



Parshvanath Charitable Trust's
A. P. SHAH INSTITUTE OF TECHNOLOGY, THANE
(All Programs Accredited by NBA)

Department of Information Technology



IoT Enabled Smart Laboratory

Group No. 06

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Introduction

- In our Lab, there are multiple appliances like Lights, Fans, Air Conditioners, and Projectors.
- The current, usual way to control the appliances in the lab is to manually toggle switches on the switch board of the particular Lab.
- However, that in itself is a time consuming task as a person has to be available to do so.
- Our proposed system is aimed at developing an automated solution where even if the end-user/admin is located remotely, the appliances can be turned on.

Objectives

- To minimize, monetary costs, user discomfort, delays, utilization of resources.
- To automatize the appliance dominant of Labs.
- To reduce the power consumption by economical usage of the appliances.
- To integrate laboratory timetable with the system.

Problem Definition

- Our institute has an abundance of laboratories and therefore, more staff. Naturally most of the faculties have totally different operating patterns than others.
- Every time if a lab session ends, usually the machines and appliances are left running.
- Physically toggling the individual lights, fans and systems within the starting of a lab session adds to the wastage of your time of the session.
- To combat this, we want to create a system for our college where the labs can be controlled remotely to save time, power consumption and energy in terms of manpower.

Proposed Technological Stack

- **Node-RED:** For wiring along all the devices and services with the help of its browser-based editor. To create a GUI dashboard for managing and controlling the ecosystem.
- **MQTT (Message Queuing telemetry Transport):** For communication protocol. Its features like small code footprint low power & bandwidth consumption, pub/sub pattern, makes it suitable for this use case.
- **Mosquitto:** Eclipse Mosquitto is an open source (EPL/EDL licensed) message broker that implements the MQTT protocol.
- **Raspberry Pi:** For its price to performance ratio and its versatility as an overall package.
- **SQLite:** For backend data management.

Review Suggestions

- We ensured cross platform compatibility with Android, Windows, iOS, Linux, since this will be a browser based web application so it can run on any browser.
- We explored multiple applications to simulate automation, and found TinkerCAD, which at least allows us to test bare minimum automation.
- Last time we have not confirmed our core technology stack as we were not sure. This time, the core technologies we will be using are confirmed.
- Last time we only had done with the Sem VI report. In this semester, we have created paper for IEEE conference and submitted for publication. Waiting for a positive response.

