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IoT BASED AUTOMATION SYSTEM

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ABSTRACT

Energy is a very important aspect for any household, industries, Environment agriculture and so. Managing the energy efficiently and conserving it intelligently for appliances is very much important. The energy usage is directly affected with Coal, oil and so towards power generation. Towards this, there has been lot of research work carried out in developing some smart lighting system pertaining to classroom for conserving the energy. In one another research, researchers have developed Android based Smart home system for monitoring the usage of power to avoid any kind of anomaly. In none of the research, researchers have worked towards automating the appliance control towards conserving the energy. Most of them concentrate on controlling the appliances using android devices. So with the upcoming of machine to `machine communication where devices can be connected wirelessly leading to IoT, we here have developed an IoT based Smart Energy Conservation system where appliances like Fan and Bulb to start with are controlled wirelessly based on humidity and light intensity information. These inputs are used towards controlling the appliances intelligently rather than just switching on or off. In addition the system also keeps computing throughput the day power consumption of the appliances which gives the user knowledge on power being consumed over a period of time. These details are updated in Cloud server. This prototype system developed have achieved energy conservation at every household

KEYWORDS:

Internet of things (IoT), Power consumption, Smart device Internet of things Home automation,security ,android

i. INTRODUCTION:

The use of energy has been a key in the development of the human society by helping to adapt to the environment. The

consumption of energy has led to major threats to climate change, environmental pollution, and human health.
. The network path can be interconnected or interconnected with the "things" being either embedded software, hardware or and sensor. It refers to the state where the things will have more and more data and information associated with them and have a ability to communicate, produce new information and become the integral part of the free world wide web .save money on energy use while keeping our office or building ,comfortable. The cost of simply forgetting to turn off your classroom lights and electric appliances can really add up over time. Controlling temperature and lighting based on time of day or occupancy can really reduce energy costs.

ii. LITERATURE SURVEY:

The pervasive advancement in the field of an autonomous system is significantly influenced by the concept of integrating a large number of devices. The use Internet of Things (IoT) has increased day by day for making connected devices over the internet. Besides, mobile sensing devices operated by IoT including smartphones, tablets, digital cameras, sensors, etc. are providing access to a large variety of data and services based on human interaction. In this paper, the implementation and analysis of an IoT based home automation framework using NodeMCU through the MQTT protocol are described. This helps the users to monitor and control home appliances from remote places by using a mobile application over the internet. Keywords Sensors, IoT, Firmware, Home Automation, Node MCU, MQTT Broker

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Home automation has drawn a massive attention from last few decades. The benefit of any home automation system is to diminish the hard effort, timings, and errors that generally take place due to inattention of individual. On the other hand, IoT is an infrastructure of numerous linked objects that is extensively used in HAS. Nowadays, the technology has been widened extremely and various applications like the smart home, smart phone, smart city, smart watch, smart shop, etc., have become obligatory applications for every person. As the inhabitation is mounting day by day, there is a big necessity to safeguard the energy and expenditure in every way possible. To save the energy and time, an access mechanism has to be build to control the smart appliances or any home application from inaccessible location. This paper presents technical comparison on IoT-based HAS using smart phone or any other smart applications and sensors.

This paper proposes a propelled home mechanization framework that utilizes an android application to control and screen the home apparatuses. This plan depends on the Internet of Things (IoT).In home computerization, every single home apparatus are organized together and worked without human intercession. In this framework, Raspberry Pi 4 is going to be interfaced with numerous sensors that may evaluate temperature and steaminess, light, energy, etc. Sensors were used to collect information and it would be stored in the data store and an example examination is done on the put away information which tells the client at which time the machines are typically on or off with the goal that they can be naturally controlled with no human intercession by watching the normal use design. The client moreover turns on/off remotely by means of mobile application and web server. Keywords: Internet of Things, Raspberry Pi 4, Home automation, Server, Mobile devices.

