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An Intelligent and Smart Parking Spot Detection

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Abstract:
The ultrasonic sensor has high frequency, high sensitivity and high penetrating power therefore it can be used to solve many day to day problems. In this paper, we propose the use of ultrasonic sensors for accurate and reliable detection of vacant spots in a parking lot which will be helpful for the people to park accordingly. Sensors offer an alluring decision for minimal effort and simple to-convey answers for savvy traffic direction frameworks and parking area applications. In the Current parking space, there is no proper vacancy detection system used, it is mostly done manually that is there is a person at the entry and exit points of parking lots. Unfortunately, this type of system fails when the person is not able to guide the people correctly. In this paper we propose a comparatively more efficient way of parking space detection using sensors.

Keywords: *Sensors, Parking Spot, Vehicle, Empty Space.*

1. INTRODUCTION:

No one appreciates revolving around parking garages searching for non-existent void parking spots. A great deal of time and exertion will be spared if data on parking spot accessibility could be gotten to by drivers previously.Sadly, current empty parking spot location (VPSD) frameworks just include computing the ideal time for which the vehicle has been left in the spot.

It would be easier for the drivers if they exactly know where the parking space is available! There are many alternative ways to identify free spaces in a parking lot such as a substitute methodology for empty parking spot identification,we could utilize parking garage surveillance cameras to make a flexible and adaptable framework. The smart parking system is implemented in many environments with various features, which solve their problems faced in their day to day activities, and these systems advantage the rich[4].

One more way to deal with distinguishing empty parking spots is to utilize car include feature detection, to decide the presence of vehicles in a parking garage.

In this paper we present a creative way of detecting the free spaces in a parking lot using ultrasonic sensors and light alongside each parking space which would indicate the vacancy by different colours. For suppose there is no car placed in the parking space, then the sensor detects it and a green light appears indicating that the space is free, making it easier for the drivers!

CHARACTERISTICS OF SENSORS AND THEIR USAGE AS I/O DEVICES:

a) CHARACTERISTICS OFSENSORS

This sensor is made out of just ease segments and is composed of only low-cost components, thus being apt in many cases, and can self-adjust to various conditions so as to give the best outcomes. No other estimating technique can be effectively be utilized on such a wide scale and in such a significant number of various applications.These sensors are incredibly strong, making it

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appropriate for even the hardest conditions. The sensor surface cleans itself, making the sensor insensitive to dirt. Ultrasonic sensors have set up their reliability and perseverance in all the assembling segments.

b) SENSORS AS I/ODEVICES:

Ultrasonic sensors have a property of obstacle detection. Ultrasonic waves can measure the distance between the initial point and the obstacle. The sensor is based on the measurement of the time of flight of an ultrasonic pulse, which is reflected from any obstacle. These sensors transmit sound waves and takes it after reflection from an article. At the point when ultrasonic waves come in contact with any object, diffused impression of the vitality happens which may be 180 degrees. Therefore, some part of the energy is reflected to the transducer as echoes.

The sensor transmits sound waves; these waves reflect when they hit any obstacle as shown in the figure below.

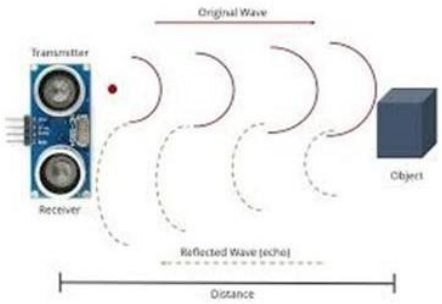

Fig. 1. Shows how the sensors work

If the object is near the sensor, the sound waves returns quickly, and if the object is far away from the sensor, it takes more time for them to return. In any case, if objects are too far away from the sensor, the sign takes such a long time to return (or is powerless when it returns) that the recipient can't detect it. Along these lines, the sensor utilizes the time it takes for the sound to return from the item to ascertain the distance of the obstacle.

So, consider the following case where the speed of ultrasonic waves (V) in the medium by the relation,

Where, 'T' is the time taken by the wave to reach back to the sensor and 'α' is the angle between the horizontal and the path

Presently the distance to the object (L) would then be able to be determined through

$$L=VT \cos \alpha/2$$

The ultrasonic sensor can figure the separations in centimeters and inches. It can gauge from 0 to 2.5 meters,with an accuracy of 3 cm.

2. EXISTING PARKING SYSTEM:

There are some deep issues in the existing parking management system. In almost every parking lot the entrance and the exit of the vehicles is managed by people. Due to this, a manual check of vehicle status and handwritten tickets are required which leads to 50% entry errors, thus resulting in huge losses to the bottom line. In this case the person who is at the entrance only collects the money and usually doesn't bother to guide the driver! The current framework neglects to recognize the empty spaces and to direct the driver to leave the vehicle in a legitimate manner.Manual parking systems mostly have cons compared to pros. To combat this problem, we have proposed this model of using sensors. This is environmental-friendly, easy to use and cost-effective.

3. **Proposed system and architecture:**

3.1 PROPOSEDSYSTEM:

As we realize that the ultrasonic sensor transmits sound waves and takes sound reflected from the object.The thought is to put light poles in the middle of each parking area.To these shafts we will attach the ultrasonic sensors.

Fig. 3.1 Shows the placement of the poles in the parking lot

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As seen the above figure, these ultrasonic sensors attach to the pole would be placed in between as pointed. These poles will have two sensors attached on either side to determine vacant spaces on both the sides of the pole.

Now the sensor transmits sound waves, these waves reflect when they hit an obstacle. Contingent on the time taken by the sound wave to resound, the vacancy of the parking garage is resolved. This will help the driver to know which parking spot is empty beforehand. If the sound wave takes less time to return that means that the obstacle is close by. So, the parking lot is occupied. If the sound wave takes longer time to return that means that the obstacle is far, and the parking lot is empty. This system also ensures proper parking of the vehicle in the parking spot i.e. there will be an indication if at least 75% of the car is not inside the spotThis additionally causes the driver to leave the vehicle appropriately in a parking space.

So, this is how ultrasonic sensors are used to detect vacancy in the parking lot. This makes it easier for the divers to park easily. To make this idea more users friendly and appealing I came up with an idea of how to place the poles in the parking lot.

Envision that you are the individual in the vehicle, and you are at the passage of the parking garage, if every pole is of a similar tallness you won't have the option to see the last pole obviously.

So, if the poles height gradually increases i.e. the first one is the shortest and the last one is the tallest among all the poles in a singlerow.

3.2 PROPOSEDARCHITECTURE:

Usually the parking lots have more than one levels, making it difficult for the people to identify where and in which level the parking spots are available! This framework checks the opportunity for parking the vehicle by utilizing a video Sensor [2].

At the point when a vehicle enters the parking garage, the main thing that the driver searches for is an empty parking space!To make it easy for the driver this idea provides a solution. As mentioned earlier poles will be placed in between two parking spots with ultrasonic sensors on either side. Depending upon the time taken for the sensor to receive the signals that bounce back after striking an obstacle, the vacancy of the spot can be predicted. There are three cases namely,

- The parking spot isoccupied
- The parking spot isfree
- The car is not properly parked in thespot.

Now, in order to predict we need to calculate the time taken for the sensor to receive the signal.

For suppose, consider that the length of the parking spot is 20 feet and the length of any average car is 14-15 feet. For the spot to be occupied at least 75% of the car should be inside the parking spot.

So, in the above case consider that the 20 feet spot is empty, and the ultrasonic sensor receives the signal in 2 seconds, which implies that the sensor ought to get the sign in 1.5 seconds. The base time wherein the sensor ought to get the sign is 1.5 seconds.

Case 1: THE PARKING SPOT IS OCCUPIED

Fig. 3.2 Show that the parking lot is occupied

In this case the ultrasonic sensor receives the signal in less then 1.5 seconds or exactly in 1.5 seconds.

This means that 75% of the car is parked inside the parking space. So depending upon this an instruction is sent to the light that is fixed on top

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of the pole.

Case 2: THE PARKING SPOT IS FREE

Fig.3.2 Shows one vacant parking spot

In this case the ultrasonic sensor receives the signal in 2 seconds, or it takes more than two seconds. This implies the parking spot is empty.

