PUBLICATION MANUSCRIPT

IOT-BASED PARKING SYSTEM DESIGN USING ULTRASONIC SENSORS AT MUHAMMADIYAH UNIVERSITY OF EAST KALIMANTAN

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INFORMATICS ENGINEERING S1 STUDY PROGRAM

FACULTY OF SCIENCE AND TECHNOLOGY

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IOT-BASED PARKING SYSTEM DESIGN USING ULTRASONIC SENSORS AT

MUHAMMADIYAH UNIVERSITY OF EAST KALIMANTAN

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Abstract – Parking space is one of the important needs for students today, but problems arise when it is difficult to get a parking space. This problem occurs when students or lecturers do not know information about the state of a parking lot. With the Internet of Things technology, these problems can be reduced. This microcontroller sensorbased parking system is a system that functions as a guide during the process 4-wheeled vehicle. The type of sensor to be used is the sensor system and the output of the detection uses a speaker. then this system can be applied not only at the Muhammadiyah University of East Kalimantan, but for the whole.

In this research, this thesis discusses the design and building of a sensor-based sensor system in the Muhammadiyah University parking lot, East Kalimantan. From the results of this study, this sensor- and microcontroller-based parking system can make it easier for parking attendants to park their vehicles and it can be concluded that the sensor has an error distance or average distance that is obtained after testing as 18 times it produces 10 CM.

Keywords: Parkir, Arduino, Light, Sound, IoT

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1. Introduction

Muhammadiyah University of East Kalimantan (UMKT) is a combination of STIKES Muhammadiyah Samarinda and STIE Muhammadiyah Samarinda. This campus often holds international collaborations, you know Quipperian, such as the collaboration between the Faculty of Health and Chulalongkorn University Thailand, as well as the double degree program between UMKT and Kingston University and several other campuses abroad.

At present the number of vehicles such as cars is increasing, as a result the more vehicles there are, the more crowded the car park area is. The problem of convenience is of great concern to car drivers. The manufacture of fully automatic equipment that overrides the human role as a subject of work has been found. Then a tool can be designed in the form of a parking system based on ultrasonic sensors.

And this problem affects parking attendants who have difficulty in directing, managing 4-wheeled vehicles in the area in front of Building E, and sometimes students or lecturers are not aware of the existence of a sensor-based parking system technology that can assist in directing vehicles when they want to park his vehicle.

With the existence of an IoT-based parking system using ultrasonic sensors, this can overcome the problems of parking attendants in managing vehicles when they want to park in the parking area with the help of an IoT-based system using this ultrasonic sensor, so a system is created to anticipate the occurrence of irregular parking areas based on IoT using ultrasonic sensor, for that a proposal must be made as a condition.

2. Resourse Methodology

This research will be conducted in the parking lot of Building E, Muhammadiyah University, East Kalimantan, Samarinda City, Jl. Ir. H. Djuanda No. 15, Sidodadi, Kec. Samarinda Ulu, City of Samarinda, East Kalimantan 75124

A. Tools

Before implementing an IoT-based parking system design using ultrasonic sensors at Muhammadiyah University, East Kalimantan,

Samarinda, there are several pieces of equipment that must be prepared. The list of equipment used in this study will be written in table 2 below:

Table 2 Tools required

No	Tool's	Fungsion	Amount
1.	Laptop	To create an application that will be used hardware and software.	1 unit
2.	Obeng	For stringing tools	2 Unit

B. Material

Before implementing an IoT-based Parking System Design Using Ultrasonic Sensors, there are several pieces of equipment that must be prepared. The list of components used in this study will be written in table 3 below:

No	Material	Fungsion	Amount
1	Arduino Uno	As a tool to be used	1 Unit
2	Sensor Ultrasonik	Used as a warning distance marker	2 Unit
4	LCD 16x2	Used as a display of sensors Ultrasonic	1 Unit
5	Wemos D1 R1	To be connected to a Wi-Fi network	1 Unit
6	Cable Jumper	Used as a liaison / jumper all components	30 Unit

