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Piezoelectric based Smart Parking System

Aman Saxena[1], Naincy Kasaudhan[2], Shashank Verma[3], Mr. Rakesh Kumar[4]
[1, 2, 3]*Student,* [4]*Assistant Professor, Electronic and Communication Engineering, Raj Kumar Goel Institute of Technology, Ghaziabad, India*

Abstract: ***In today's technological world the concept of smart city has become an area of interest. Concern to parking became impending in an urban area. The parking space problem can be turn into a new opportunity brought by the recent trends to meet the world's connected continuum. This paper describes the Piezoelectric based Smart Car Parking System. This paper makes easy for the user to find automatically a free space at the low cost and without consuming time and fuel.***

I. INTRODUCTION

The present system of parking activity reads frustration to the user. All the vehicles have to be parked in some space when the drivers leave them. Due to unorganized parking lots, people face problems in finding a parking space and remembering it. Time is spent in obtaining parking pass while entering the lot and roaming around the lots to see any free space is available. Sometime, the driver may not notice the vacant space or would be wandering without knowing the parking lot is full unless the driver reconnects the exact parking space, he/she cannot pinpoint the vehicles in huge lots while collecting it back. These consume precious time and let to frustration, fuel wastage, environmental pollution and traffic congestion. To overcome all these problems these kinds of smart parking system are essential in major cities. [1] The primary goal of piezoelectric based smart parking system is to harness the power by using piezoelectric element. Piezoelectric element has the ability to generate electricity by converting mechanical force to electrical energy. System uses various sensors and controllers that handles the system automatically. [3]

This paper describes Piezoelectric Based Smart Parking System which uses, LDR sensor, IR sensor and L293D Motor Driver IC which is used for the automating the parking system. This system consists of LDR sensor which manages the light activity by switching on or off as according to the need in the parking lot System have automatic entry exit gates which is managed by RFID System for money deduction. The power generated by the piezoelectric and rooftop solar panel is used for powering up the whole system and helps in conserving the power grid electricity. The primary goal of this task is to produce power from piezo electric component when vehicle enters the parking garage. For instance, the vehicle enters the parking garage the piezo electric component will deliver power consequently the leaving opening will keep on indicating the green for vacant space and red for consumed space.

II. COMPONNTS REQUIRED

1) *Battery:* It is used to store the excess power generated by the piezoelectric and rooftop solar panel that can be used in the absence of power generation.
2) *LDR Sensor:* LDR Sensor is a light dependent resistor, it reduces the resistance in dark and increases the resistance in light.



Fig.1 LDR sensor

3) *Voltage Regulator IC (7805):* It regulates the voltage of 5 volts as various sensors and IC's work at5volt.
4) *IR Sensor:* IR sensor emits and detects the infrared radiations to sense the obstacles or objects in the surrounding. An infrared sensor is basically an electronic device which is used to detect the presence of objects. Infrared light is emitted by this device. If this device does not detect any IR light reflected back that means there is no object is present. If the light is detected by the sensor there is an object present. [2]



Fig.2 IR sensor

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5) *PIC16F877A:* It is the microcontroller used to control the whole system.



Fig.3 PIC16F877A microcontroller

6) *Printed Circuit Board:* 0 level PCB is to mount the microcontroller, voltage regulator and IC's.
7) *Jumper Wires:* It is used to connect the components to the micro controller.
8) *L293D Motor Driver:* It is used to drive dc motor.

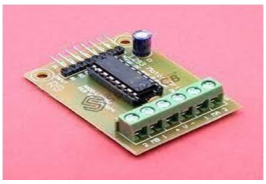


Fig.4 L293D motor driver

9) *Display:* It is used to show the vacant or occupied space in the parking lot.
10) *Solar Cell:* Solar cell is a photovoltaic cell that generates potential difference when exposed to light. It is having the capability to change the light energy into electrical energy.

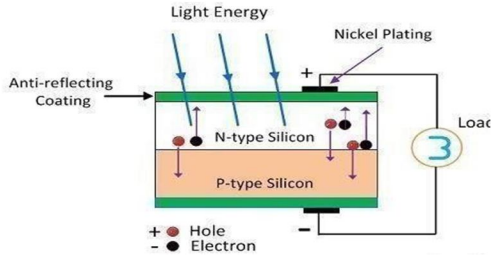


Fig.5 solar cell

III. DESIGN OF THE PARKING SYSTEM

The entry and exit gates are controlled by the dc motors to open and close the gate by detecting the presence of a car Display sections shows the vacant places and parked placed on the display in the parking lot and this data showed on the display is fetched with the help of sensor by detecting the vacant or occupied space.

IV. BLOCK DIAGRAM

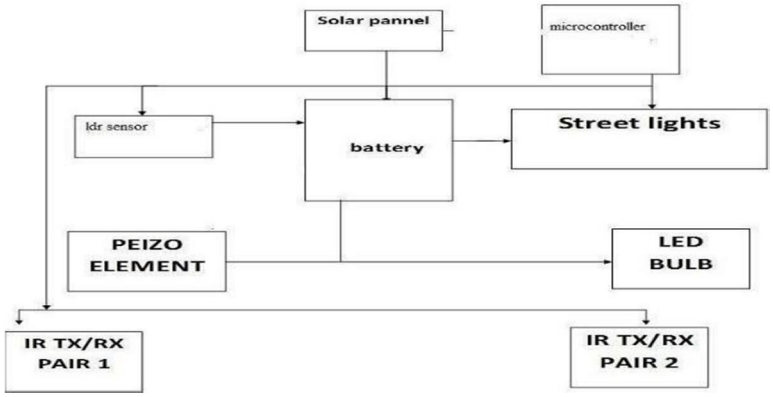


Fig.6 Circuit Diagram of parking system

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V. WORKING OF THE PARKING SYSTEM