This paper discusses an IoT based home automation system through which home security, room air quality check, and emergency assistance can be obtained. This system can automatically provide home safety, but the user can also control the system manually if desired. The system uses the NodeMCU module as the mainboard and has a mobile application for remote monitoring. In addition to air quality detection, the system can detect CFCs used in the air conditioning system to avoid accidents. If any unwanted incident occurs, the system will immediately turn off the home's main power connection and send the house's status in the form of a notification to the user's mobile app. Also, an essential feature of the system is that the system is able to block the entry of any unwanted person in the house. There is also an assistant robot to prevent fire accidents initially.

Emerging network paradigm that connects billions of devices to the internet and to the users to meliorate the facet of life of the people is IoT Internet of Things. In IoT internet depicts inter networking of things that is it focuses on devices whereas things exemplify physical devices, virtual services, functions, machines. IoT allows devices to interact directly with each other to make decisions and exchange data as an evolution of machine-to-machine communication. The power of data collection, artificial intelligence, wireless sensor networks, embedded systems, control, and automation systems makes IoT smart. IoT de vices generating data are from different vendors and different domains. For the size of machines from small scale to large scale, shares data and execute an action without the intervention of individuals by the advancement of automation technology using IoT. Nowadays, IoT becomes one of the essential and integral components in our daily life. For sectors like academics and industry, the area of interest is IoT. So, it becomes necessary to find new methodologies to associate different devices over the internet. Thus, the IoT concept makes a road map for many sectors in the community such as health care, home automation, industrial automation, smart grid, smart building, agriculture, energy management system.

With the advancement and development of communication technology, the Internet of Things (IoT) has become the focus of attention and attraction for many in terms of home automation. The Internet of Things is used to control and monitor devices and keep an eye on the home environment through the home automation system. Therefore, this paper provides a flexible, low-value and energy-efficient environmental monitoring tool with an intuitive interface based on the Internet of Things (IoT). The network server built into NodeMCU is used to access and control tools remotely, either locally or globally. The tools are managed online or through a smartphone app that supports Wi Fi and mobile network (LTE / 4G) through access to a cloud hosting server. Provides a unique protocol for viewing and controlling the home environment over more than one switch. To demonstrate the safety and effectiveness of this device, the instruments are combined with medium switches, power components, temperature and humidity sensor, gas sensor and notification system with the proposed processing device. The proposed system can easily and efficiently control IoT based devices for home automation and support home safety through autonomous operation, energy saving and ensuring the required comfort and safety for residents.

Home Automation System is one of the subjects that is gaining traction due to its multiple benefits. Home automation is the process of remotely monitoring and controlling household appliances. With the Internet's and its applications' never-ending growth, there is a lot of promise and scope for remote access, control, and monitoring of network-enabled appliances. This article examines a variety of intelligent home automation systems and technologies from a variety of perspectives. The endeavor was focused on the home automation idea, in which smart devices are used to control and monitor operations. Home automation systems and technologies with a central controller (Arduino or Raspberry Pi), cloud-based, Bluetooth-based,

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SMS-based, ZigBee-based, mobile-based, RF Module-based, web-based, and Internet-based performance are all reviewed. Life is becoming simpler and easier in all aspects due to advancements in automation technologies.

Back ground In the era of Internet of Things (IoT) automation of home and security systems was becoming remarkably easy. Many research works have been also conducted to bring the most convenient way of automating the home appliances and security systems but insignificant research has been carried out in providing the most comprehensive and autonomous or self-controlled home automation. The aim of this paper is to provide a comprehensive solution to mitigate the existing need. End users can interact with household appliances in a variety of means irrespective of platforms used and their geographical location through smart phone application developed. Using their speech as input users can
also operate the electrical appliances via voice commands. In addition to the mobile application and voice command, by integrating some cloud services an attractive web interface would be provided as another alternative for better data presentation and analysis. The autonomous feature would allow the home to monitor and control its environment by itself through installed sensors, sharing data into one another and taking a relevant measurement without a need for human intervention Method In order to achieve those performances the work will deploy an MQTT (Message Queuing Telemetry Transport) messaging protocol to enable the modules easily communicates one another. Results Multiple alternative means of contro lling and interacting with home appliances was provided. Both autonomous mode and safe mode features would make the system to behave and run autonomously. Conclusion The paper also embraces the presentation for an application of multiway, cross-platform and user oriented home automation and security system as well as convenient means of controlling and monitoring household electrical appliances.

