Mushroom Cultivation

This is an Internet-Of-Things (IoT) based Automation Project
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Course: Advance Operating System
Section: A

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Project Idea/Problem Statement:

This is a project where Mushrooms are cultivated by an automated system. The big burden of mushroom cultivation is that it can take a lot of caring and nurturing in the fruiting stage of the mushrooms. Otherwise, they might not grow up as intended. But there is a good side that, mushroom cultivation can be done by maintaining some ideal environment variables. That is why , in this IoT based automation project a viable solution to this problem is given.

Temperature, humidity and light are considered and monitored by the different sensors put into place. These factors of taking care of the mushrooms will be taken care of by the automated parts of the system.

Generally we are following a published paper [1] as reference in implementation level which will be the Default parameters of our system. In advancement we also added mode switching option which will help user to choose different types of option for different types of mushroom kind. These parameters are collected from an online blog [2] we can find all types of mushroom cultivation process. Our system will be also connected with a wifi network and if the system environment face any high intensive light it will buzz to alert the user and also send an alert notification through the internet.

[For this system prototype we have selected Oyster Mushroom & as example there are three different specific types of it in the option menu (Yellow Oyster, Tree Oyster, and Indian Oyster).]

System Functionality:

- Monitor light intensity
- Monitor temperature
- Monitor humidity
- Auto control environment Temperature & Humidity
- Sound Alert on high light intensity
- IoT notification for high light intensity
- Mushroom type selection

Component List:

1. ESP-8266 Wi-Fi module
2. Humidity & temperature sensor DHT11
3. Light sensor GY-30
4. Air Pump
5. Fan
6. Breadboard (Mini)
7. Led light (Red)
8. Resistor (1k Ohm)
9. Button
10. Buzzer
11. Relay (5V DC , 250V AC)
12. Battery Holder (AA , 4S)
13. Jumper Cables
14. Plastic Box (Prototype Surface)

Additional Library:

- BH1750 (V 1.1.4) *by Christopher Laws* [Light]
- SimpleDHT (V 1.0.12) *by Winlin*
- Adafruit Unified Sensor (V 1.0.2) *by Adafruit*
- DHT Sensor Library (V 1.3.10) *by Adafruit*

IoT Test Code:

If we want to test this virtually we can use XAMPP for creating *virtual server* and inside XAMPP's "htdocs" **folder** we have to make a "test" **folder** and inside that we have to make a **file** named "index.php".

The file path will be like: *"XAMPP\htdocs\test"* .

Then we have to copy this code and inside the "index.php" file **paste** it and start the Apache.

```php
<?php
if(isset($_POST['light_status'])) {
    $status = $_POST['light_status'];
    echo $status;
}else {
    echo "false";
}
```

[Note : Go to "cmd" and run this command "**ipconfig**" and get your IP from "IPv4 Address" section and use the IP in the device code.

String link = "http://000.000.00.00/test/";

This is the sample **"POST"** request address. We have to replace zeros with IPv4 Address & update the "link" variable in the controller.]

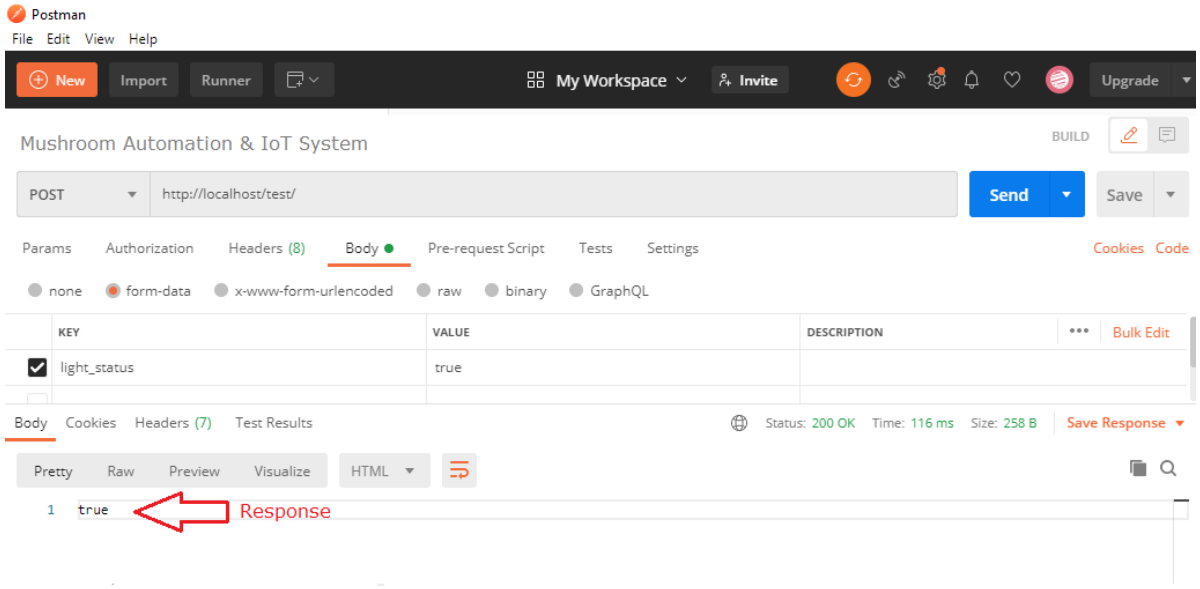
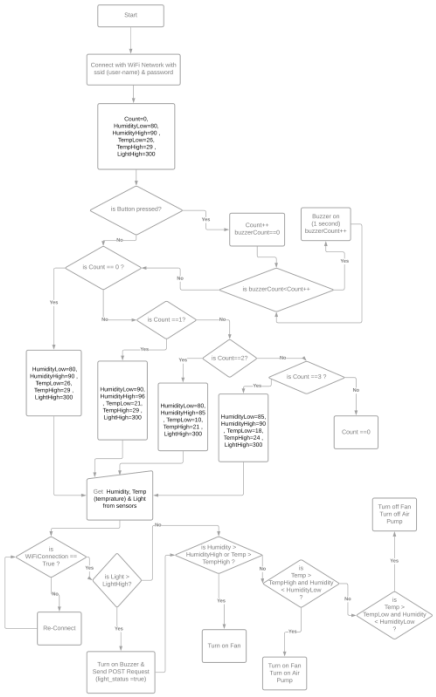