Table 3 Material Required

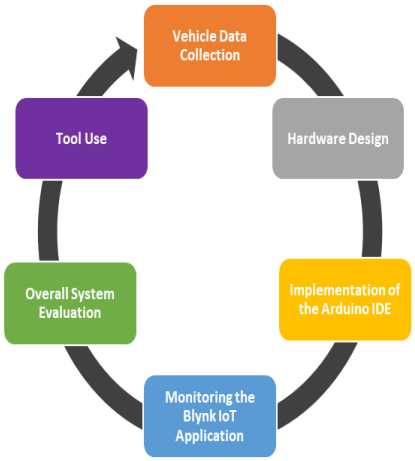
C. Sofware

Before implementing an IoT-based parking system design using ultrasonic sensors at Muhammadiyah University, East Kalimantan, there are several pieces of equipment that must be prepared. The list of equipment used in this study will be written in table 4 below:

Table 4 Sofware required

No	Name	Spesifikasi	Fungsion
1	IDE Arduino	2.0.4	Create a program that the Arduino device will download
2	Blynk IoT	500 Pro X B2	As Server of Arduino and wemos.

This chapter will explain the research steps that will be carried out in implementing IoT-based Parking System Design using Ultrasonic sensors at Muhammadiyah University, East Kalimantan. The research flow used is,



D. Parking And Vehicle Data Collection'

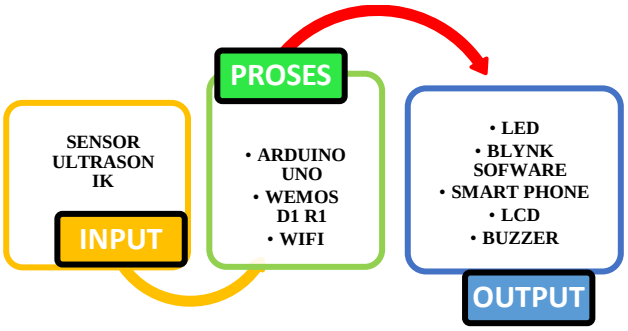
Data collection aims to understand the characteristics and factors that cause irregularities when a vehicle wants to park, as well as overcome parking problems, shown in table 5 below:

Table 5 Data Parking UMKT

NO	CAR TYPE	WHEEL VEHICLE SIZE 4
1	Karimun Suzuki	Panjang 4 M Lebar 2 M
2	Avanza Tipe Veloz 1.3 MT	Panjang 4 M Lebar 2 M
3	Daihatsu Ayla 1.0L D MT.	Panjang 4 M Lebar 2 M
4	Expander Cross 2020	Panjang 5 M Lebar 2 M

E. Design Hardware

Table 7 Flow Chart Mechanism



From the picture above there are 2 ultrasonic sensors with the HC-SR04 type that the author used in this study and there is an LCD screen that functions as a display for numbers, letters or other symbols. How does the sensor work by sending input that will be processed through Arduino IDE Type 1.6.3 to function as a container for Arduino system programming, Arduino Uno as an intermediary for input results to become complex with the help of a Wai-Fai or 4G network, After processing there are markers in the form of 4 The color of the LED lights are red, yellow, green and white, where the four lights have their respective functions, the first is red as a marker that the vehicle is outside the sensor, yellow as a marker that the distance for the vehicle is in the warning area or standby, the green color indicates that the vehicle is right in accordance with the parking provided and the white color is to provide the vision of the vehicle that wants to park, after that a notification will appear via the Blynk application which sends to the driver's smartphone so that they can find out whether it is correct the vehicle is parked in the parking area.

F. Implementation Arduino IDE

In this section it is explained how the functions of Arduino Uno, Arduino IDE, and the Blynk application or internet network in the form of 3G/4G. Arduino Uno as a place to scan an input from an ultrasonic sensor which will be forwarded through the blynk application as an application container which contains widgets for smartphones.