Case3: THE VEHIVCLE IS NOT PROPERLY PARKED INSIDE THE PARKING SPOT

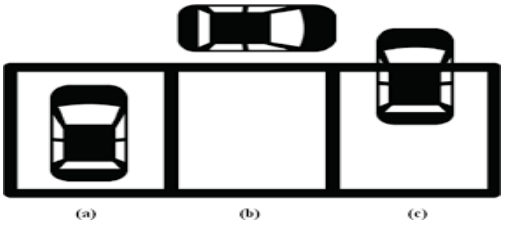


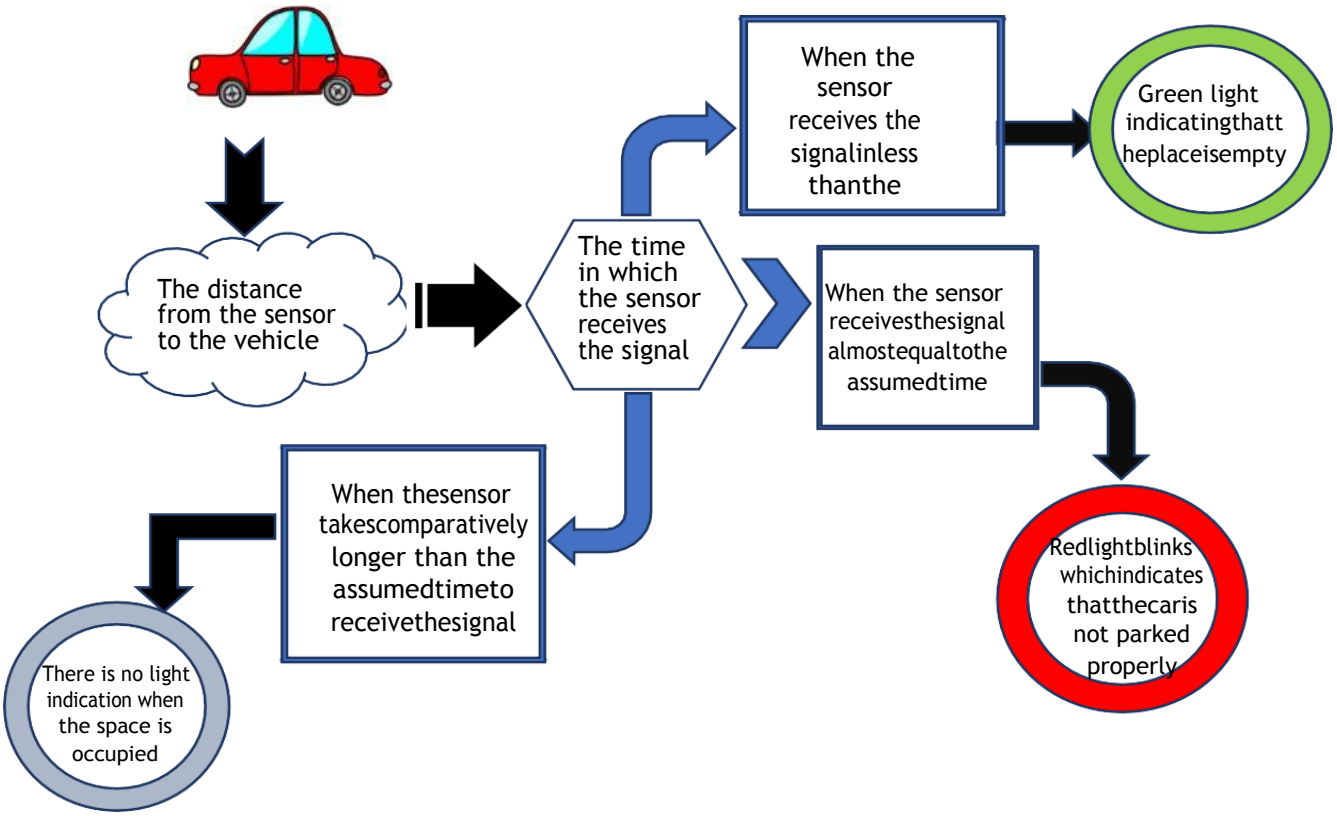
Fig. 3.3 Shows the three cases of parking a

Vehicle i.e. the spot is empty, the spot is free and the vehicle is not properly parked.

In this case the ultrasonic sensor receives the signal in 1.5 seconds to 2 seconds.

This means that 75% of the car is not inside the spot. Indicating improper parking.

Depending upon the parking spot length the time required can be calculated and then implemented accordingl y.



4. RESULTS:

CASE1:

When the parking spot is vacant, then the light on the pole indicates a green color, making it clear for the driver to easily identify the free parking spots.

CASE2:

When the car is not properly parked in the spot,

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which might be problematic for the other people to park their respective vehicles.

Here the light on the pole indicates a red light which constantly blinks until the driver again parks the vehicle properly.

CASE3:

When the parking spot is occupied i.e. when there is already a vehicle parked in the space.

The light on the pole indicates no color i.e. it doesn't glow, making it clear that if there is no light glowing then that spot is occupied.

A remote based stopping administration is displayed in [1]. It won't just give smart parking administrations, yet it will likewise expel mis-parking. To give an intelligent and programmed parking administration, the exhibited framework will utilize sensor aptitudes alongside wireless remote system. The investigation of the event of mis-parking in a customary parking facility is given through this model.

5. FUTURE SCOPE ANDCONCLUSION:

In this idea of using ultrasonic sensors for free parking space detection is a creative solution to the drawbacks of the current system. This system can provide reliable way of detecting empty spots. Addition of barcodes near the entrance and exit of the parking lot which the drivers can scan though their mobile phones .once scanned it will display the in time and the out time calculate the amount to be paid and also helps in detecting where the vehicle is parked. In the smart payment parking framework, the client needs to pay for utilizing the parking spot for the vehicle [3]. The money counters are utilized to gather the money, however the upkeep is not accurate and is problematic.

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