

Control of Energy Utilization through Android Application

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Abstract: In industries, a sensor is used to monitor the energy utilization in different areas. It is important to control and optimize the energy utilization. An efficient energy management system helps to optimize energy consumption for heating, ventilation, air conditioning, refrigeration, lighting, fire systems, and security systems, ensuring that energy is used only when needed. At present the whole process was carried manually by measuring the sensor data. In this paper the basic level IoT application was implemented. It shows that through IoT data analytics, Manufacturing and business process and monitoring of machines and devices in an industry can be automated and easily communicated through SMART devices.

Keywords: Android Application, IoT , Database

1. Introduction

A data-driven process in industry requires that complex decisions are taken within short time periods, demands uncertainties to be handled according to real time data. The process, however, is difficult to model, since it involves a very large number of variables. Smart data handling is useful for such complex decisions. It includes cloud computing and storage, energy management and android application development for smart phones which helps to implement smart system.

2. Integration of Components

2.1 Modules Selection

Arduino microcontroller is selected for sensor data handling. Arduino is an open source prototyping platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a twitter message and turn it into an output activating a motor, turning on an LED, publishing something online.ESP8288 module is selected for Internet Connectivity. It is the low-cost alternative for the arduino shields. ESP8266 is relatively new and cheap in price. It has an inbuilt firmware which supports serial interface and can be controlled using AT commands. Even though this module can be used for offload functionality from another microcontroller or any other processor, this module is not just a serial to transceiver.

2.2 Arduino ESP Pinout

Connect the Arduino's 3.3V output to the ESP8266. Connect GND together. Connect the RES or RESET pin to a switch. Connect the RXD pin of the Arduino to the RX pin of the ESP8266. Connect the TXD pin of the Arduino to the TX pin of the ESP. Two things to talk to each other over serial, connect the TX pin of one to the RX of the other. Connect the GND pin of the ESP to GND and the VCC pin to the 3.3V. Connect the ESP Module and the Arduino as shown in Figure 1.

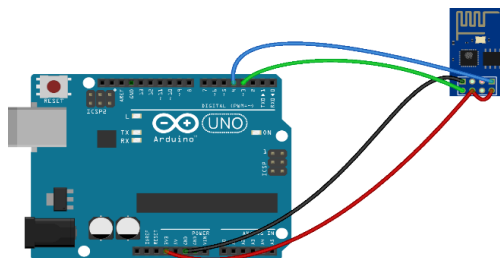


Figure 1:Arduino ESP pinout

2.3 Establish TCP Connection

ESP8266 module can be configured as a Station / Client or an Access Point. Once it the ESP8266 module is configured in either mode or both mode simultaneously it can be used to communicate with other Access Points or Clients. ESP8266 module can handle multiple connections if configured and send / receive data.

2.3.1 Configure TCP Server

AT+CIPSERVER=1

A value of 1 creates the server while 0 deletes the server in which case the module needs to be restarted. The +port can be optionally specified as a second argument otherwise the default port of 333 is used.

Table 3.1: AT Commands List

Basic	WiFi layer	TCP/IP layer
AT	AT+CWMODE	AT+CIPSTATUS
AT+RST	AT+CWJAP	AT+CIPSTART
AT+GMR	AT+CWLAP	AT+CIPSEND

3. Database Server

WAMP is a Windows OS based program that installs and configures Apache web server, MySQL database server, PHP scripting language, phpMy Admin and SQ Lite Manager. WAMP is designed to offer an easy way to install Apache, PHP and MySQL package with an easy to use installation program instead of having to install and configure everything.

3.1 Database Development

Start Wamp server and create new database in phpMyAdmin as shown in Figure 2.

