

DESIGN AND IMPLEMENTATION OF IOT BASED SMART LABORATORY

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Abstract- Internet of things (IoT) provides a platform that allows devices to be connected, sensed and controlled remotely across a network infrastructure. This work aims to develop a smart laboratory system based on IoT and mobile application technologies to monitor the overall activities of the lab including energy consumption and utilization of devices, environmental parameters via sensors, thereby providing a smart environment to with energy efficiency and comfort.

Keywords- NodeMCU IoT Sensors Adafruit IO

I. INTRODUCTION

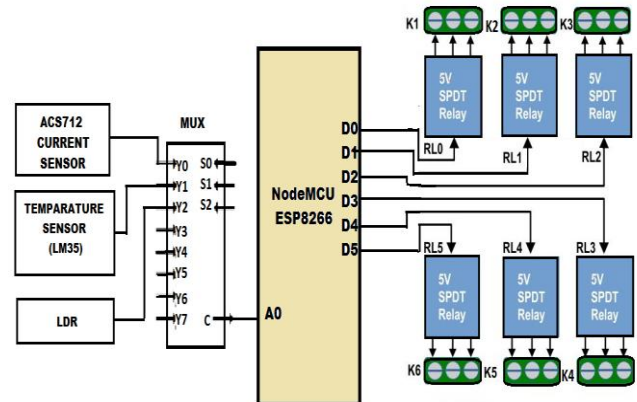
The term internet of things was coined more than ten years ago by industry researchers but has emerged into mainstream public view only more recently. Some claim the Internet of Things will completely transform how computer networks used for the next 10 or 100 years, while others believe IoT is simply hyper that. won't much impact the daily lives of most people. Internet of Things represents a general concept for the ability of network devices to sense and collect the data from the world around us, and then share that data across the Internet where it can be processed and utilized for various interesting purposes.

NodeMCU: is an open source IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi SOC from Express if Systems and hardware which is based on the ESP-12E module. The term "NodeMCU" by default refers to the firmware rather than the development kits whether your Arduino or Raspberry pi is linked to the internet over Wi-Fi, Ethernet or this new ESP8266, blink will get you online and ready for the IoT. We can make difference in 1st and 2nd version of NodeMCU Development board by their boards design and ESP modules on it.

- In 1st version of NodeMCU Dev Kit v0.9, CH341SER USB to Serial converter is used whereas in 2nd version of NodeMCU Dev Kit v1.0, CP2102 USB to Serial converter is used.
- 1st version uses ESP-12 and 2nd version uses ESP-12E (Enhanced version).



II. BLOCK DIAGRAM



It provides a platform that allows devices to be connected, sensed and controlled remotely across a network infrastructure by finding the temperature level in the lab, the fans or ac's will be ON. The temperature sensor detects the temperature in the room by using thermocouple. The thermocouple varies voltage according to the temperature and produces the signal in the form of analog signal. The current sensor by using Hall Effect measures the total current consumed by the particular device. The Light dependant resistor measures the intensity of light in the room. The LDR device upon exposed to light, its resistance decreases.

III. SYSTEM DESIGN

COMPONENTS: The system consists of following components

CURRENT SENSOR: The ACS712 Module uses the famous ACS712 IC to measure current using the Hall Effect principle. The module gets its name from the IC (ACS712) used in the module, so for your final products use the IC directly instead of the module. These ACS712 module can measure current AC or DC current ranging from +5A to -5A, +20A to -20A and +30A to -30A. You have to select the right range for your project since you have to trade off accuracy for higher range modules.

TEMPERATURE SENSOR: Thermistors are temperature sensitive resistors. The principle behind the functioning of this sensor is much like the one from the RTD, however thermistors differ from RTDs in that the material used in a thermistor is generally a ceramic or polymer, while RTDs use pure metals and, also unlike RTDs, the resistance of a thermistor decreases with increasing temperature. The temperature response is different as well; RTDs are useful over broader temperature ranges, while thermistors typically achieve a higher precision within a limited temperature range, usually $-90\text{ }^{\circ}\text{C}$ to $130\text{ }^{\circ}\text{C}$. Thermocouples are based on the Seebeck effect: two dissimilar metals bearing different temperatures, joint together at at least two different points (a reference and a measuring point) will produce electromotive force proportional to the temperature. Different metal-pairs produce different outputs. Thermocouples are not as accurate as thermistors or RTDs but can take readings of very high temperatures ranges over $2000\text{ }^{\circ}\text{C}$. They are used, for instance, in High Temperature Probes attached to ROVs when exploring hydrothermal vents.

LDR: A photo resistor or light dependent resistor is a component that is sensitive to light. This resistor works on the principle of photo conductivity. when the light falls on its surface, then the material conductivity reduces and also the electrons in the valence band of the device are excited to the conduction band. These photons in the incident light must have energy greater than the band gap of the semiconductor material. This makes the electrons to jump from the valence band to conduction. When light falls upon it then the resistance changes. Values of the resistance of the LDR may change over many orders of magnitude the value of the resistance falling as the level of light increases. It is not uncommon for the values of resistance of an LDR or photo resistor to be several mega ohms in darkness.

IV. RESULTS



Fig: Proposed type circuit



Fig: Controlling feeds of Adafruit IO

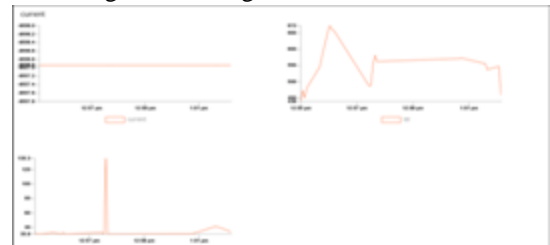


Fig: Graphical representation of data

V. APPLICATIONS

- Industrial facilities
- Manufacturing plants and warehouses
- Parking lots
- Chemical plants
- Solar farms
- Military Field

VI. CONCLUSION

In this paper the access and surveillance using IoT based smart laboratory is implemented. The lab is successfully controlled using mobile application through Wi-Fi modules and sensors. We also successfully controlled the house hold devices with the help of internet of things by Adafruit IO. By this we can reduce the man power.

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