G. Monitoring System Aplikation Blynk IoT

Monitoring aims to get feedback on the needs of the ongoing program, to identify gaps between planning and targets. By knowing this need, program implementation can make adjustments by utilizing whether the sensor can read a predetermined distance and for this blynk application it can send notifications to smartphones with the help of wai-fai or 4G networks.

H. Evaluation All Of System

At this stage it will be evaluated whether the sensor can read a certain distance, for this reason it is necessary to evaluate this system and for the blynk application whether it can send notifications to smartphones to provide notifications so that the vehicle has been parked properly

I. Use Of Tool

At this stage the IoT-based system using this ultrasonic sensor is ready to use and can practice this sensor well

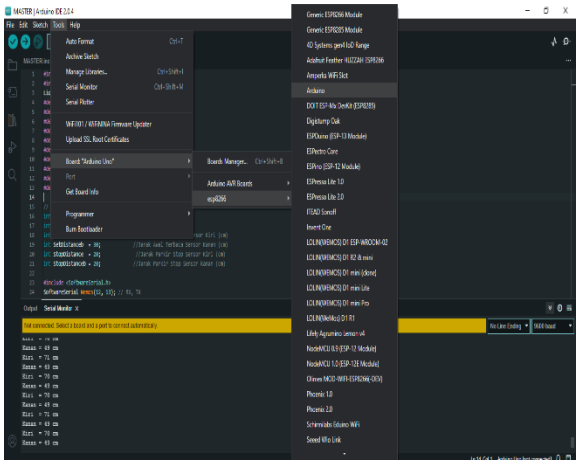
3. Result And Discussion

The aim of the research is to make a tool aiming to find out how the IoT-based parking system works using ultrasonic sensors. In front of building E, Muhammadiyah University, East Kalimantan, Samarinda City, the author will describe and explain some of the test results and research results Assignments This end. The purpose of this chapter is to determine the success rateon the design of the parking system that has been proposed and worked on. The testing carried out includes testing the distance of the ultrasonic sensor with a measuring instrument ruler, and application in the Blynk IoT Application system design that has been proposed and worked on.

A. Testing Procedures for the Arduino Uno

- Turn on the laptop that will be used to test the Arduino Uno
- Open the Arduino IDE application
- Plugging in the micro USB data cable on the Arduino Uno and the USB side to Laptop USB

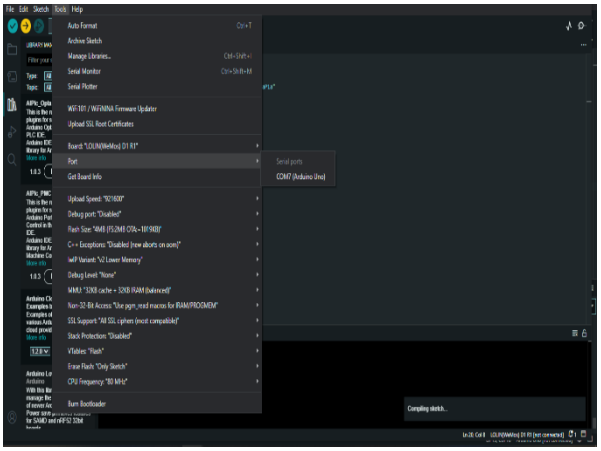
- Check on the tools menu select board Then look for Arduino Uno. Like following picture 10



Picture 10
Connect Arduino Uno with Arduino IDE Software

In the picture it is explained that you have to input the Arduino Uno Board, then select esp2866 and choose as arduino so that it can be connected to the sensor and in the picture below it explains that the input part of the port means that the micro usb cable entry must match what is entered

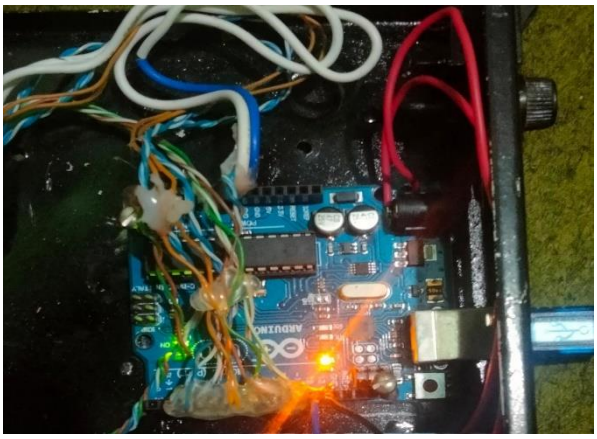
B. Connect Arduino Uno with Arduino IDE Software



Picture 11 Setting Port Arduino Uno

B. Test Results on Arduino Uno

After testing the Arduino Uno, the following results were obtained in Figures 10 and 11



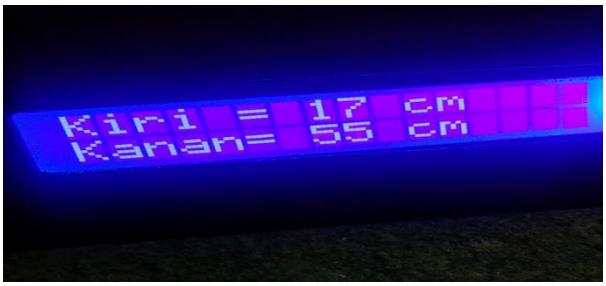
Picture 12 Results From Uploading Programs

Picture 12 shows that the finished program can work as desired which is indicated by the Arduino Uno LED light.This shows that Arduino Uno can work as it should,it can also be concluded that the Arduino Uno is in good condition and ready to use.

C. Testing the Distance Sensor

The purpose of testing the ultrasonic sensor distance is to ensure thatSuch sensors can provide accurate and consistent distance measurements in the application in questions Tools Used in Testing Distance Sensors:

1. Labtops
2. Ultrasonic Sensors
3. LCDs 16x2
4. Iron measuring tool
5. Arduino Uno
6. Arduino IDE programs
7. A cardboard



Picture 13 Display from LCD

in the picture above is the result of measuring the distance using the sensor, in the picture above is the result of measuring the distance using the sensor and in the picture below it will be measured using a ruler measuring 50 cm. You will see a difference in measuring the distance between the two tools

Picture 14 Rules distance 50 cm

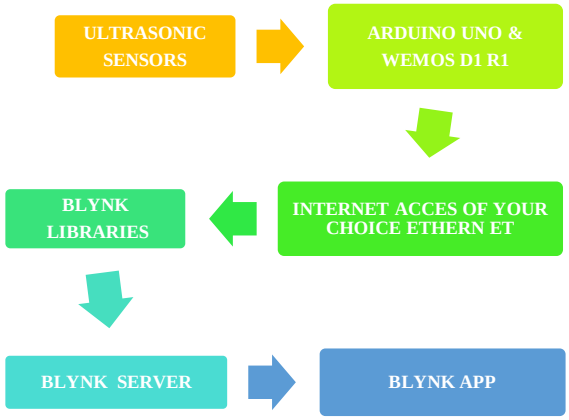
D. Test Results On Sensor Distance With Ruler Measuring Instrument

When testing the sensor distance, the sensor immediately reads Arduino Uno It activates and when the sensor reaches the target it takes a reading. Gauge ruler to measure and compare the accuracy of sensor readings distance.

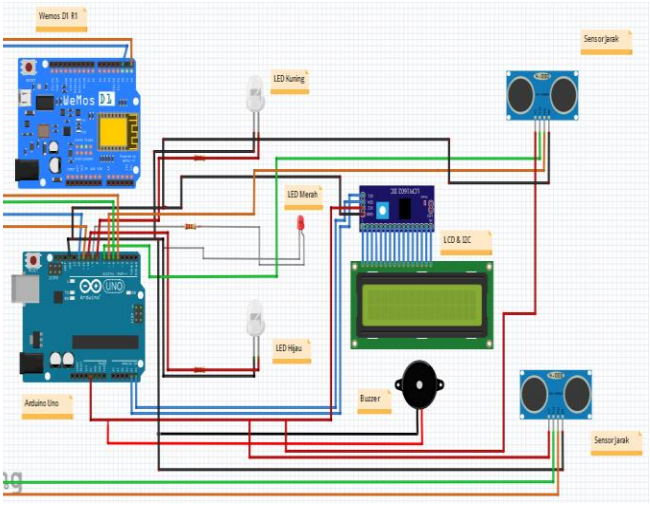
Table 8
Test Results for Sensor Distance and Ruler Distance

