**Praktik Simulasi Sensor Jarak  
(Ultrasonic)**

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**Abstract**

Ultrasonic distance sensors are widely used in various applications, including robotics, automation, and security systems, due to their ability to measure distances accurately without physical contact. These sensors work by emitting ultrasonic waves and measuring the time it takes for the waves to bounce back after hitting an object. In this simulation using Wokwi, an ESP32 microcontroller is programmed to read distance data from an ultrasonic sensor and display the results. By understanding the working principles of ultrasonic sensors and their integration with microcontrollers, this practice provides fundamental knowledge essential for developing obstacle detection and automated measurement systems.

*Keywords—ESP32, Sensor, Ultrasonic*

**1. Introduction**

**1.1 Background**

Ultrasonic sensors are widely used in various applications, such as robotics, automation, and security systems, due to their ability to measure distances accurately without physical contact. These sensors operate by emitting ultrasonic waves and measuring the time it takes for the waves to reflect back after hitting an object. In this practice, a simulation is conducted using the Wokwi platform to test the functionality of the ultrasonic sensor without requiring physical hardware. By understanding the working principles of ultrasonic sensors and their integration with the ESP32 microcontroller, this practice provides essential knowledge for developing object detection and automated distance measurement systems.

**1.2 Objectives**

**Objective**

The objective of this ultrasonic sensor simulation practice is to understand how ultrasonic sensors measure distance and integrate them with the ESP32 microcontroller using the Wokwi simulation platform. This practice aims to study how the sensor detects objects based on the travel time of ultrasonic waves and how the obtained data can be processed and displayed in real time. By using Wokwi, participants can conduct simulations without the need for physical hardware, making it easier to understand the application of ultrasonic sensors in automation, robotics, and security systems.

**2. Methodology**

**2.1 Tools & Materials**

* **Microcontroller**: Virtual Arduino Uno (via Wokwi)
* **Software**: Wokwi (https://wokwi.com), GitHub (https://github.com)
* **Internet Access**
  1. **Implementation Steps**

1. Open wokwi.com, and Choose ESP 32 to create a diagram like the one in the module.
2. Copy code from the module and paste to sketch.ino and diagram.json.
3. Start simulation on wokwi and then the simulation results will come out.
4. The temperature settings can be edited as shown in the picture.

**3. Results and Discussion**

**3.1 Experimental Results**

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| **Platform** | **Completed Task** | **Key Outcome** |
| Wokwi | Ultrasonic sensor simulation | The ultrasonic sensor successfully measured distance and displayed real-time data in the simulation |
| ESP32 (Simulated) | Processing sensor data | The ESP32 correctly processed the ultrasonic sensor readings and provided accurate distance measurements |

Wokwi screenshot result:



