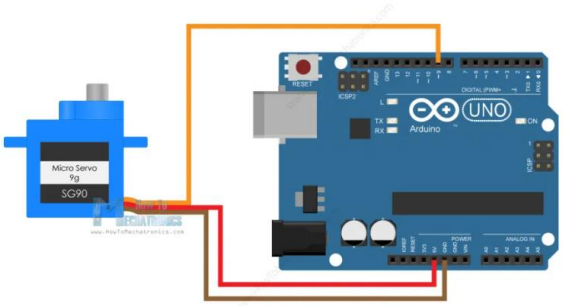
IoT ProtoTask Project

TASKS

1. Person detection using PIR Sensor and Ultrasonic sensor (tested) (Arduino Uno)
2. If person is detected send information to esp32 (done, NT) (Arduino Uno)
3. Receive unlock command over serial port and perform unlock operation (done, NT) (Arduino Uno)
4. Receive BLE data from THL module (done, NT) (ESP 32)
5. Send data from esp32 to mqtt broker (pending)

Hardware Setup

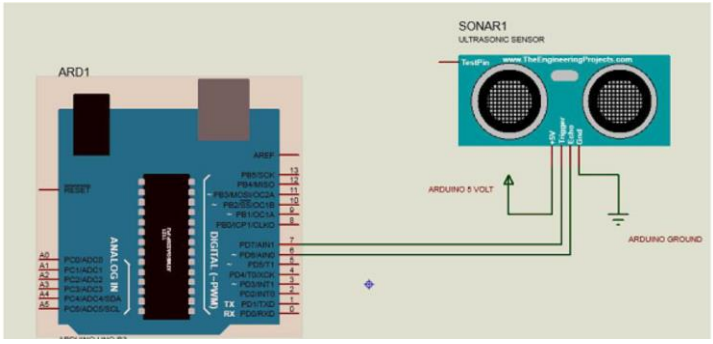
1. Servo Motor



2. PIR Sensor

Seeeduino	Grove - PIR Motion Sensor
5V	Red
GND	Black
Not Conencted	White
D2	Yellow

3. Ultrasonic Sensor



4. Serial connection between ESP32 and Arduino

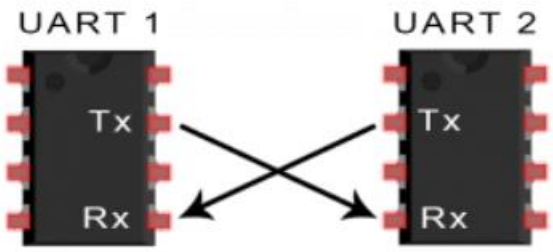


Figure 1: Basic UART Connection Diagram

Software Setup

1. Person Detection
   - Detect Motion through PIR sensor.
   - If motion is detected, then check if person is in range through ultrasonic sensor.
   - Unlock door using servo motor when command is received over serial port from ESP32.
2. ESP32 Gateway Implementation
   - Receive THL module data from BLE Nano
   - Send THL module data to MQTT broker
   - Receive SenseNode data from Arduino Uno
   - Send SenseNode data to MQTT broker

Tasks Completed

States are Verified, Done, Blocked, Pending, In Progress.

1. Verified: Task is complete and tested
2. Done: Task implementation is done but not tested
3. Blocked: Task Implementation done but testing is blocked because of interdependency
4. Pending: Not started yet
5. In Progress: No interdependency, Task in progress

Task	State	Comments	File Reference
Person Detection	Verified		PIR_servo_arduno.ino
Send SenseNode data to ESP32	Blocked	Need bigger breadboard to implement serial connection between ESP32 and Arduino Uno	PIR_servo_arduno.ino
Receive Unlock command	Blocked	Same as above. Though feature is verified through Serial Monitor	PIR_servo_arduno.ino
Send unlock command	Pending		
MQTT Implementation	Pending		
Receive THL node data over BLE	Blocked	Need Gatt server to test as ESP32 acts as BLE client	esp32Gateway.ino

Data Formats

1. UART Serial communication

Packet Structure: Header: DIR: Operation: data value (if any): footer

a) Header: 0x55
b) Footer: 0x5E
c) Direction

Direction	Value
ESP32 to Arduino	0x01
Arduino to ESP32	0x02

d) Operation

Operation	OpCode	Data Value
Unlock	0xA0	none
Person Detected	0xA1	none

2. BLE Communication between BLE Nano and ESP32
   - BLE Nano: server
   - ESP32: client

GATT Profile

```
<server-configuration name="BLE_Nano">
   <service name="Environmental Sensing" uuid="cfc1cd76-cb65-11ed-afa1-0242ac120002">
      <characteristic name="Temperature" uuid="cfc1c916-cb65-11ed-afa1-0242ac120002">
         <descriptor configure="CCCD"/>
         <permission name="READ"/>
         <permission name="WRITE"/>
         <property name="NOTIFY"/>
      </characteristic>
      <characteristic name="Humidity" uuid="cfc1d2d0-cb65-11ed-afa1-0242ac120002">
         <descriptor configure="CCCD"/>
         <permission name="READ"/>
         <permission name="WRITE"/>
         <property name="NOTIFY"/>
      </characteristic>
```

```
      <characteristic name="Light Intensity" uuid="cfc1cc18-cb65-11ed-
afa1-0242ac120002">
         <descriptor configure="CCCD"/>
         <permission name="READ"/>
         <permission name="WRITE"/>
         <property name="NOTIFY"/>
      </characteristic>
   </service>
</server-configuration>
```

References

1. Person Detection: Detecting presence of people with distance control and time lag – SENSING THE CITY
2. BLE Communication between BLE Nano and ESP32: https://randomnerdtutorials.com/esp32-ble-server-client/