TEST	SENSORS & Blynk IOT		REAL DISTANCE (RULE)	BUZZER	LED
	RIGHT	LEFT			
1	49 cm	50 cm	50 cm	OFF	WHITE
2	43 cm	42 cm	41 cm	OFF	WHITE
3	38 cm	38 cm	41 cm	OFF	WHITE
4	35 cm	37 cm	35 cm	OFF	WHITE
5	24 cm	20 cm	23 cm	ON	RED
6	32 cm	34 cm	35 cm	ON	GREEN
AVERAGE ERROR OF MEASUREMENT 10 CM					

Connection Scheme to Blynk IoT



The diagram above has shown the flow of how the device processes the vehicle when it wants to park, starting from the input from the ultrasonic sensor which detects the presence of the vehicle, then it is processed through Arduino Uno as a processor from the sensor and then a data is sent via Wemos D1 R1 as a connecting container to Blynk Iot which is where are required to have a network in the form of wifi or the like so that they can connect to the application then the data sent will be sent via Blynk IoT to the user and before that the user must install and register a blynk Iot account



In the picture above it is explained that how is a tool that functions to direct and regulate vehicles that want to park their vehicles, starting from these 2 ultrasonic sensors providing vision and distance estimation to Arduino Uno which processes then sends input from reading the distance to wemos d1 r1 which functions as container network server that is connected to the Blynk IoT Application which functions as an application container for reading left and right sensor distances and provides notification 2, namely positions and notifications that require an internet network to be able to access, the buzzer will sound at a certain distance, namely 30 CM - 5 CM is accompanied by several LED lights, first there is a red light for a danger sign, yellow as a warning, green as a marker that is correct and white as nothing has been detected from the whole this tool will be very good if it is protected from water and others.

4. CLOSING

A. Conclusion

Designing an IoT-based parking system using ultrasonic sensors can help increase the efficiency of parking space management. With an ultrasonic sensor connected to the Blynk IoT Application, this system can monitor parking space availability in real-time and provide accurate information to users. In addition, through user applications that are connected to the system. By using ultrasonic sensors, this system can detect the presence of parking space availability information obtained from sensors which can be processed and processed by the server to provide useful data for users, such 10 CM as the number of available parking spaces or estimated travel time. to the nearest parking lot.

B. Suggestion

1. Choose a quality ultrasonic sensor that fits the system requirements. Make sure the sensor has sufficient range and high accuracy in detecting vehicles.
2. Design an intuitive and user-friendly user application interface so that users can easily monitor parking space availability and make reservations.
3. Ensure a reliable and stable network infrastructure to connect the system with servers and user applications. This ensures smooth data transmission and fast response times.
   Always conduct periodic trials and monitoring of this parking system to ensure optimal performance. Repair and upgrade the system if problems are found or changes are needed. By implementing an IoT-based parking system using ultrasonic sensors, it is hoped that it can improve the user experience in finding a parking space.

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بسم الله الرحمن الرحيم

SURAT KETERANGAN ARTIKEL PUBLIKASI

Assalamu'alaikum Warahmatullahi wabarakatuh

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Progam Studi	:	Sains dan Teknologi

Manyatakan bahwa artikel ilmiah yang berjudul "IOT Based Parking System Design Using Ultrasonic Sensors at Muhammadiyah University of East Kalimantan" telah di submit pada Journal of Science and Engineering
https://journals.umkt.ac.id/index.php/jse

Demikian surat keterangan ini dibuat untuk dapat dipergunakan sebagaimana mestinya.

Wassalamu'alaikum Warahmatullahi wabarakatuh

Samarinda, 24 Juli 2023

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