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Energy Saving And Security In A Building By Landscaping And Electric Devices Controlling By Wi-Fi Module.

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Abstract— We live in a time where many technological advancements are at our fingertips, our lives are made easier, which is fortunate considering the fast-paced lives most of us lead. In recent years, great strides have been made in making homes a bit more "tech savvy." This technology, in short, allows the homeowner to run his or her home while away through remote, often on a Smartphone or iPad. In our project we presented a prototype implementation of home automation system that uses wifi technology as a network infrastructure connecting its parts. Previously Bluetooth module was used for this purpose which has reduced control since it covers small distance, high power consumption due to Bluetooth connectivity. We are using ESP8266 wifi module which is a self contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your wifi network. For home security we are using PIR motion sensor which are basically made up of pyroelectric sensors which can detect the level of infra-red radiation. It almost always used to detect whether a human has moved in or out of the sensors range. These home automation systems provide increased comfort especially installed in private home. The conclusion of our project is to increase overall energy saving which is main issue today.

Keywords— Landscaping, wifi module, home security, home automation.

1. INTRODUCTION

Homes of the 21st century will become more and more self-controlled and automated. Simple devices such as a timer to turn on one's coffee maker in the morning have been around for many years, but much more sophisticated mechanisms will soon be prevalent in homes around the world. Imagine walking into your home and being greeted at the door with lights illuminating your path without you ever having to touch a light switch, with your favorite music streaming through the speakers in whichever room you enter all while having the peace of mind knowing that your home automation system took care of activating your security system. Furthermore, such a system could allow the user to schedule events to occur at recurring intervals. In today's world, use of Home automation system is increasing due to its numerous advantages, easiness etc. Home automation system is that in which the various appliances within the home are remotely controlled. There are different technologies exist which are used for Home Automation. By using Bluetooth or ZigBee we can remotely control all appliances within home but both of them having area limit or within some specific distance we can operate that devices remotely but by using Internet of Things (IoT) we can control our home appliances from anywhere around the world. In home automation the monitoring and control operations are assist through smart devices installed in residential

buildings. Different home automation systems and techniques considered in review with central controller based (Arduino or Raspberry pi), Bluetooth-based, ZigBee based, email based, web based, SMS based, mobile-based, cloud-based, Dual Tone Multi Frequency based, and the Internet (Wi-Fi) based.

Home automation can:

1)Increase your independence and give you greater control of your home environment.
2)Save your time and effort.
3)Improve your personal safety.
4)Increase your home energy efficiency.
5)Alter you to monitor your home while your away.

2. LANDSCAPING OF HOME

Landscaping is the mechanism used to improve the energy saving in a house or building by a proper design. This design would improve the heat absorbed, solar heat through windows and roofs that can increase cooling costs, and incorporating shade from landscaping elements that can help reduce this solar heat gain. Shading and evapotranspiration (the process by which a plant actively moves and releases water vapor) from trees can reduce surrounding air temperatures as much as 6° F. Because cool air settles near the ground, air temperatures directly under trees can be as much as 25°F cooler than air temperatures above nearby blacktop. Using shade effectively requires you to know the size, shape, and location of the moving shadow that your shading device casts. Also, microclimate homes in cool regions may never overheat and may not require shading. Therefore, we need to know what landscape shade strategies will work best based on the regional climate .

The regional climate (temper, hot-arid, hot-humid, cool, etc.,) and the microclimate (surrounding climate) are the key concepts that impact on the selection of trees available based on appropriate sizes, densities, and shapes for almost any shade. Deciduous trees with high, spreading leaves and branches can be planted to provide maximum summertime roof shading.

Trees, shrubs, and groundcover plants can also shade the ground and pavement around the home reduces heat radiation and cools the air before it reaches walls and windows. Shrubs planted close to the house will fill in rapidly and begin shading walls and windows within a few years. Well-landscaped homes in wet areas allow winds to flow around the home, keeping the home and its surrounding soil reasonably dry. To ensure lasting performance of energy-saving landscaping, use plant species that are adapted to the microclimate.

Evergreen trees combined with a wall, fence, or earth berm (natural or man-made walls or raised areas of soil) can deflect or lift the wind over the home. In addition to more distant windbreaks, planting shrubs, bushes, and vines next to your house creates dead air spaces that insulate the house in both winter and summer. Windbreaks provide A barrier from sounds, sights, and smells, an aesthetically pleasing landscape element.

Energy efficiency is the major concern and so, before adding solar features to a new home design or existing house, the most cost-effective strategy is to be considered for reducing heating and cooling bills.

2.1 Design Criterion

A solar home design must include some basic elements that work together:

a) Properly oriented windows. During the spring, fall, and cooling season, the windows should be shaded to avoid overheating. Be sure to keep window glass clean.

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b) Thermal mass. -- Commonly concrete, brick, stone, and tile -- absorbs heat from sunlight during the heating season and absorbs heat from warm air in the house during the cooling season. Making sure that objects do not block sunlight on thermal mass materials.

c) Distribution mechanisms. