most microcontrollers in the industry. This controller is very convenient to use, the coding or programming of this controller is also easier. One of the main advantages is that it can be write erase as many times as possible because it use FLASH memory technology. It has a total number of 40 pins and there are 33 pins for input and output. PIC16F877A is used in many pic microcontroller projects. PIC16F877A also have many applications in digital electronics circuits.

4.3 Counter

This is two digit counter unit which can provide the basic for many application where counter is required. Connection are provide to connect together two or more counter to make 6 to 9 digit unit. The display is single unit LED multiplex display. The kit is constructed on the single sided PCB. Protect at a tracks and schematic where use to design the board. In general, two or more digit counter can be made a no. of ways the circuit use here compromise between these two approaches. The circuit in the kit describe two IC. The output are fed into the 14511 CMOS 7 segment decoder driver then go to 2 digit multiplex display unit. Each digit is turn on at correct time when car is enter at the gate and also it count when car is exit at parking slot.

V. RESULT

1. When Car is enter and parking slot is empty



Number of Slots	Empty	Full
1	0	-
2	0	-
3	0	-
4	0	-

2. When car is enter and parking slot is Full



Number of Slots	Empty	Full
1	-	1
2	-	1
3	-	1
4	-	1

VI. CONCLUSION

In this paper, the implementation of an Automated Car Parking system commanded by Android Application is successfully discussed. The components used for the implementation of the system provide efficient output at various stages of implementation. The interfaces established between various components provide an effective communication across the overall working of the system. Thus, the system functioning is efficient and is recommended for commercial implementation. In future, certain changes can be incorporated as per the requirements of the organizations implementing the system. They are:-

- Search of free parking slots can be improved using Binary or Hash Search.
- System can be extended to multi-level and multiple parking areas by making potential changes in the hardware setup.

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