Proposed System Architecture

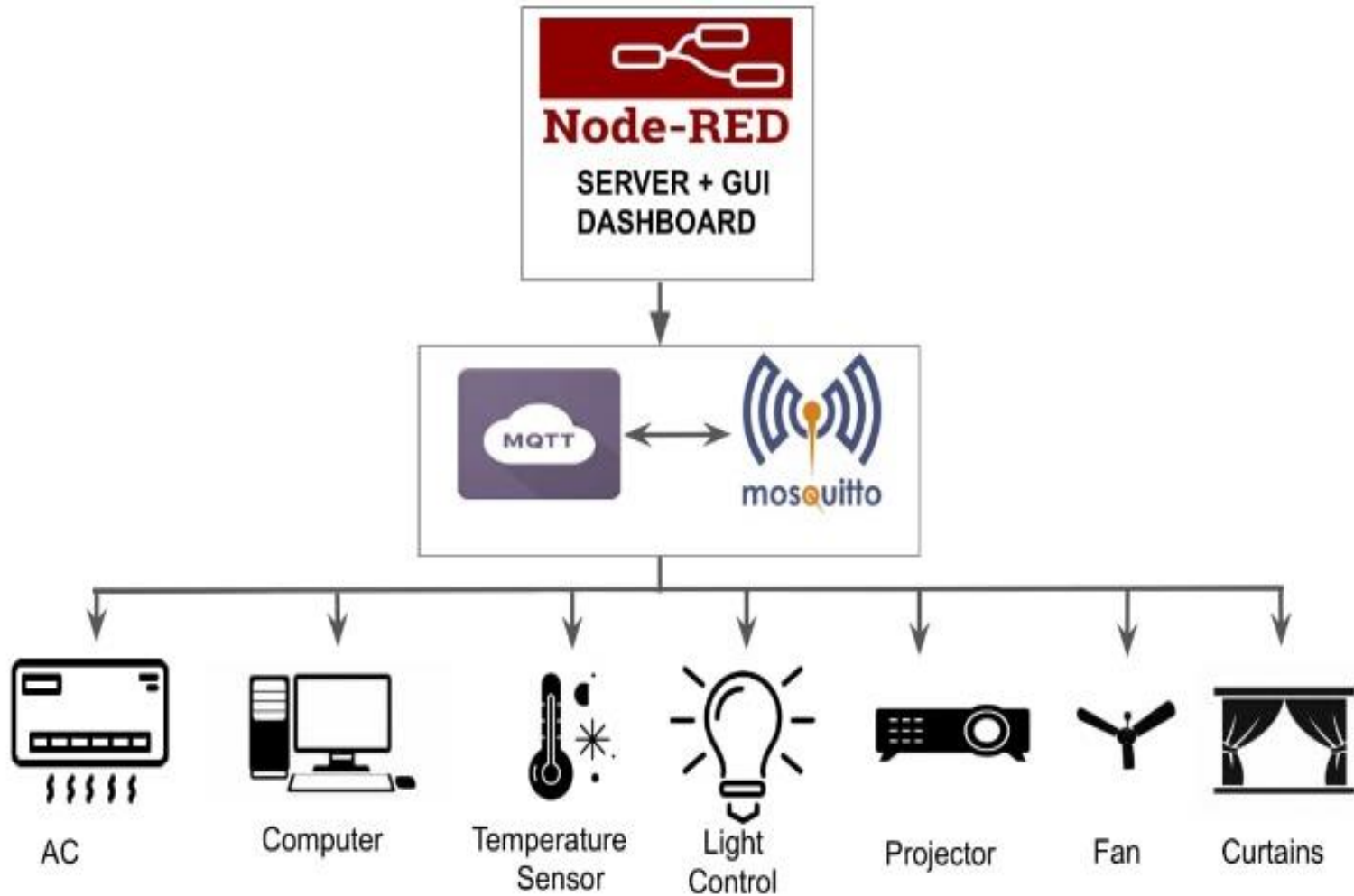


Figure 1: Proposed System Architecture

Prototype Design Simulation

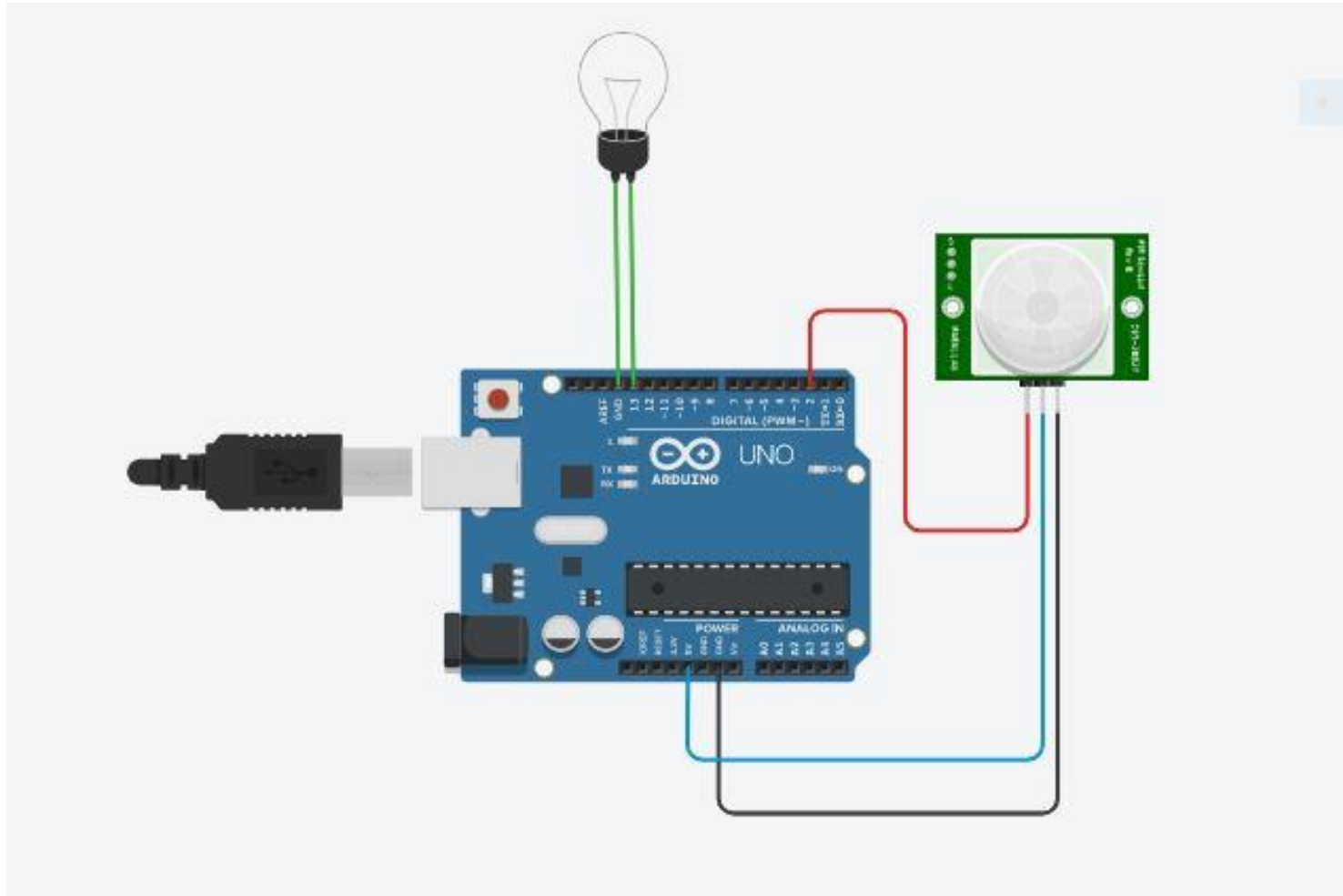


Figure 2: Circuit diagram of Light control using Arduino and PIR sensor.

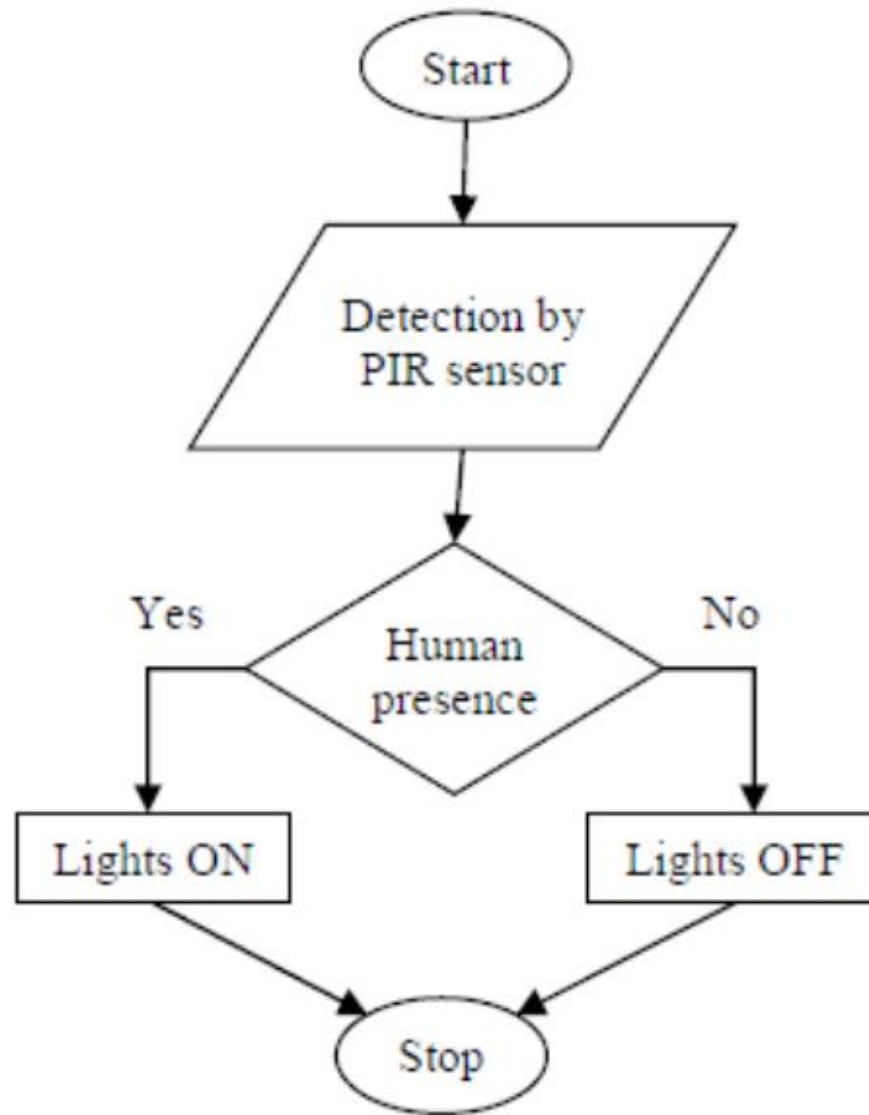


Figure 3: Flow of Working.

Working of prototype:

- Initially, when there is no human movement, the PIR Sensor doesn't detect any person and its OUT pin stays LOW.
- As the person enters the room, the change in infrared radiation in the room is detected by the PIR Sensor.
- As a result, the output of the PIR Sensor becomes HIGH and the light glows.
- When the person leaves the room, after a delay, the sensor does not detect any human movement, causing the OUT pin to be LOW and turning the light off.

Plan of Paper Publication

- Paper Title: IoT based Smart Laboratory
- Publication: IEEE 6th International Conference for Convergence in Technology (I2CT), (<http://ieeepune.i2ct.in>)
- Link to Paper: [IoT Enabled Smart Laboratory.](#)

Thank You!