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Residential and Official Extension of IOT Enabled Building Automation System

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ABSTRACT

This project aims at achieving automation using the widely used mobile operating system ANDROID i.e. android operating system. The electrical and office appliances can be controlled using the android mobile phones and Internet of things (IoT) even if you are out of your house and you forgot to switch off the appliances. Many electrical and office appliances like light, fan, air conditioner etc., can be controlled using the android operating system. This proposed system is implemented in order to overcome the drawbacks of the previous methodologies. This can also be implemented at homes also. Office automation is the residential extension of building automation. Office automation may include centralized control of lighting, HVAC (heating, ventilation and air conditioning), appliances, to provide improved convenience, comfort, energy efficiency and security. Office automation for the elderly and disabled can provide increased quality of life for persons who might otherwise require caregivers or institutional care.

Keywords: IoT, Android, Automation.

1. INTRODUCTION

An embedded system is a computer system designed for specific control functions within a larger system; it can easily interface with real-time computing constraints. It is embedded as part of a complete device often including hardware and mechanical parts as well as software parts. By contrast, a general-purpose computer, it is designed to be flexible and to meet a wide range of end-user needs. Since the embedded system is dedicated to specific tasks, design engineers can optimize it to reduce the size and cost of the product and increase the reliability and performance. The main technology used here for wireless communication with the Office appliances and user is Internet of things. Internet is the wireless technology. It can be used to share a data between two ends such as transmitter as well receiver as well to transfer the commands between them. The IoT module will be connected with the micro-controller and the commands to the Office appliances from the user will be given through the android application.

2. IMPLEMENTATION SETUP

Components required,

1. Arduino node MCU
2. Accessible Wifi
3. Relays for connecting home appliances
4. Smart phone as a transmitter
5. Arduino genuino (Software).

2.1. ARDUINO NODE MCU

Node MCU is an open source IoT platform. It includes firmware which runs on the ESP8266Wi-Fi SoC from Express if Systems, and hardware which is based on the ESP-12 module. The term "Node MCU" by default refers

to the firmware rather than the dev kits. The firmware uses the Lua scripting language. It is based on the eLua project, and built on the Express if Non-OS SDK for ESP8266.

2.2. ACCESSIBLE WIFI

In order to provide the internet or cloud connection to the node MCU we need to provide an accessible WiFi or hot spot to the in-built wifi module of Arduino node MCU.

2.3. RELAYS

The 4-Channel Relay Driver Module makes it simple and convenient to drive loads such as 12V relays from simple 5V digital outputs of our Arduino compatible board or other micro-controller. We can use any of the control channels independently, so simply leave any unused channels disconnected.

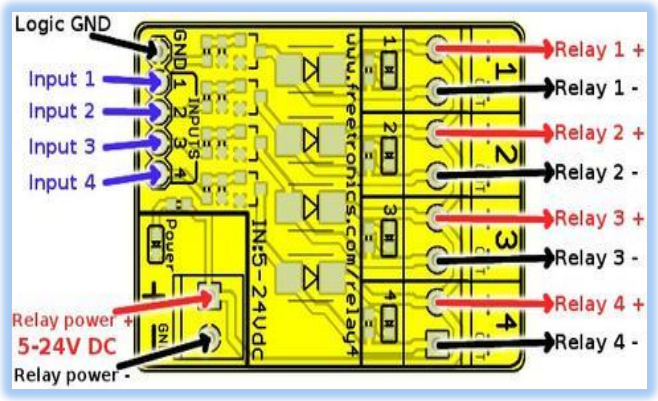

Figure.1 Channel relay

2.4. SMART PHONES AS TRANSMITTER

Using the android smart phones as a transmitter is a wise solution because it provides easy appearance and user friendly too. It provides a simplified process of controlling the office appliances. But we cannot directly control the office appliances which are connected to the cloud network, for that purpose we need an Android application.

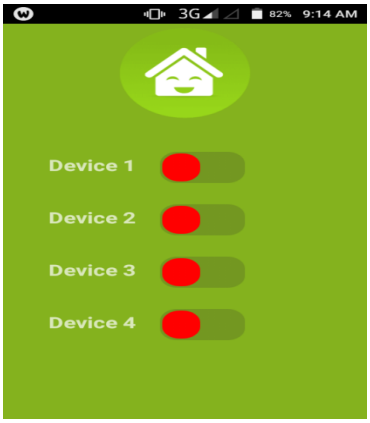

Figure 2 Android applications

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2.5. ARDUINO GENUINO I.D.E

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them.

