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Application of IOT Based for Parking System

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Abstract – The variety of facilities must be considered to provide for the disabled people to preserve their privileges. However, the application for the various Internet of Thing (IoT) is still limited. In this paper, the research was created on the disabled parking lot. The ultrasonic sensor was used to detect the object response due to this low-cost sensor. The sensor is able to detect any object for vehicle, trolley or bin, so it will trigger the alarm. The correct information from smartphone will turn off the alarm. The detection of response objects was measured with three environments such as object without sound, vehicle standard exhaust, and vehicle noise exhaust. Based on the data from sensors, comparison analysis of the measured distance (cm) and actual distance (cm) were performed. It is obtained that the result of measurement is approximately the same between the distance. It is considered that the ultrasonic sensor should be applicable when there is noise interference emitted from the vehicle and to help for the disabled person as they need this kind of privilege.

Keywords: Internet of Thing, Ultrasonic Sensor, Disable People.

Introduction

Nowadays, with the state of the city which is increasingly developing .One of the challenges of living in an area with a high population is having a vehicle parking area including disabled people. Most people underestimating by using disabled people parking space for their own and neglect the signage that had been mounted at the parking space. There are some individual make fake documents and they displayed on their windscreen [1]. When parking spaces provided not enough, some of people tend to break the rules and violating other right such as park at forbidden area like disabled parking space [2]. So this researcht has been purpose in order to solve the misuse of disabled parking space to the other people around it by using Internet of Thing system as platform. It will help the disabled peoples to get their own privilege and facilities that are provided by the government especially for them [2]. The ultrasonic sensor has pros and cons which is the measurement will not operate perfectly when includes noise of a high accuracy in a domestic environment range, which will affect the operation of the sensors [3]. To establish a measurement of the ultrasonic sensor for the object detection response, the research was conducted with three environments. The environments selected for this analysis were object without sound, vehicle with standard exhaust and vehicle with noise exhaust.

There are a lot of researchers that able to be found in the paper or journal. To get information about ultrasonic sensor, the researcher from [4] ultrasonic wave communicated from a transmitter and reflected by an identification target object situated in a discovery target space. Other works from researcher [5] ultrasonic sensor work by sending a beat of sound, similar as sonar indicators, outside the scope of human hearing. Next, to find the suitable sensor in this project which is ultrasonic and infrared sensor there a lot of researcher makes comparison. Researcher from [6] present the performance comparison of ultrasonic and infrared sensor detection across obstacles of different types of materials. Other works from researcher [7] they presented an obstacle detection and avoidance system for unmanned lawnmower with system consists of two sensor which is infrared sensor and ultrasonic sensor. To find about Internet of Thing, the paper from [8] they created the smart parking system using ultrasonic control sensors. In their project they created one application in smart phone as a user interface between data cloud. Other research about internet of thing, researcher from [9] they created IoT-

based E-Parking System for Smart Cities. In this research, the IoT used for to store the data based and will be sending to central server for providing parking availability information throughout the city and receiving parking lot reservation request from the driver of a vehicle.

Materials and Methods

Some of the components needed in this project: Adapter, Arduino Node MCU ESP8266, Ultrasonic Sensor HC-SR04, Buzzer, LED, Jumper Wire, Blynk Application. Arduino software has been used which is Arduino IDE.

The complete system diagram for IOT Base Parking System was shown in the Figure 1. It consists of a sensor, smartphone, microcontroller, buzzer, and LED. Output for IOT Parking System is 3 (three) which is buzzer and LED connected microcontroller. The bottom consists of ultrasonic sensor. The front consists of LED and the side consists of buzzer.

