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EFFICIENT POWER MANAGEMENT SYSTEM USING IOT

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Abstract: Internet of things is a growing network of everyday object-from industrial machine to consumer goods that can share information and complete tasks while you are busy with other activities. Wireless Home Automation system(WHAS) using IoT is a system that uses computers or mobile devices to control basic home functions and features automatically through internet from anywhere around the world, an automated home is sometimes called a smart home. In this paper we are using Arduino mega and Node MCU is used for server to control different appliances. The system will automatically based on the sensor data. The system is designed to be low cost and expandable allowing a variety of devices to be controlled.
Keywords – Automation, Iot, Arduino, MCU.

INTRODUCTION

Homes of the 21st century will become more and more self-controlled and automated due to the comfort it provides, especially when employed in a private home. A home automation system is a means that allow users to control electric appliances of varying kind. Many existing, well-established home automation systems are based on wired communication [1]. This does not pose a problem until the system is planned well in advance and installed during the physical construction of the building. But for already existing buildings the implementation cost goes very high. In contrast, Wireless systems can be of great help for automation systems. With the advancement of wireless technologies such as Wi-Fi, cloud networks in the recent past, wireless systems are used every day and everywhere. In this paper we use bi directional concept to know the number of people entering a room and when some one is present in the room lights and fan are ON, the appliances works on the basis of sensor data (data measured using sensors) [2]. When the rooms are empty the lights and fans are turned OFF. Thus there is no power loss also when people tend to forget about lights and fans which happen these days thus saving a lot of power [3]. There is wide research and development in this area trying to take maximum advantage of this technology and in coming years many new appliances and research areas will continue to appear [4]. In a developing country like ours lots of latest technologies that has been developed such as Bluetooth Wi-Fi etc. These technologies can be adopted to improve our daily routines so that our life becomes more comfortable and easy [5].Even in hospitals these self-automation technology needs to be implied where the appliances need to be controlled according to climatic factors (regulation of fans etc on temperature) is a helpful way for different patients [6]. Also the proper implementation is cost effective and helps in conservation of power [7-8].

BLOCK DIAGRAM

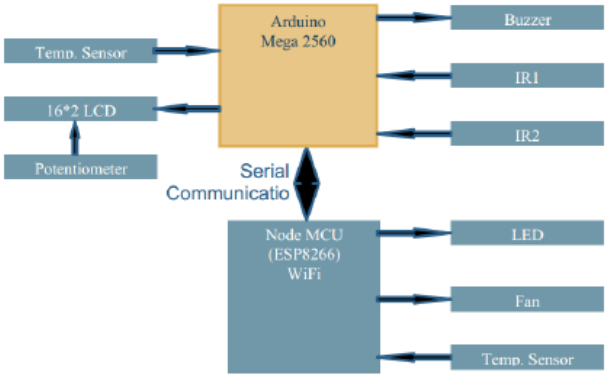

Fig.1 Block-Diagram of Energy Management system using IoT

Block diagram as shown in fig.1, consists of Arduino Mega 2560, It is a microcontroller board based on the ATmega2560. NodeMCU, It is an open source IoT platform. DHT11 Humidity TempSensor, It is a basic, ultra low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air. LCD, It is a flat display used in digital watches, cameras and many portable computers.LCD displays utilize two sheets of polarizing material with a liquid crystal solution between them.48000RPM Coreless Motor, Coreless dc motors, also known as slot less, ironless, basket wound, or cup motors, offer numerous.

OPERATION AND WORKING

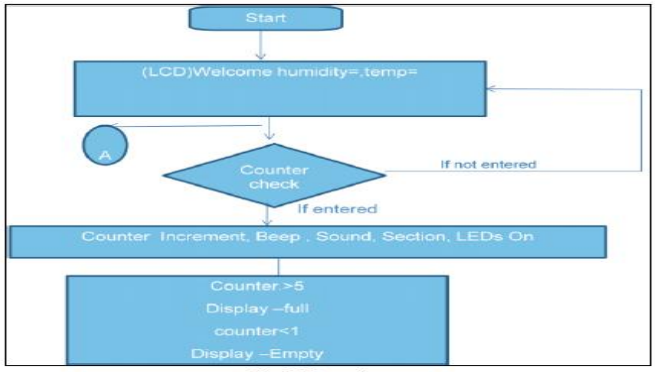

Fig.2 Flow chart

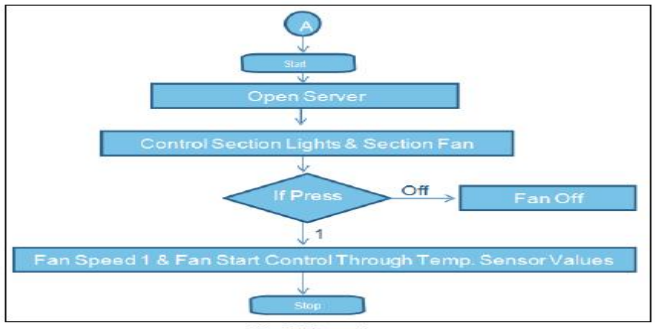

Fig.3 Flow chart

Operation and working is represented through flowchart as shown in fig.2 & fig.3.

