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Electrical Appliances Control and Automation Using Wi-Fi

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ABSTRACT: The Internet of things is the inter networking of physical devices, vehicles, buildings, and other items embedded with electronics, software, sensors, actuators, and network connectivity that enable these objects to collect and exchange data. In 2013 the Global Standards Initiative on Internet of Things defined the IOT as "the infrastructure of the information society. The IOT allows objects to be sensed and or controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit in addition to reduced human intervention.

In this project, we will be using the aid of various types of relays and sensors to control all the electrical appliances of an office room such as fans and tube lights from any point in a room. Wi-Fi technology will be interfaced with android application, the application allows us to control the electronic equipment. The application uses Wi-Fi technology to transmit data to the receiver section where microcontroller is placed. The recorded values and preloaded actions will determine control of the flow of power. At the receiving end, the data will be transmitted to a processor which analyses the received local variables and sends the same data to the relays which will perform the corresponding action. Thus, the entire control of the appliances of the staff room will be present at single place and can be controlled easily.

KEYWORDS: Arduino controller, Wi-Fi Technology, android application, IOT.

I. INTRODUCTION

The major component of this system is the Arduino microcontroller which controls the entire part of it. In the transmitter section, a mobile app is designed in such a way that it transfers unique characters each time when a button is pressed. The app needs to be connected to the Wi-Fi module present at the receiver section to control the switches. Every time when a button is pressed, the pre-coded unique character is sent to the Arduino through the Wi-Fi module. The Arduino microcontroller after receiving the character, checks for the presence of the received unique character in the coded program. If such character is present, the corresponding action is triggered. The action that is set upon receiving a unique character from the mobile app is the switching of relay. The T-Shape relay that is being used in the project is triggered and internal relay circuit is closed. Once the circuit is closed, the current flows and switches the electronic/electrical equipment on.

For breaking the circuit i.e. switching the equipment off, the user needs to press the same button in the provided mobile app. Upon pressing the same button for the second time, a different character from the previous one is sent and the same is received.

The same action i.e. checking for the presence of the received character is done and corresponding pre-coded action is performed.

Thus, this system provides an efficient way of controlling the staff room equipment.