When the car arrives at the entry gate of the parking area then infrared sensors detects the presence and opens the gate for entry of a car and this car passes through the entrance which consists of piezoelectric element and the force exerted by the car is directly proportional to the power generated by piezoelectric. Rooftop solar panel also generates the power in the daytime and the summation of power of both types are stored in batteries for further use of the system. Display section used in the parking lot shows the number of vacant places and occupied places in the parking lot with the help of IR sensor values. System also consists of LDR sensor that manages the parking lot lights activity. All the vehicles have to be parked in some space when the drivers leave them. Due to parking lots, people face problem in finding a parking space in lesser time and remembering it. Time is spent in obtaining parking so to overcome the problem parking system is designed.

VI. CONCLUSION

Our proposed framework presents an efficient parking system that manages various vehicles to the closest parking space at some random time dependent on the parking spot accessibility. The client demands the Parking Control Unit to check the status of accessible parking spots. When the client demands, all the accessible free spots are shown to the client. The parking spot is observed consistently in real time and the status of the space is refreshed. Utilizing the information, we can streamline parking and diminish fuel utilization.

VII. FUTURE SCOPE

A. The automated parking expense framework would permit individuals to go without money. Also, it would lessen the waiting time, long lines, strain, stress and increment the effectiveness of the parking framework.

B. The smart parking management framework can be applied for plane and boat and fleet management.

C. For private and household parking framework the device can be interfaced with Home Automation framework which can control the different home machines by detecting whether the client is entering or leaving the parking spot.

VIII. ACKNOWLEDGMENT

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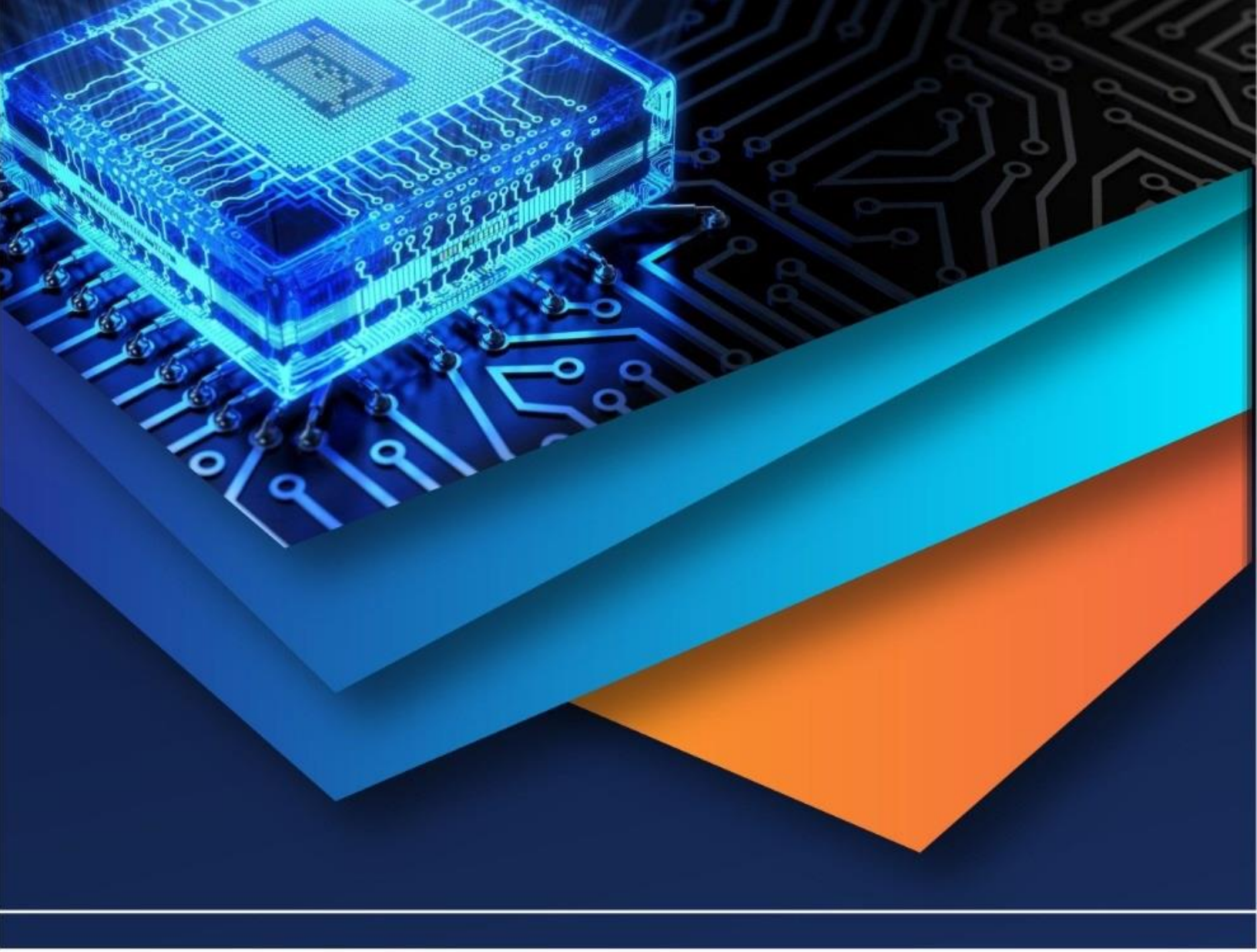
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