The pervasive advancement in the field of an autonomous system is significantly influenced by the concept of integrating a large number of devices. The use Internet of Things (IoT) has increased day by day for making connected devices over the internet. Besides, mobile sensing devices operated by IoT including smartphones, tablets, digital cameras, sensors, etc. are providing access to a large variety of data and services based on human interaction. In this paper, the implementation and analysis of an IoT-based home automation framework using NodeMCU through the MQTT protocol are described. This helps the users to monitor and control home appliances from remote places by using a mobile application over the internet. Keywords Sensors, IoT, Firmware, Home Automation, Node MCU.

Background In the era of Internet of Things (IoT) automation of home and security systems was becoming remarkably easy. Many research works have been also conducted to bring the most convenient way of automating the home appliances and security systems but insignificant research has been carried out in providing the most comprehensive and autonomous or self-controlled home automation. The aim of this paper is to provide a comprehensive solution to mitigate the existing need. End users can interact with household appliances in a variety of means irrespective of platforms used and their geographical location through smartphone application developed. Using their speech as input users can also operate the electrical appliances via voice commands. In addition to the mobile application and voice command, by integrating some cloud services an attractive web interface would be provided as another alternative for better data presentation and analysis. The autonomous feature would allow the home to monitor and control its environment by itself through installed sensors, sharing data into one another and taking a relevant measurement without a need for human intervention Method In order to achieve those performances the work will deploy an MQTT (Message Queuing Telemetry Transport) messaging protocol to enable the modules easily communicates one another. Results Multiple alternative means of controlling and interacting with home appliances was provided. Both autonomous mode and safe mode features would make the system to behave and run autonomously. Conclusion The paper also embraces the presentation for an application of multiway, cross-platform and user oriented home automation and security system as well as convenient means of controlling and monitoring household electrical appliances

In the modern world of automation where in most of the system become machine driven, such as home automation and alternative business sectors.Home automation system using IoT is an innovative application of internet of things developed to control home appliances remotely over the cloud.This system aims to provide the switching control of light, fan or any other home appliances from anywhere around the world using IoT.The IoT based home automation project is done using ATMEGA328P microcontroller, relays, sensor and few simple components and electrical devices can be controlled and their status can be monitored. The main goal of this project is the home automation controlling the home appliances.

iii. PROPOSED SYSTEM:

In this system, owner directly monitors and control through their mobile phone using IOT (Internet of Things) for Home.The Arduino controller will control the load depending on the input given by the user. The home load such as fan and light will be controlled with the help of IOT website. The system is interfaced with temperature sensor to detect temperature. When the temperature of the home increases then the fan runs automatically to cool down room temperature.The command for the system is given by IOT website and all the information displayed with LCD display.