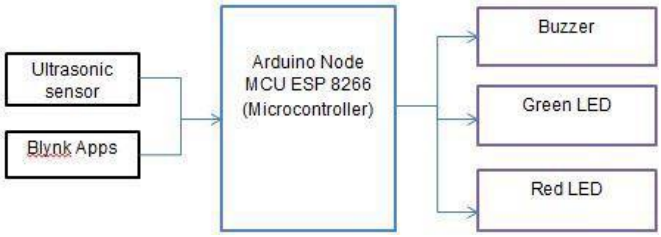

Figure 1. Block Diagram

Figure 2 shows the sketching of panel box. The sensor will locate at the bottom of the panel box. The 2 LED will locate in front of the panel box. The microcontroller, Arduino Node MCU ESP 8266 is placed at the center of the panel box. At the side of the panel box was located buzzer. The behind of the panel box it has 1 hole for supply current.

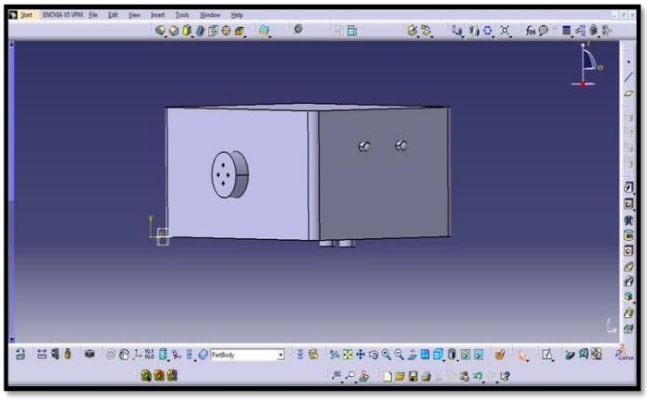

Figure 2. The Sketching of Panel Box Using Catia Software

All the components which are connected to the main microcontroller (Arduino Node MCU ESP8266) (Figure 3). Each component is supplied 5V and GND from the microcontroller. Based on diagram the connection of the ultrasonic sensor, LED, speaker with Arduino Node MCU. These sensor and component directly connected to the microcontroller.

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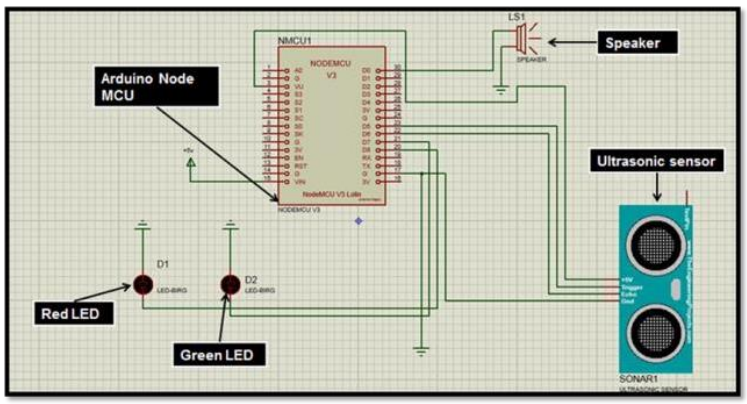

Figure 3. Schematic Diagram

The overview of panel box IoT Based Parking System using Ultrasonic sensor is illustrated in Figure 4 and Figure 5.

Figure 4. IOT Based Parking System

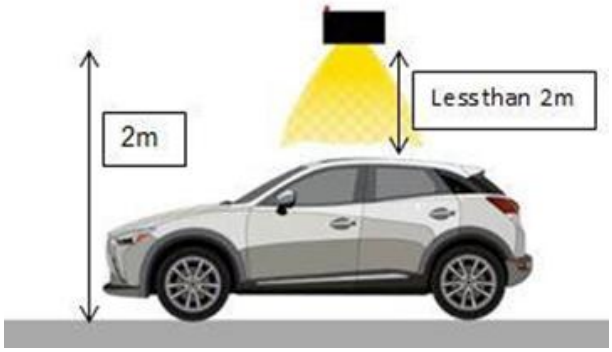

Figure 5. Object Overview

According to this research, the alarm will be off when the correct information was sent by the smart phone using the Blynk apps which is Internet of Things. The measurement will be start when the vehicle park or any object at the parking space. After 3 seconds the ultrasonic sensor will be detecting the vehicle or any object at parking space. The sensor directly connected to the main controller without any interfacing components. The signal from ultrasonic sensor will be send to the Arduino Node MCU 8266 to trigger the alarm and LED turn to red light. The sound of alarm produces in 3 stage which is for 1 second the sound slowly, 2 second the sound medially and 4 second the sound loudly. So, at the same time a person must open the Blynk apps in smartphone then enter the information such as IC number and select number of parking. If the information will be correct the alarm will be off and LED turn to green light but if the person failed enter the correct information more than 3 minutes the alarm still ringing and LED red light until the vehicle left.