Figure: Test result of Device to Server communication with POSTMAN

Implementation Description:

- As we are making a prototype we are testing this full project in a 362.25 cubic inch plastic box (11.5 inch, 7.0 inch, and 4.5 inch).
- The temperature & humidity sensor (DHT11) is placed inside the box which sends the temperature & humidity value of the box to our controller.
- There is also a light sensor inside the box which monitors the light intensity inside the box and sends status value to the controller.
- On the top of the box the switch and buzzer is placed.
- The buzzer is used for :
    - Mode switching identification
    - Bright light intensive alarm
- The button is connected with the controller with **1k ohm** resistor.
- The button is used for Mushroom mode switching.
    - For this prototype we are using **Oyster Mushrooms**
    - This prototype will have one default ideal oyster mushroom mode
    - There will be also three more mode for
        - Yellow Oyster,
        - Tree Oyster
        - Indian Oyster mushrooms.
    - In total there will be 4 mushroom mode switching option.
- We are using 2 relays of 5V DC & 250V AC (10A)
    - 1st Relay is controlling *AC* connection for the **Air Pump**
    - 2nd Relay is controlling the power of 4 AA batteries of 1.5V DC for the *DC* **Cooling Fan**
- We are using ESP-8266 as main controller this is where all input parameters are received and processed for automation.
- ESP-8266 monitors the environment with its ***sensors*** and if needed it can control the environment temperature & humidity with its ***relay***.
- We also focused on IoT just for testing. Whenever the ESP-8266 is powered it automatically connected with available WIFI network.
- The IoT feature is only active when the light intensity is high. On that situation the device will just send a "POST" request to the server to notify the light status alert to the user.

Flowchart:



Flowchart Diagram of the system

Circuit diagram:

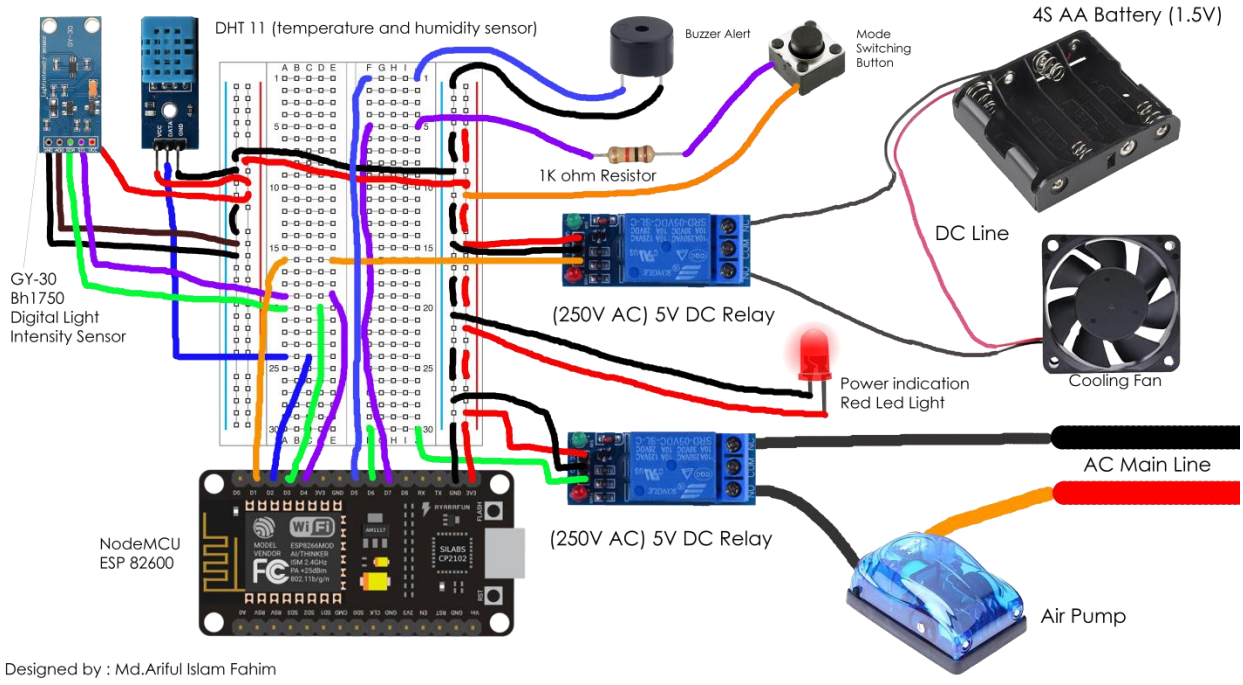


Figure: Circuit Diagram of Mushroom Cultivation Automation & IoT System

Figure: Custom switch to auto-control any AC powered machine in the system (Atomizer/Air pump)

Figure: Final Implemented Project

Reference:

[1] https://iopscience.iop.org/article/10.1088/1742-6596/1019/1/012053/pdf

[2] https://improvemushroomcultivation.com/12-important-growing-factors-mushroom-farming/