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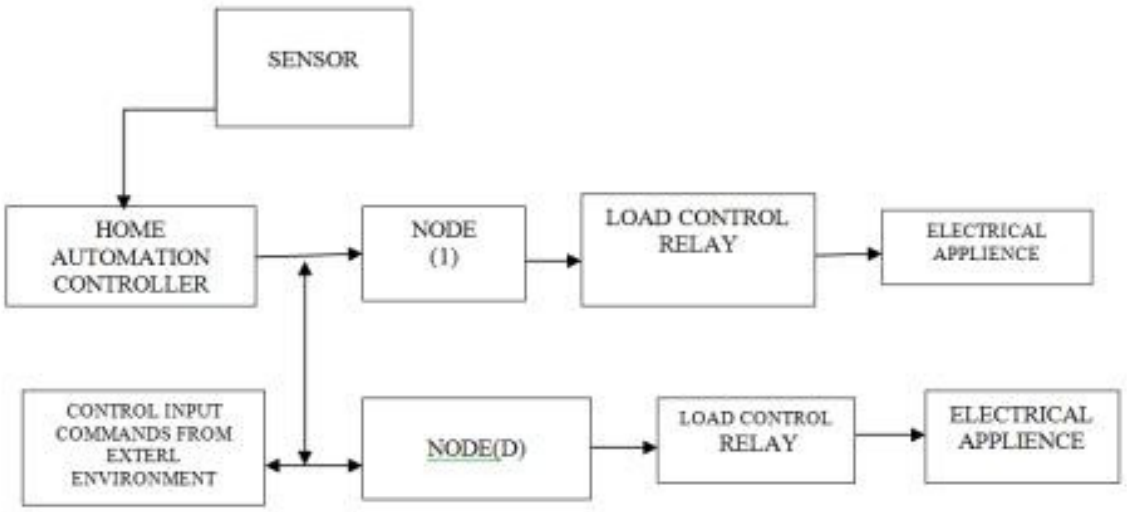
BLOCK DIAGRAM



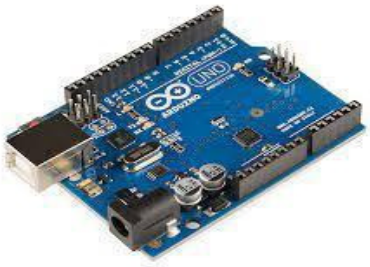
Figg:1.1

IoT is an emerging technology that uses the Internet and aims to provide connectivity between physical devices or "things". Examples of physical devices include home appliances and industrial equipment The communication protocols that are the third component of the IoT platform, enable the different devices to communicate and share their data with the controllers or the decision making centers. IoT platforms offer the flexibility to select the type of the communication technologies (each having specific features), according to the needs of the application. The examples of these technologies include Wi-Fi, Bluetooth, ZigBee and cellular technology such as LTE-4G and 5G networks. The data storage is the focomponentofthe IoT platform which enables management of collected data from the sensors.

3.2 INTERNET OF THINGS:

IoT is an emerging technology that uses the Internet and aims to provide connectivity between physical devices or "things". Examples of physical devices include home appliances and industrial equipment.The communication protocols that are the third component of the IoT platform, enable the different devices to communicate and share their data with the controllers or the decision making centers. IoT platforms offer the flexibility to select the type of the communication technologies (each having specific features), according to the needs of the application. The examples of these technologies include Wi-Fi, Bluetooth, ZigBee and cellular technology such as LTE-4G and 5G networks. The data storage is the fourth component of the IoT platforms enables management of collected data from the sensors. The internet of things describes physical objects with sensors,processing ability ,software ,and exchange data with other devices and systems over the internet or other communications network.

ARDUINO:



Figg:1.2

The **Arduino integrated development environment (IDE)** is a cross-platform application (for Windows, macOS, Linux) that is written in the programming language Java. It is used to write and upload programs to Arduino board.Arduino is an open-source

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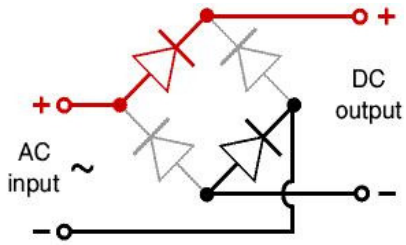
electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publish in somet online. You can tell your board what to do by sending a set of instructions to the microcontroller on the boar.The "Run simulator" option simulates the circuit in a normal speed (If the circuit is not heavy). "Advance frame by frame" option advances to next frame and waits till you click this button for the next time. This can be useful for debugging digital circuits.

