

# RTOS Based Energy Management System

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**Abstract-** The room is easily controllable with an automatic mode and manual mode of a home device and Manage through RTOS. The room having automatic standby power cut-off outlets, a Light, and a Arduino hub. The Arduino has a code learning function and educates the automatic control signal of a home device connected to the power outlet. Then the power outlet sends the lighting the room can be controlled with an automatic control. Normally automatic standby power cut-off outlet has a waiting time before cutting off the electric power. This standby power it consumes during that time. To reduce the waiting time, simultaneously we turn off the home device and the power outlet with an automatic Control through the Arduino processor. This method actively eliminates the standby power. The proposed design provides easy way to manage, control and monitor the home devices through Arduino processor and RTOS. When a home device is moved to the Different outlet, the total energy in formation of the home device is kept consistently and seamlessly regardless of location change.

## I. INTRODUCTION

To fulfill our society's ever demanding energy needs we have to effectively manage our current energy consumption. One way to accomplish this is by using real time operating system so that residential energy consumption can be effectively reduced. As more and more home appliances and consumer electronics are installed, residential energy consumption are grow rapidly. A large number of these home devices increase power consumption in two aspects, standby power mode and normal operation power mode. Those two kinds of power consumption are proportional to the number of home devices installed. As a result, operational cost in home area is also increasing. Standby power is electricity used by appliances and equipment while they are switched off or not performing their primary function. As around 10 % of a total household power is consumed during standby power mode, the standby power reduction is greatly contributing to reduce and manage the electricity cost in home. Normal operation power of home devices is also important to reduce the energy cost in home. Home appliances and consumer electronics account for about 27 % of home energy consumption. Therefore, the products with ENERGY STAR label are recommended to minimize the cost of operating the products during their lifetime.

## II. METHODOLOGY USED BY PREVIOUS RESEARCHER

### 1]. Bluetooth Based Home Automation

The system Bluetooth technology is secured and low cost. It makes use of an Arduino Bluetooth board. An interactive python program is used in the cell phone to provide the user interface. The I/O ports of the Bluetooth board and relays are used for interfacing with the devices which are to be controlled. The Bluetooth is password protected to ensure that the system is secure and not misused by any intruders. The Bluetooth has a range of 10 to 100 meters, 2.4 GHz bandwidth and 3Mbps speed. The python app on the phone is portable. It is also a fast and cost effective system. There is a diagnostic system that can detect problems in the circuitry. A feedback system will report status of devices after every signal toggle. The main drawback with respect to Bluetooth is that it takes a long time to discover and access devices in its vicinity. It does not provide energy conservation tips. Real time access cannot be achieved. Anywhere access to the devices cannot be achieved. Access is limited to within the Bluetooth range.

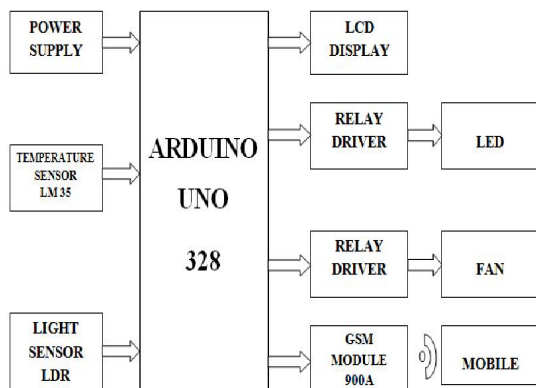
## III. METHODOLOGY USED IN PROPOSED SYSTEM

### 1]. GSM based Home Automation System

The system proposed in [1] provides 3 means to control the home: the GSM network, the Internet and through speech. The real time monitoring has been an important feature that can be used in the home automation systems. As a change in the status of the devices occurs, the user can be informed in real time. The user commands are transferred to a server which is usually done by a PC. The server processes the user commands and sends them to the relevant units. This can help control the appliances. GSM is used as a communication medium to help establish connection in places where there may not be proper internet connectivity. The server uses AT commands to communicate with the GSM modem. The mobile interface is developed using J2ME. The server has 4 engines running – the web server, database, main control program and speech recognition program. The system can be controlled using SMS. It can send confirmation messages. Speech processing is done with a dynamic time wrapping

algorithm. The voice activation has been tested and found to be too

**IV. BLOCK DAIGRAM**



BLOCK DIAGRAM OF PROPOSED SYSTEM

**Hardware Description-**

1) ARDUINO UNO:

The Arduino Uno is a 8 bit microcontroller board based on the ATmega328. It has 14 digital pins and 6 analog pins and other power pins such as, GND, VCC, It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, and a reset button. It has SRAM 2kb and flash memory 32kb. EEPROM with 1KB. Arduino is open source hardware board with many open source libraries to interface it on board microcontroller with many other external components like LED, motors, IR sensors and many other things one want to interface with Arduino board. Arduino is a complete board which includes all things to connect with external peripheral and to program through computer. It contains everything needed to support the microcontroller. We either need to connect it to a computer using a USB cable or power it with an AC-to-DC (7-12v) adapter. The Arduino circuit acts as an interface between the software part and the hardware part of the project. The Arduino Uno can be powered via the USB connection or with an external power supply. RX and TX LEDs on the board will flash when data is being transmitted via the USB-to-serial chip and USB connection to the computer The Arduino Uno has a resettable poly fuse that protects your computer's USB ports from shorts and over current. Although most computers provide their