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II. BLOCK DIAGRAM

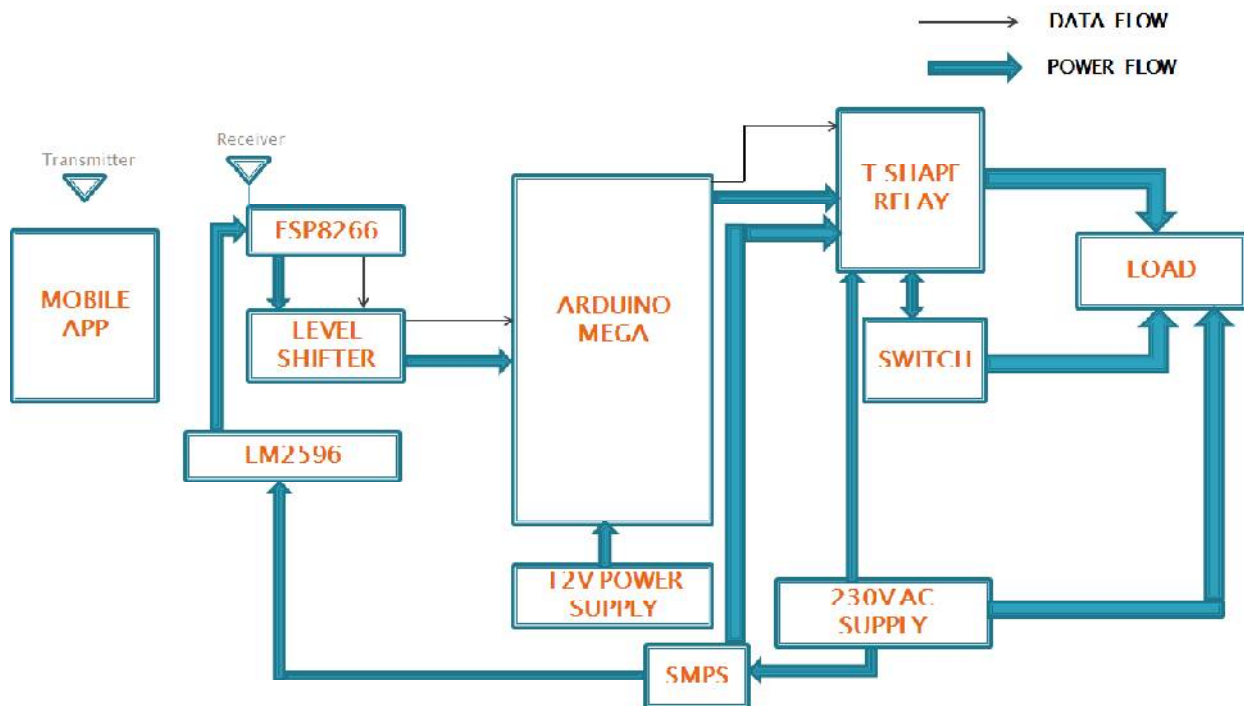


Fig 1. Block Diagram

The Arduino microcontroller is an easy to use yet powerful single board computer that has gained considerable traction in the hobby and professional market. The Arduino is open-source, which means hardware is reasonably priced and development software is free. This guide is for students in ME 2011, or students anywhere who are confronting the Arduino for the first time. For advanced Arduino users, prowl the web; there are lots of resources. The Arduino project was started in Italy to develop low cost hardware for interaction design. An overview is on the Wikipedia entry for Arduino. The Arduino home page is <http://www.arduino.cc/>. The Arduino hardware comes in several flavors. In the United States, Sparkfun (www.sparkfun.com) is a good source for Arduino hardware.

This guide covers the Arduino Mega board, a good choice for educators. With the Arduino board, you can write programs and create interface circuits to read switches and other sensors, and to control motors and lights with very little effort. Many of the pictures and drawings in this guide were taken from the documentation on the Arduino site, the place to turn if you need more information.

The Arduino Mega is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins (of which 14 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Mega is compatible with most shields designed for the Arduino Duemilanove or Diecimila. The Mega 2560 R3 also adds SDA and SCL pins next to the AREF. In addition, there are two new pins placed near the RESET pin. One is the IOREF that allow the shields to adapt to the voltage provided from the board. The other is a not connected and is reserved for future purposes. The Mega 2560 R3 works with all existing shields but can adapt to new shields which use these additional pins

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The Arduino programming language is a simplified version of C/C++. If you know C, programming the Arduino will be familiar. If you do not know C, no need to worry as only a few commands are needed to perform useful functions.

An important feature of the Arduino is that you can create a control program on the host PC, download it to the Arduino and it will run automatically. Remove the USB cable connection to the PC, and the program will still run from the top each time you push the reset button. Remove the battery and put the Arduino board in a closet for six months. When you reconnect the battery, the last program you stored will run. This means that you connect the board to the host PC to develop and debug your program, but once that is done, you no longer need the PC to run the program.

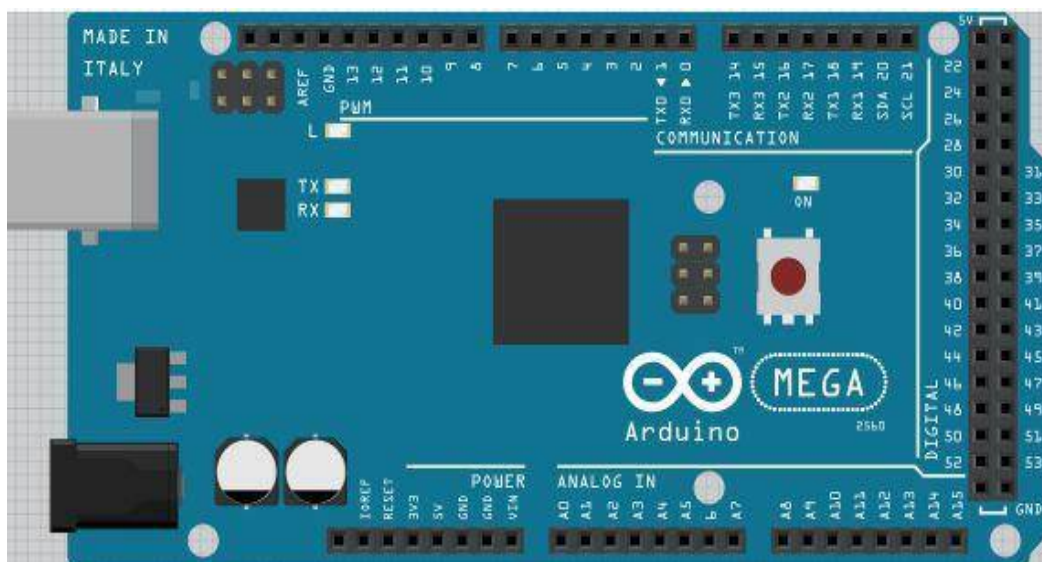


Fig. 2 Arduino Mega

III. WIRELESS PROTOCOLS USED IN RF MODULES:

RF modules, especially SoC modules, are frequently used to communicate according to a pre-defined wireless standard, including:

- S-WAVE Smart Wave
- Zigbee
- Bluetooth low energy
- **Wi-Fi** – Wi-Fi Module ESP 8266 is being used in the project.
- IEEE 802.15.4
- Z wave