The ultrasonic sensor will detect the vehicle. The ultrasonic will be programmed 2 meter according high of length from the floor to the sensor. If the sensor detects high of length from the floor less than 2 meter its mean that has an objected. If the object doesn't move within 1 second, the sensor will be sending the signal to the Arduino Node MCU 8266. Then the alarm will be activated.

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Data collection

The all components in this research development were tested its capability and sending signal or instruction process given by main microcontroller which is Arduino Node MCU ESP8266. The Figure 6 shows the three environments object measured to describes the method to test the components used in.

Figure 6. 3 (Three) the Environment Selected

All data were collected from sensors, and the comparison analysis of the measured distance (cm) and actual distance (cm) will be performed. The result of measurement can be found in the Table 1,2, and 3, as shown below:

Table 1. Object Without Sound

No	Actual Distance (cm)	Ultrasonic Sensor (HC-SR04)
1	20	19
2	40	38
3	60	58
4	80	79
5	100	99
6	120	116
7	140	139
8	160	158
9	180	177
10	200	196

Table 2. Standard Exhaust

No	Actual Distance (cm)	Ultrasonic sensor (HC-SR04)
1	**20**	**19**
2	**40**	**39**
3	**60**	**59**
4	**80**	**79**
5	**100**	**98**
6	**120**	**118**
7	**140**	**138**
8	**160**	**160**
9	**180**	**179**
10	**200**	**200**

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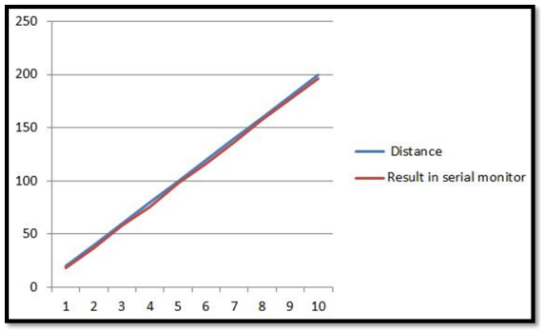
Results

Figure 7 shows the result of sensor detection for ultrasonic sensor. The environment type is object without sound. The proposed method identifies is the flat surface. The result obtained by test for ultrasonic sensor in range 20 cm to 200 cm. The graph shows the consistent reading for ultrasonic sensor. The graph shows consistent because the method to identify is the flat surface. Ultrasonic wave can perform if the method flat edges but if the method with sharp edges it may not give a good echo [10]. The operation of ultrasonic has a good detection object in short distance and long distance but he is reading just has a little parallax error then measuring tape. Parallax error happen because this sensor will be affected by pressure, temperature, and humidity in the air it will affect accuracy of calculation and this sensor also have a blind zone of a few cm which is 3 cm or less [11].

Figure 7. Sensor Detection Result for Object Without Sound



The result of sensor detection for standard exhaust can be described in the Figure 8. The Figure shows the environment type is vehicle with standard exhaust. The proposed method identifies was vehicle surface. Observation from the graph above, the ultrasonic sensor was detected perfectly. Ultrasonic sensor HC-SR04 has maximum limitation range was 400 cm which is 4 meters [10]. The height from floor to sensor only 200 cm, the ultrasonic wave can reflect the signal perfectly because it does not reach the limit of maximum range. The result obtained by test for ultrasonic sensor in range 20 cm to 200 cm. The graph shows the consistent reading for ultrasonic sensor. The operation of ultrasonic has a good detection object in short distance and long distance but he reads just has a little parallax error then measuring tape. Parallax error happen because this sensor will be affected by pressure, temperature, and humidity in the air. It will affect accuracy of calculation and this sensor also have a blind zone of a few cm which is 3 cm or less [11]. Ultrasonic sensor HC-SR04 limitation frequency was 40 KHz [12]. The frequency of standard vehicle exhaust just 315Hz [13]. So, the absorption sound wave of ultrasonic sensor to standard exhaust sound is not affected the operation.