Feature

32 x 8 General Purpose Working Registers

Two 8-bit Timer/Counters with Separate Pre-scalar and Compare Mode Up to 64 sense channels. 8-channel 10-bit ADC in TQFP and QFN/MLF package. Power-on Reset and Programmable Brown-out Detection 1KBytes EEPROM

2.) GSM Sim 900A

Unlike mobile phones, a GSM modem doesn't have a keypad and display to interact with. It just accepts certain commands through a serial interface and acknowledges for those. These commands are called as AT commands. There are a list of AT commands to instruct the modem to perform its functions. Every command starts with "AT". That's why they are called as AT commands. AT stands for attention. In our simple project, the program waits for the mobile number to be entered through the keyboard. When a ten digit mobile number is provided, the program instructs the modem to send the text message using a sequence of AT commands.

The GSM modem can be tested by connecting it with a PC. The modem is equipped with a RS232 cable. Just use a Serial to USB converter and connect it with the PC. Now you can proceed with sending the commands to the modem using any serial communication program like HyperTerminal, minicamp etc. Ensure the serial parameters are configured to 8N1 and the baud rate is set to 9600bps.

Features

Dual band GSM/GPRS 900/1800MHz. Configurable baud rate. SIM card holder.

4). TEMPRETURE SENSOR:

The LM35 can be connected easily in the same way as other integrated circuit temperature sensors. It can be stuck or established to a surface and its temperature will be within around the range of 0.01 °C of the surface temperature. This presumes that the ambient air temperature is just about the same as the surface temperature; if the air temperature were much higher or lower than the surface temperature, the actual temperature of the LM35 die would be at an intermediate temperature between the surface temperature and the air temperature.



Figure Of Tempreture Sensor

**Features and Benefits:**

- 1) Linear + 10-mV/°C Scale Factor.
- 2) 0.5°C Ensured Accuracy (at 25°C)
- 3) Rated for Full -55°C to 150°C Range.
- 4) Suitable for Remote Applications.
- 5) LDR SENSOR:

A **light dependent resistor** works on the principle of photo conductivity. Photo conductivity is an optical phenomenon in which the materials conductivity is increased when light is absorbed by the material. When light falls i.e. when the photons fall on the device, the electrons in the valence band of the semiconductor material are excited to the conduction band. These photons in the incident light should have energy greater than the band gap of the semiconductor material to make the electrons jump from the valence band to the conduction band.



Figure Of Ldr Sensor

- 1) LDR's are cheap and are readily available in many sizes and shapes.
- 2) Practical LDRs are available in a variety of sizes and package styles, the most popular size having a face diameter of roughly 10 mm.
- 3) they need very small power and voltage for its operation.

**V. CIRCUIT DAIGRAM**

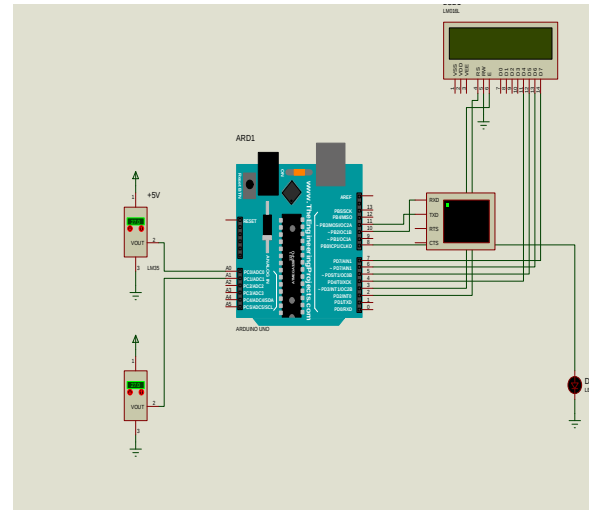


Fig.Circuit Daigram Of System

**FLOWCHART**

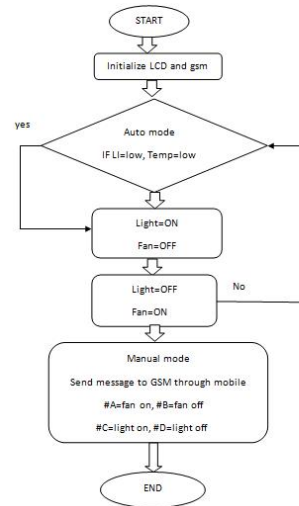


Fig Flowchart Of The System

**VI. CONCLUSION**

We proposed the Energy efficient RF communication and RF remote controls designed by using CC2500. The configured ARM network is composed of the home server, the ARM hub, and the power outlets and light. The home server is a central control unit. The power outlets and the light are the sensor nodes. The home server can manage the power outlets and the light through the ARM hub. The ARM hub with RF code learning function enables a user to control the power outlets and the light with an RF remote control. Furthermore, we actively reduce standby power consumption by turning off a home device and the power outlet simultaneously through the ARM hub. This method eliminates the waiting time of a typical automatic power cut-off outlet.

## REFERENCES

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