3.5 BRIDGE RECTIFIER:



Fig;1.3

A bridge rectifier can be made using four individual diodes, but it is also available in special packages containing the four diodes required. It is called a full-wave rectifier because it uses the entire AC wave (both positive and negative sections).1.4V is used up in the bridge rectifier because each diode uses 0.7V when conducting and there are always twodiodes conducting

3.6 TEMPERATURE SENSOR:

The DHT11 is basic ,ultra low-cost digital temperature and humidity sensor.It is uses a capacitive humidity sensor and a thermistor to measure the surrounding air,and spits out a digital signal on the data pin(no analog input pins needed)

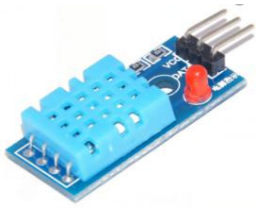
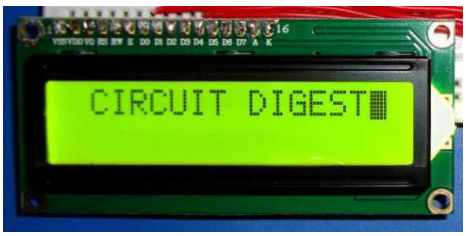


Fig:1.5

LIQUID CRYSTAL DISPLAY:

A liquid crystal display (LCD) is a flat panel display, electronic visual display, or video display that uses the light modulating properties of liquid crystals. Liquid crystals do not emit light directly. LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock. They use the same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements. An LCD is a small low cost display. It is easy to interface with a micro-controller because of an embedded controller (the black blob on the back of the board). This controller is standard across many displays (HD 44780) which means many micro-controllers (including the Arduino) have libraries that make displaying messages as easy as a single line of code.



LCD display unit

Fig:1.4

LCDs are used in a wide range of applications including computer monitors, televisions, instrument panels, aircraft cockpit displays, and signage. They are common in consumer devices such as video players, gaming devices, clocks, watches, calculators, and telephones, and have replaced cathode ray tube (CRT) displays in most applications. They are available in a wider range of screen sizes than CRT and plasma displays, and since they do not use phosphors, they do not suffer image burn-in. LCDs are, however, susceptible to image persistence.

METHODOLOGY

The application of IoT in different sectors and industries has been widely discussed and reviewed in the literature (for example. Moreover, challenges and opportunities with respect to the deployment of one or a group of IoT technologies have received a high level of technical assessment, e.g., sensors or 5G network. With respect to the energy sector, most of survey studies have focused on one specific subsector, e.g., buildings or the technical potential of a certain IoT technology in the energy sector. For example, Stojkoska et al. reviews smart home applications of IoT and the prospect of integrating those applications into an IoT enabled environment. In a study by Hui et al., the methods, recent advances, and implementation of 5G are studied only with focusing on the energy demand side. The role of IoT in improving energy efficiency in buildings and public transport has been discussed in, respectively. Khatua et al. reviews the key challenges in the suitability of IoT

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data transfer and communication protocols for deployment in smart grids. However, unlike the reviewed literature where the focus is commonly either on a specific subsector in the energy sector or certain IoT technologies, this paper reviews the application of IoT in the energy sector, from energy generation to transmission and distribution (T&D) and demand side. As such, the main contribution of this paper is to extend the existing body of literature by providing energy policy-makers, economists, energy experts, and managers with a general overview of the opportunities and challenges of applying IoT in different parts of the entire energy sector. In this respect, we briefly introduce the IoT framework and its enabling technologies to form a basis for discussing their role in the energy sector. To conduct this survey, a systematic search was carried out to collect and review the recent body of literature on the role of IoT in the energy sector. First, we searched the terms "Internet of Things" and "Energy", case non-specific, in the title, abstract, and keywords of publications stored in SCOPUS, IEEE, Hindawi, and Google Scholar databases. Then, we limited the scope of search results to engineering, economics and management branches where possible. Next, papers published before 2012 and most of conference papers with no information on the peer-review process were excluded. Finally, we clustered the relevant papers in sub-categories of energy generation (including power plants, ancillary services, and centralized renewable energy), T&D systems (including electricity, gas and district heating networks, and smart grids), and the demand side (including energy use in buildings, transportation, and the industry sector). We focus on the IoT applications that can be generally applicable to most of energy systems without discussing specific cases and their boundary conditions. For example, we discuss the role of IoT in smart buildings, without falling into the details of building typology, building material, occupants' energy consumption pattern, type and number of home appliances, etc.