IV. FEATURES OF Wi-Fi MODULE

- 802.11 b / g / n
- Wi-Fi Direct (P2P),

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- soft-AP Built-in TCP / IP protocol stack
- Built-in TR switch, balun, LNA, power amplifier and matching network
- Built-in PLL, voltage regulator and power management components
- 802.11b mode + 19.5dBm output power
- Built-in temperature sensor Support antenna diversity off leakage current is less than 10uA Built-in low-power 32-bit CPU: can double as an application processor
- SDIO 2.0, SPI, UART STBC, 1x1 MIMO, 2x1 MIMO A-MPDU, A-MSDU aggregation and the 0.4 Within wake 2ms
- connect and transfer data packets standby power consumption of less than 1.0mW (DTIM3)



Fig.3 ESP8266 module

V. INSTALLING ANDROID STUDIO

Google has made installing Android Studio as simple as possible. We have to visit the Android Studio page and download the installer for our platform. Supported platforms include Windows, Mac OS X, and Linux. By following the installation instructions for the particular platform the installation of the application is made easy.

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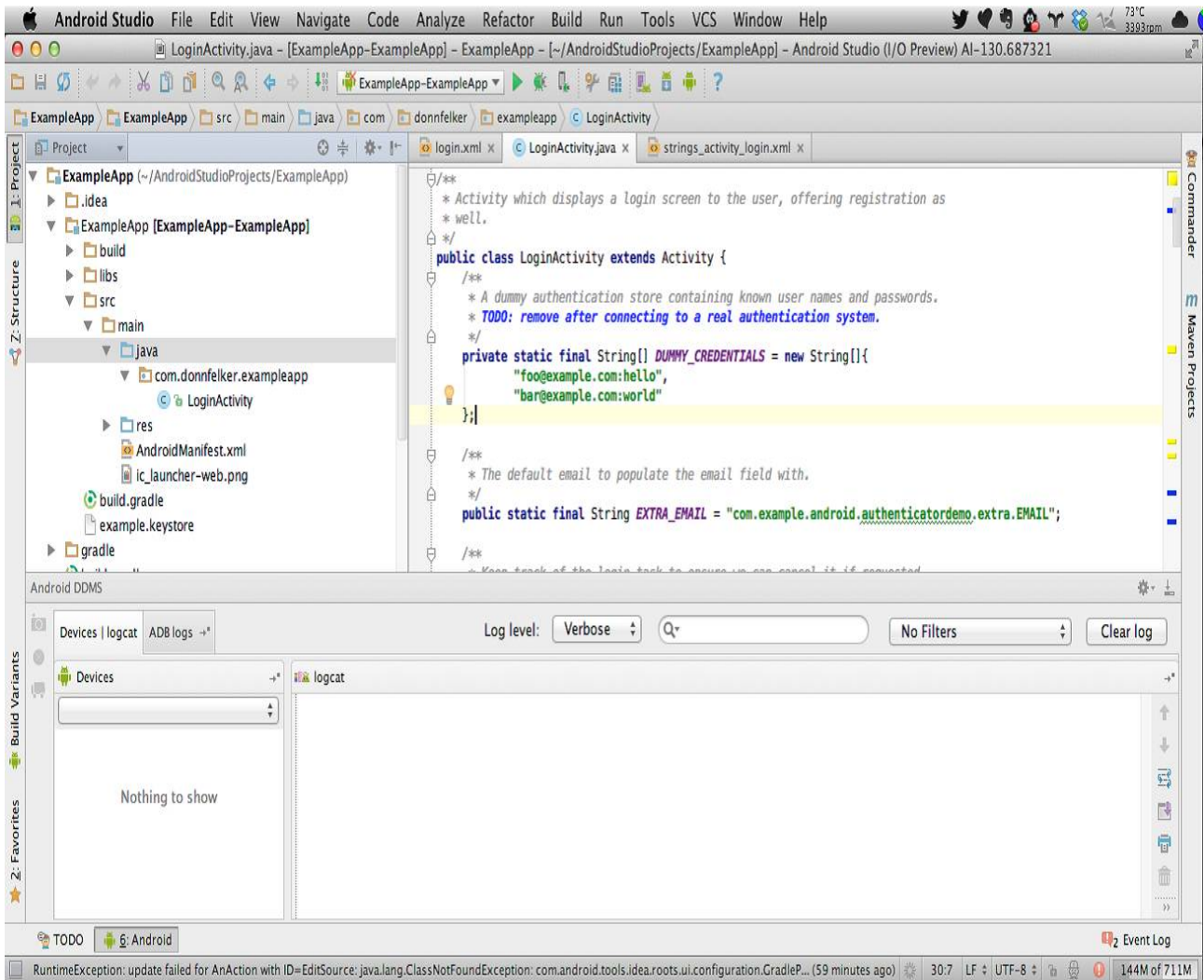


Fig. 4 Android Studio with the Editor, Project, and Android panels.

