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

Diagram

Description automatically generated

1. PIR Sensor

Table

Description automatically generated

1. Ultrasonic Sensor

Diagram, schematic

Description automatically generated

1. Serial connection between ESP32 and Arduino

Diagram, schematic

Description automatically generated

# 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.

1. 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

1. Header: 0x55
2. Footer: 0x5E
3. Direction

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

1. Operation

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

1. 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](https://www.sensingthecity.com/detecting-presence-of-people-with-distance-control-and-time-lag/)
2. BLE Communication between BLE Nano and ESP32: <https://randomnerdtutorials.com/esp32-ble-server-client/>