HARDWARE SPECIFICATION

Hardware specification for Microcontroller is shown in table1.

Microcontroller	ATmega2560
OperatingVoltage	5V
InputVoltage	7-12V
Input Voltage(limits)	6-20V
DigitalI/OPins	54 (ofwhich 15 providePWM output)
Analog InputPins	16
DCCurrentperI/Opin	20 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	256 KB of which 4 KB used by boot loader
SRAM	8 KB
EEPROM	4 KB
Clock Speed	16 MHz

Table1: Specification for Microcontroller

Feature of Arduino at a Glance is listed in table2

Property	Description
Voltage	3.3 V (3.0 -3.6 V tolerated)
Current	10 uA-500 mA (64 mAaverage)
Processor	TensilicaL106 32 bit
ProcessorClock	80-160MHz
RAM	32K +80K
Storage	Flashmemory,16MBmax(512K-4MBoftenprovided)
GPIOs	17 (multiplexed
ADC	1 (10bit)
WiFi	802.11 support b/g/n/d/e/i/k/r
TCPConnections	Max: 5 concurrent

Table2: Specification of Arduino

TECHNICAL SPECIFICATION

- 3 to 5V power and I/O
- 2.5mA max current use during conversion (while requesting data)
- Good for 20-80% humidity readings with 5% accuracy
- Good for 0-50°C temperature readings ±2°C accuracy No more than 1 Hz sampling rate (once every second)
- Body size 15.5mm x 12mm x 5.5mm
- 4 pins with 0.1" spacing

PRODUCT DESCRIPTION

Product description is listed in table3.

Table3: Specification of Product

BodySize	7x16 mm
Shaft Size	0.8x5 mm
RatedVoltage	3.7 V
Current	0.1 A
MaxSpeed	50000 RPM
Wire Length	5cm /3"
Main Color	Silver Tone

SOFTWARE SPECIFICATION

The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. It runs on Windows, Mac OS X, and Linux. The environment is written in Java and based on Processing and other open-source software. This software can be used with any Arduino board.

APPLICATIONS

1. In case of lighting control, it is possible to conserve energy in both residential and commercial applications by automatically controlling intensity of light depending on the presence of anyone inside the room.
2. It could be useful for old aged/especially able people as appliances can be controlled by merely a touch. It is also possible to control the system using voice commands using Android. It is safe because there is no chance of getting electric shock
3. Security system has motion sensors that will detect any kind of unapproved movement and alert the user through the alarm and via web page.
4. Security cameras can be installed which will monitor the premises, allowing the user to observe activity around the house.

ADVANTAGES & DISADVANTAGES

- Advantages
  - It is a robust and easy to use system.
  - There is no need for extra training of that person who is using it.
  - All the control would be in your hands by using this home automation system.
  - This project can provide the facility of monitoring all the appliances with in the communication range through Bluetooth.
  - The schematic of Arduino is open source, for the future enhancement of the project board can be extended to add more hardware's.

- Disadvantages
  - Bluetooth is used in this home automation system, which have a range of 10 to 20 meters so the control cannot be achieved from outside this range.
  - Application is connected after disconnect of the Bluetooth.
  - When the new users want to connect, first download application software and then configuration must be done.
  - High power consumption because of Bluetooth connectivity

CONCLUSION

The main motivation behind this work of a EMS in a micro-grid is to achieve a higher energy efficiency, to maximize of the return on investment of the solar panels, to maximize the utilization of the RE and finally to minimize the dependency on the power provided by the utility company. This paper doesn't only focus only on the theoretical aspects of the EMS but it did yield concrete hardware prototypes. A case study analysis was done for a chosen typical home. After the cost analysis, we can conclude that renewable energy use is still difficult to implement in the context because of the limited resources in terms of materials needed.

The first part of the product consisted of monitoring and control of appliances in an Energy Management System. The first phase was the collection of data from sensors. After that, make sure that there is both way communication between the sensors and the gateway. The last phase, data must be transmitted to the database through the Wi-Fi.

FUTURE SCOPE

In the context of the EMS, a number of future projects could be undertaken to complete and enhance this capstone product.

The implementation of the sensing network using both a current sensor and a voltagesensor along with adding sensors (i.e.: humidity, motion, gas…).

Second, the deployment of the system in a sample of households to generate a consumption profile.

Third, enhancing privacy and security of the data communicated within the system.

Fourth, Enhancing the system's intelligence by using optimization algorithms.

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