VI. GENERATING AN APK

Generating an APK in Android Studio is a snap. Follow these steps:

1. Select Generate Signed APK from the Build menu. This will display the Generate Signed APK Wizard.
2. Select the module and click Next.
3. Either supply the path to of keystore that we currently using for our Android application, or create a new keystore.
5. Click Next.
6. At this point you can define the destination for our APK. You can also specify whether you'd like to run ProGuard (described in "ProGuard" on page 141), and where the ProGuard configuration file is located.
7. Click Finish and our APK will be generated in the destination folder

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VII. HARDWARE AND RESULTS

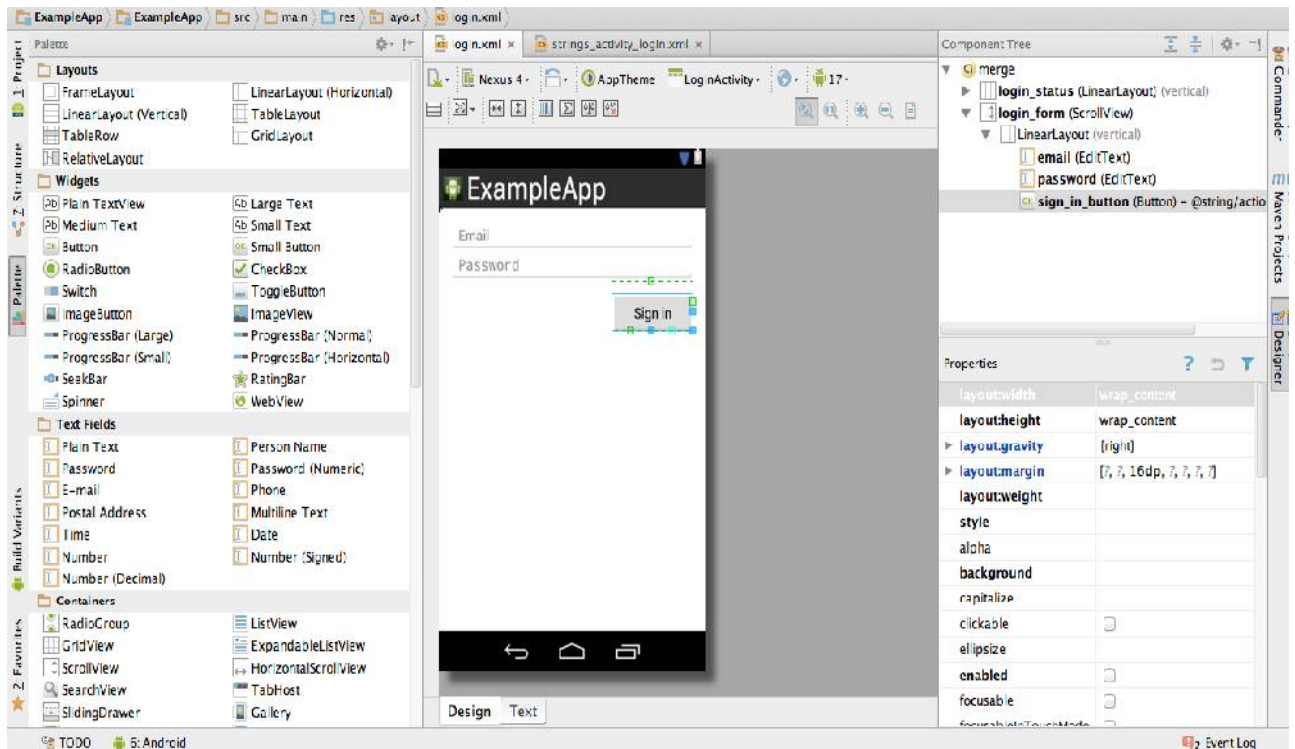


Fig. 5 The Android Layout Designer



Fig. 6 Assembled Hardware and connections



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VIII. CONCLUSION AND FUTURE WORK

a. Applications:

- Real time use for staff room electronic control
- Can be operated in small-middle scale industries
- Can be easily modified for full scale office & staff room automation.

b. Advantages:

- Control of electronic appliances using single switching system.
- Heavy duty switching using bigger relays for large appliances.
- Fool proof switching control technique.

c. Conclusion:

Thus, using the latest advancements in the IOT-Automation sector, the project can be configured to real time usage by wiring the relays where it can centralize the switching control of office room equipment by app in hand and hassle free installation and app convenience is added advantage.

d. Future scope:

This project is aimed at real time control for staff room of the college. Status monitoring can be included in the application by interfacing trans-receivers at each electronic appliance but it is very expensive. Potentiometers can be added to the circuit to control the intensity of fan speed and light brightness.

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