The three important part of the block diagram is Arduino UNO ,NodeMCU and ACS712.The step down transformer is used andit converts 230V to 12Vac .The supply is fed to the arduino. Current sensor and voltage sensor connected to the arduino pin A0 and A1 respectively. The load connected to ACS712.The supply is ON, the current sensed by using ACS712. The data is monitored using arduino in the cayenne platform. The microcontroller takes this reading and sends it to website using NodeMCU.It is a Wi-Fi module, which provides internet facility for microcontroller. NODEMCU ESP8266 has one analog input. So,I have choose Arduinouno.It has multi analoginput. Here Arduino is used as a microcontroller. The Arduino can be provided with a 5V supply and ESP 8266 is powered by a 7.5V adapter. Arduino is programmed using Arduino IDE and the Wi-Fi module is programmed using AT commands in the same Arduino IDE. The zero crossing detector is also used. It consists of two op-amp and XOR Gate. One op-amp indicate voltage wave and other op-amp indicate current wave.XOR gate is used to measure power factor.Power factor is phase shift between voltage and current and the CRO is connected to the XOR Gate.The waveform is displayed it. The voltage, current and power factor readings are fed to the arduinoand calculate the real power,reactive power,energy and cost of energy using arduino coding.These The data is displayed on cayenne platform along with cost to be paid for consumption in graphical and gauge format respectively. The design of Smart Energy Meter involves the measuring of load current and voltage using sensors and then feeding them to energy metering IC which converts it into the real power consumed by the load. Power factor is measured by measuring the phase shift between voltage and load current. Microcontroller used to perform the calculations related to power and energy consumed and shows the reading on LCD as well as it sends the reading of Smart Energy Meter with the help of GSM modem [12]. Active power, reactive power, voltage, load current, power factor and units (kWh) are measured and displayed successfully. Meter reading are sent from GSM modem and received on mobile successfully.

NodeMCU is an open source IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The term "NodeMCU" by default refers to the firmware rather than the dev kits. The firmware uses the Lua scripting language. Node MCU board that incorporates the ESP8266 chip on a standard circuit board.The board has a built-in USB port that is already wired up with the chip, a hardware reset button, WIFI antenna, LED lights and standardsized GPIO(General Purpose Input Output) pins that can plug into a bread board. The NodeMCU DEVKIT board that comes preloaded with firmware can be purchased, which makes it a very economical device for prototyping and even for production use. In this board we connect a pin of RX and TX to the arduino board of TX and RX to detect the arduino.

Mobile App The Homergy Mobile App was developed using the crossplatform app development framework Flutter, making it available for major mobile platforms (Web, iOS and Android). The Mobile App was designed to have a nice user-friendly interface. Using the Firebase Database, a rewards system was developed where users gain points (called H-points) for using the system (Fig. 8). Such a reward system is proven to contribute to user retention and engagement [14], and hence leads to better energy efficiency for Homergy users. The app screen on which appliances (relays) are controlled is shown in Fig. 9. The default relay names (Relay 1, Relay 2, etc.) can be edited by the user to more recognizable names (e.g. Projector, Microwave), depending on how the relays are connected to the building by the electrician. Cloud: The Google Firebase Realtime Database was used as the cloud provider in our implementation. Google's Firebase Realtime Database is a NoSQL JSON-based database with real-time data streaming capabilities. The JSON was structured as shown in Fig. 11. [4] discussed about a system, GSM based AMR has low infrastructure cost and it reduces man power. The system is fully automatic, hence the probability of error is reduced. The data is highly secured and it not only solve the problem of traditional meter reading system but also provides additional features such as power disconnection, reconnection and the concept of power management. The database stores the current month and also all the previous month data for the future use.

