Guide for using RoboCop Safety Device

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1 Introduction

RoboCop is a safety device designed for workspaces. It utilizes ultrasonic proximity sensor to measure the distance between objects and the device, ensuring accurate distance measurements. The measured data is written to a Modbus holding register (register 5). The data sent to the holding register is persistent and can be accessed remotely by devices within the same network.
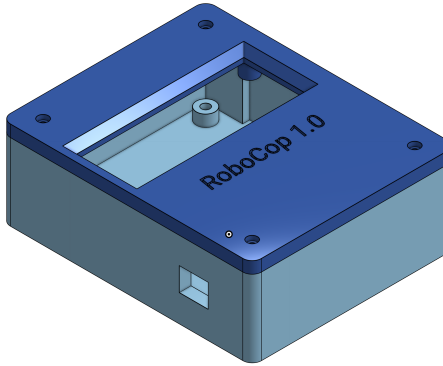

Figure 1: RoboCop - Safety Proximity Device

1.1 Block Diagram

The block diagram of RoboCop illustrates the system's workflow, highlighting its core components and functionality. The ESP32 microcontroller is the core of the device, as it manages Wi-Fi connectivity and Modbus communication. The device connects to the Wi-Fi network (AirVandalRobot) and configures a static IP address to enable seamless communication with other devices on the same network. The ultrasonic sensor measures the distance to nearby objects relative to the device, and the calculated value is stored in Holding Register 5 of the Modbus server, making the data accessible to external systems within the same network.
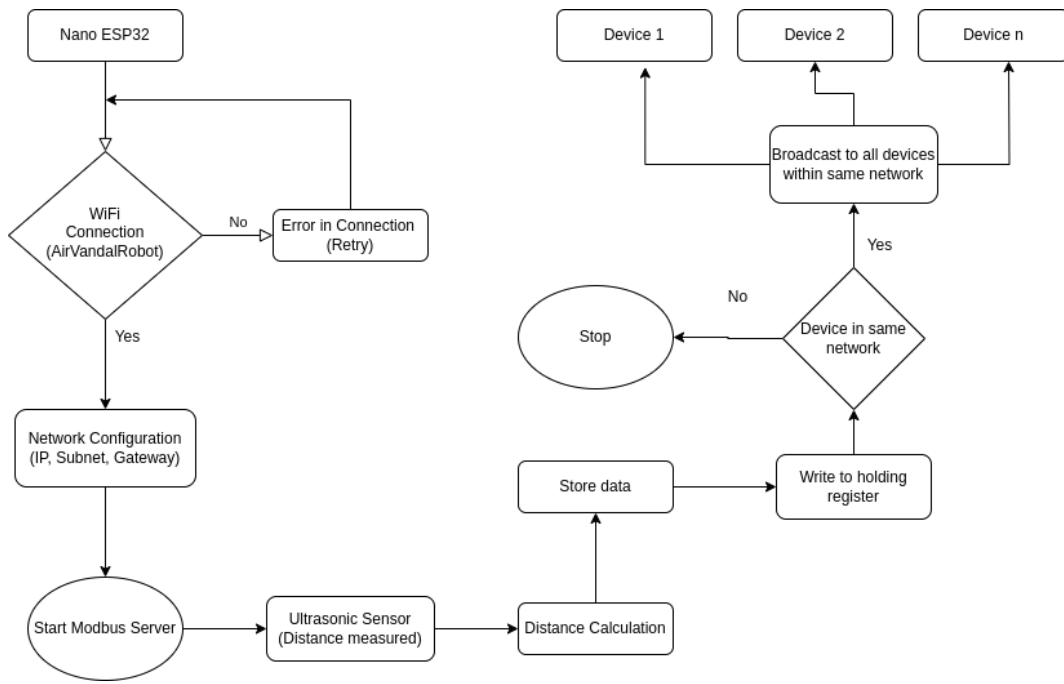
Figure 2: Block diagram for RoboCop

2 Setup and Guide

2.1 Powering the Device

The device (RoboCop) can be powered in the following ways,

1. Using a USB terminal:

   - Connect a USB Type-C cable to the device.
   - Once powered, the server IP and current measurement will be displayed on the LCD screen.

2. Using a 9V Battery:

   - Unscrew the back panel of the device.
   - Connect a 9V battery to the battery terminal.
   - RoboCop supports a voltage range of 5V to 9V but operates optimally at 5V.

2.2 Using the Device

1. Power On:

   - When powered, the device displays:
     - Server IP: The unique IP address assigned to the device (e.g., 127.xx.xx.xx or 10.xx.xx.xx).
     - Distance Measurement: The distance measured in millimeters.
   - Once powered, the server IP and current measurement will be displayed on the LCD screen.

2. Reading Data:

   - Ensure your computer/device is connected to the same network as the RoboCop device, that is AirVandalRobot Wi-Fi network.
   - Ping the device's IP address to confirm connectivity. Source the workspace:
     ```
     ping 127.xx.xx.xx
     ```

3. Accessing the Data:

- Use the Modbus protocol to read from Holding Register 5, which stores the measured distance.
- The distance value is an unsigned integer representing millimeters (e.g., Distance = 540 mm).

Notes:

1. Network Requirement: Ensure that your systems is withing the same WiFi network (AirVandal-Robot) to access the RoboCop.

2. Data Format: The measured distance is stored in millimeters but can be converted to other units as needed.

3. Modbus Protocol: The Modbus communication protocol ensures the seamless data exchange with other devices.