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SMART PARKING SYSTEM ARCHITECTURE USING SENSOR DETECTOR

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ABSTRACT:
As we know that due to population explosion, the world population is increasing at an alarming rate and as a result the vehicle production is also increasing and consecutively more and more parking spaces and facilities are required. In this paper concept known as Smart Parking System (SPS) is introduced which would help the people driving the vehicles to know that which parking slot is vacant and which is occupied which ultimately would save time and reduce chaos. The new Smart Parking System uses Infrared (IR) Sensors to detect whether car parking slot is occupied or it is vacant.

KEYWORDS: OP-Amp, IR Sensor, 555timer IC, Solar Panel, Piezoelectric crystal

I. INTRODUCTION

The main objective of this project is to generate electricity from piezoelectric element. When car enters the parking lot and applies pressure on the piezoelectric crystal in the ground, the piezo- electric element will produce the electricity due to the impulse force applied on it, thus the parking lot indicator lamps will continue to show the green signal for vacant space and red for occupied space[1-2]. Similarly when car enters the parking, green lights will glow on and when there will be no car in the parking lot, light will be off using PIR [3]. This project can be enhanced in future and we can add a feature of automatic car parking system. As we all know that cost and time are two important factors of our lives whether for an individual or for a business enterprise. As the standard of living of people is increasing more and more people are moving to cities due to urbanization [6]. Shopping complexes have become an important place of attraction both for the residents of a city and the tourists as well. With the evolution of modern shopping complexes which provide a wide range of services, more and more people are attracted to visit them. Hence more shop owners prefer locates their business in shopping complexes to target more customers and increase revenue [4, 5]. Recently shopping complexes have started providing services much more diverse than just selling and buying. Customers can use banking services, food courts, cinemas; children's play areas and so on. The growth of shopping malls has influenced shopping culture and behavior.

II. PIEZOELECTRIC CRYSTAL

When force is applied on certain type of crystals such as quartz, then electricity starts flowing through them. The reverse process is also true which means that if we pass electricity through such type of crystals then they start vibrating back and forth. Now scientifically we can say that Piezoelectricity (also known as piezoelectric effect) is the appearance of an electric potential across the sides of piezoelectric crystals when it is subjected to mechanical stress. Practically their is a positive charge on one face of the crystal and a negative charge on other face of the crystal and if we connect the two faces to make a circuit then current flows through it. In reverse piezoelectric effect, a crystal becomes mechanically stressed when a voltage is applied across it's opposite faces. In most of the crystals such as metals, the basic repeating unit is symmetrical but it is not so in piezoelectric crystals. Normally piezoelectric crystals are

electrically neutral though the atoms inside them are not symmetrically arranged but their electrical charges are perfectly balanced. Moreover when mechanical stress is applied the structure of the crystal gets deformed and such the balance of the positive and negative charge gets disturbed and as a result net electrical charge appears. The reverse piezoelectric effect takes place in opposite way. If we apply a voltage across the piezoelectric crystal then ultimately we are subjecting the atoms inside it to electrical pressure and as such these atoms have to move to restore their original position which ultimately leads to deformation of the piezoelectric crystal.

III. SMART PARKING SYSTEM DESCRIPTION

In order to find the vacant spaces, drivers look at an LED display board which shows how many and which type of vacant spaces are available at each level at that time. After navigating to the desired parking level, drivers look at internal signs hanging from the ceiling at the end of each aisle. Each internal sign shows two parts: the number of available spaces and the direction (left, right or forward) of the aisle which has a vacant space.

