

PERSONALIZED ROOM ENVIRONMENT CONTROLLING SYSTEM

Basic Operation in brief

We propose a room environment control system which is based on Bluetooth Low Energy beacons. When a user enters the room the temperature and light intensity are automatically adjusted to the users pre-defined preference. Furthermore when more than one person is inside the room the temperature and the light intensity will be changed accordingly as well. This works as a BLE beacon based Geo-Fencing system. The users must wear or carry a BLE enabled device such as a smart watch or a smart phone with BLE capability which is a fairly common feature. Additionally, the system monitors the environmental conditions outside the room and acts intelligently as well.

Method of implementation

ESP32 devices which are configured to act as BLE beacon scanners are positioned in the room. They are placed along with the lights which needs to be switched and also with the Air conditioning system as well. Additional beacon scanners which are used for the precise detection of the presence of the user will be positioned in the corners of the room. When a user enters the room the beacon scanners detect the BLE beacon from the user's device and the signal strength values (RSSI) information are sent to a Node-Red server using MQTT protocol. The signal strength is used to get an approximate distance measurement. The identification of the known users and the security measurements can be implemented with the use of UUIDs in the beacons. The Node-Red flow will process the RSSI values and determine whether the user is inside the room and position approximately. After the processing the lights and air-conditioning will be set according to the user preference.

A third party API will be used to monitor the external environmental conditions. For example if it is raining and dark the lights will automatically turn on when the room is occupied regardless if it is day or night, and the room temperature will be set to a warmer state.

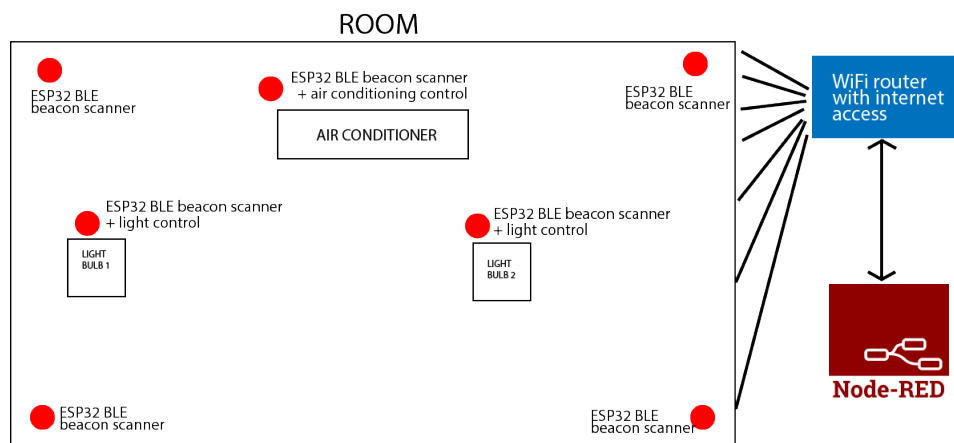


Figure 1: Proposed system functionality

A node red dashboard is presented to the user to configure the system and display the current state of the system.

All of the ESP devices will be connected to a local WiFi router with internet access. The Node-Red flow is run on a cloud server eliminating the need of a Raspberry pi or similar local server reducing the system cost.

MQTT protocol will be used in the control messages for ESP devices as well.

Since this is a fixed implementation, our main focus is on reducing the power consumption of the user's device. The BLE beacons will only use an extremely low amount of energy.