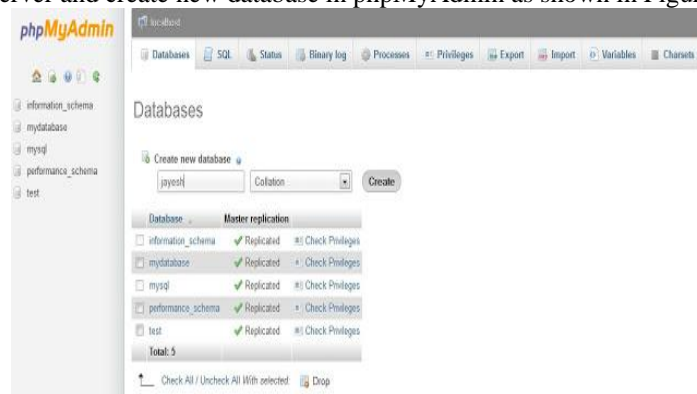


Figure 2: New database screen

Syntax used to create database is `CREATE DATABASE dbname;`

Create new table inside the database to store the data. In the SQL editor, simply type in the SQL syntax for creating tables or click create new table. Creation of new table in phpMyAdmin is shown in Figure 3.

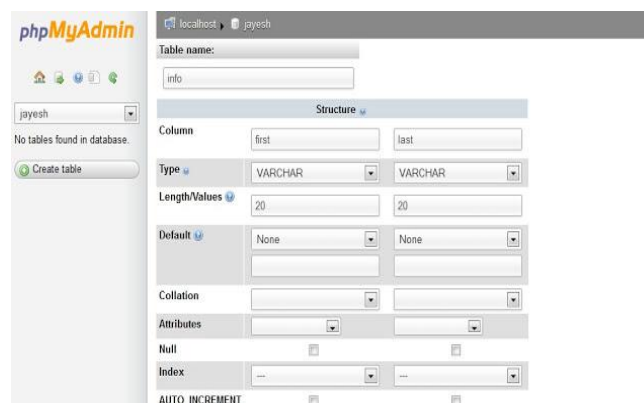


Figure 3: Database table

4. Android Application

Steps to develop the android app

- Start and configure the project.
- Select form factors and API level.
- Add an activity.
- Configure an activity.
- Develop the App.

4.1 Android Application Screen

The application screen was developed using android studio and connection was established with ESP. The random data from the ESP was read from the application. Home screen of the android application is shown in Figure 5.2.

Temperature and Humidity data is randomly set into the arduino. That data is sent to the database through ESP. The data in the database is read by using php script and it is sent to the android application. The data in android application was read and it can be stored for future analysis.

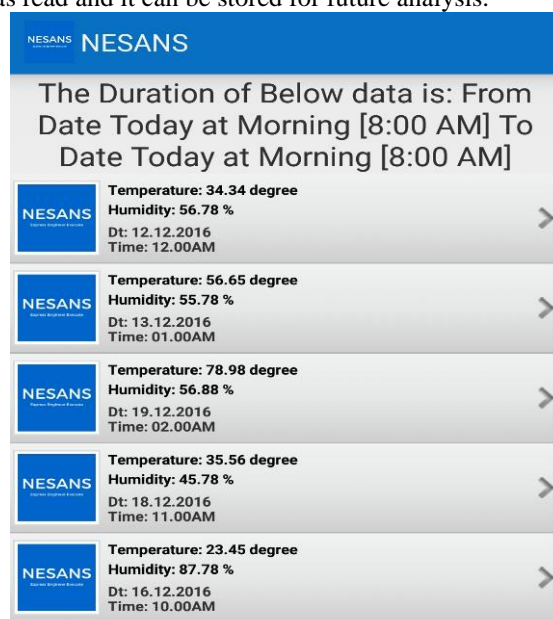


Figure 4: Android App home screen

5. Conclusion

The Internet of Things (IoT) has undergone rapid transformation nowadays. Since the variety and the number of devices connected to the Internet has increased exponentially in recent years, IoT has become a mainstream technology with a significant potential for advancing the lifestyle of modern societies. This system has got wide scope because of its low cost, smartness and high efficiency of the data and management. The project is found to have vast scope in the near future due to its low cost and high need in all industries which needs energy management and Internet of Things (IoT). The future work involves concepts of data analytics and database management.

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