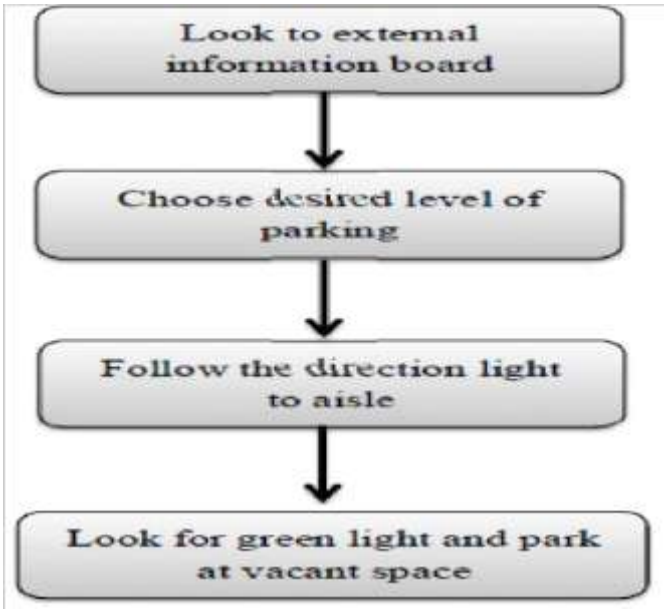

Fig.1. Flowchart description of the work

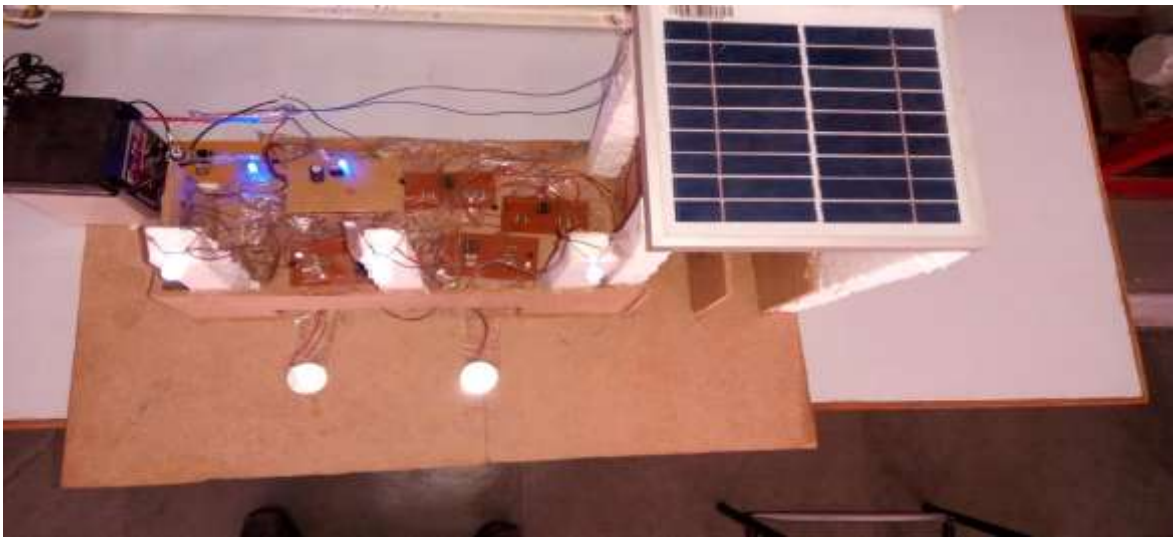

Fig.2. Snapshot of final hardware designed to implement idea

IV. SPS FEATURES

Smart Parking System (SPS) consists of main and secondary features for different purposes and situations. Some of the features mentioned in this paper will be part of future research. The main features of SPS are:

1. Detect occupancy status of each individual space in a multilevel parking lot.
2. Display the number of available spaces at entrance of parking lot, at entrance to each level, and at end of each aisle.
3. Display directional signage for each aisle, showing drivers which direction has vacant spaces.
4. Parking monitoring and management software to coordinate and operate the various features.
5. Display different colored LED lights to differentiate between spaces (reserved, occupied, vacant or handicapped)
6. Touch 'n' Go module to facilitate payment of parking fees.
7. Assign space beside each directional sign for advertising purposes.
8. Line detection system to avoid improper parking.

V. CONCLUSION

The main contribution of this study is to highlight the most significant parking problem — i.e., finding a vacant space in order to park the car— and propose a solution so as to solve this problem. Ultrasonic sensors can be used both for parking space detection and improper parking detection. The proposed architecture for a parking detection system would decrease searching time for vacant spaces and reduce chances of single cars improperly parking across two spaces. Future research might examine car park booking procedures and optimization of sensor usage. Cost effectiveness and marketing could be studied as well.

VI. FUTURE SCOPE

Parking has been considered in India as a good business for a very long time. As we are aware of the fact that India is the third largest market in the world for automobiles and parking is directly connected to automobiles, and the growth of infrastructure."The market for parking is growing at rate of 35% CAGR and so we believe that there is ample scope for private players in this business" says N Sathyanarayan Managing Director, Central Parking Services (CPS) Pvt Ltd

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