4.TESTING AND RESULTS:

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Three varied environments were used to measure the effectiveness of Homergy. [2] discussed about Intelligent Sensor Network for Vehicle Maintenance System. Modern automobiles are no longer mere mechanical devices; they are pervasively monitored through various sensor networks & using integrated circuits and microprocessor based design and control techniques while this transformation has driven major advancements in efficiency and safety.

iv. RESULT & DISCUSSION:

This project results in a system that automatically turns on the fan when the temperature is increased.And then automatically turns on the light when a person enter room.The Lights will turn off automatically when the number of person inside the room is zero . The load can be turned on or off using an ioT.

4.1 HARDWARE DETAILS:

Fig:1.6

Fig:1.7

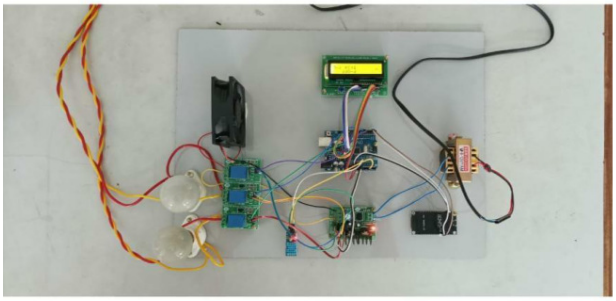

Fig:1.8

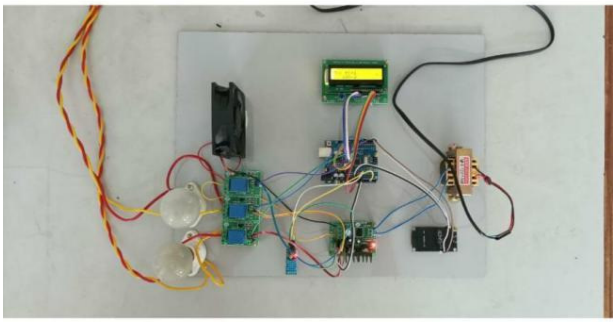

Fig:1.9

COMPONENTS	SPECIFICATIONS
ARDUINO UNO	ATMEGA 328P, 5V, cost-1800
POWER SUPPLY	7805, 7812, rectifier, 25v capacitor, 12v- step down transformer, cost- 500
TEMPERATURE SENSOR	DH11, 5V, cost-240
RELAY	Cost-100
NODE MCU	ESP8266P, cost- 580
LCD DISPLAY	16X2, 5V, cost- 350

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4.2 SOFTWARE REQUIREMENTS:

MC Programming Language	:Embedded C
Coding	: Arduino IDE 1.8.3
Simulation	:PROTEUS

4.3 HARDWARE REQUIREMENTS:

ARDUINO UNO
NODEMCU
RELAY
POWER SUPPLY
LCD DISPLAY
TEMPERATURE SENSOR

CONCLUSION

Smart Home and Energy Management is current trend with of IoT. Lot of labor been reported with regards to controlling the appliances of home and also on monitoring the electrical parameters towards hazard. Also work reporting in controlling the appliance for energy consumption. So, with all these works reported, we here have developed a better IoT system for Energy Management which takes the Humidity, Temperature and light intensity into consideration and accordingly interfaced with Arduino Microcontrollers for controlling the usage of appliance like speed of fan, can develop power instead of just turn on or off. Also, the prototype system computes the current drawn from each appliance based on appliance usage and send to Raspberry Pi3 where total power consumed of appliances computed against time. This information is computed during the day and same uploaded in cloud server too.

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