3. SYSTEM MODEL

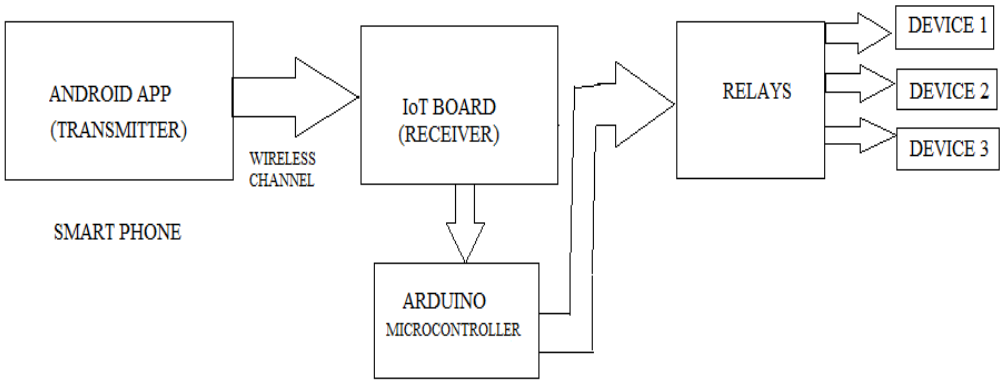

Figure 3 IoT block diagram

Here the android application can be used as a transmitter and the mobile phone and arduino micro controller connected wirelessly. IoT board receives the signal from the android app and gives that to the microcontroller. Microcontroller gives that signal to ON the relays.

3.1. FEATURES

1. Uses 3G modem or Quad band GSM cellular modem.
2. Can be used as an IoT gateway.
3. Two modes (a) Alarm reporting mode (b) Continuous monitoring mode.
4. Battery low reporting through SMS and/or GPRS.
5. Output relays can be controlled through SMS and/or GPRS. Latching relays are used to preserve state in case of power failures.
6. Buzzer on and off control remotely through SMS and/or GPRS.
7. Analog inputs alarms are sent when condition is satisfied (voltage exceeds certain threshold or goes below certain threshold including hysteresis).
8. All inputs (digital + analog) & output status periodic reporting configurable for every x seconds over SMS and/or GPRS.
9. Dual SIM capability, the 2nd SIM will be used as backup in case there is no connectivity using the 1st SIM.
10. Has an I2C bus connector to optionally connect to an external temperature/humidity sensor and monitor the same.

11. Optional RS232/RS485 interface for monitoring and reporting external RS232/RS485 based sensors & equipment like Energy meters, Tilt sensors, accelerometers, Fuel or liquid level sensors, Weight/Pressure sensors, Vibration sensors etc.
12. All configurations can be done through SMS. Optionally USB can be used for configuring the device also.

4. IMPLEMENTATION SETUP

Figure 4 IoT implementation setup.

Here we are having two modes of operations such as manual as well as automatic mode of operation. During the manual mode we can directly ON and OFF the off the appliances, similar to that during the automatic mode of operation we can control the office appliances from anywhere. The outputs are,

1. Device ON

2. Devices ON

3. Devices ON

4. Devices ON

Figure 5 Outputs

4.1. APPLICATIONS

1. IoT Gateway / Machine to machine (M2M) hardware
2. Reports the states of analog/digital inputs & also RS-485 modbus slaves over internet or SMS.
3. GPRS/3G/SMS based Remote Alarm Monitoring & Reporting.
4. Energy/Power monitoring.
5. Remote Temperature/Humidity monitoring.
6. Remote Water & Liquid level monitoring & control.

5. CONCLUSION AND FUTURE ENHANCEMENT

It is very satisfying to implement this project and see its function. The specification is met and goals have been achieved. The system developed automation based on internet of things, is an alternative that can be used to help people with various worst technologies. Likewise with this set of solution the aim is to improve the quality of life of people, not just monitoring the devices, but also to enable direct them to improve their efficiency.

The context model developed for the system prove to be the efficient when making inferences related to the context, such as recommendations for taking measures through sensors as well as the workout routines tips to improve the power saving capability as well improved performances .In this paper we try to compare the existing methods for ensuring the automation methodologies.

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