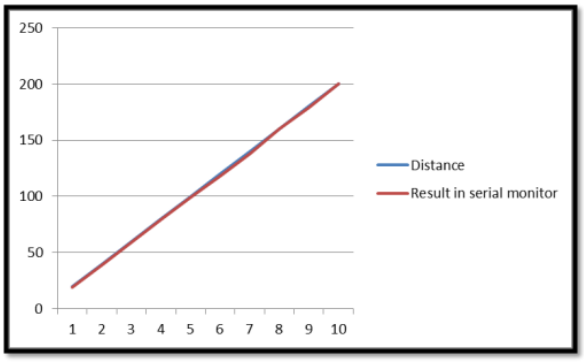


Figure 8. Sensor Detection Result for Standard Exhaust

Figure 9 shows the result of sensor detection for ultrasonic sensors. The environment type is vehicle with noise exhaust. The proposed method identifies was vehicle surface. The result obtained by test for ultrasonic sensor in range 20 cm to 200 cm. Ultrasonic sensor HC-SR04 has maximum limitation range was 400cm which is 4 meters [10]. The graph shows the consistent reading for ultrasonic sensor. The operation of ultrasonic has a good detection object in short distance and long distance but he reads just has a little parallax error then measuring tapes. Parallax error happen because this sensor will be affected by pressure, temperature, and humidity in the air, so it will affect accuracy of calculation and this sensor also have a blind zone of a few cm which is 3cm or less [11]. Ultrasonic sensor HC-SR04 limitation frequency was 40 KHz [12]. The frequency of vehicle with exhausts after market just 500 Hz [14]. The absorption sound wave of ultrasonic sensor to noise exhaust sound is not affected the operation.

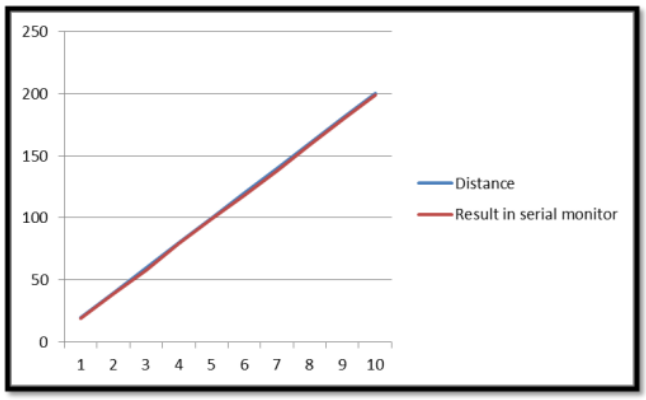


Figure 9. Sensor Detection Result for Noise Exhaust

Conclusion

The objective of this project achieved, which is to develop model of wireless parking space that can control the presence of non-disabled groups for parking in disabled parking areas and to establish a measurement of the ultrasonic sensor for the object detection response with three environments. This project uses a low-cost sensor which commonly use in electronic industry, HC- SR04 ultrasonic sensor.

The analysis of the comparison for the sensor detection response is a distance data (Measured Distance) from ultrasonic sensor. Based on all data were collected it can conclude the environment such as object with no sound, standard exhaust, and noise exhaust can't affect the result because each sound has pitch limitation range. Ultrasonic sensor HC-SR04 has pitch limitation range 40 KHz [12] beyond the range of human hearing and automobile exhaust system has pitch limitation range 315 Hz to 810 Hz [13] . This experiment proves that our project has no problem being installed in parking lots involving passing vehicles. With the world towards modernity, it is hoped that this project can help disabled people get their privileged and more easily use it because this project uses one of the pillars of the industrial revolution (IR4.0) which is the internet of things.

Acknowledgment

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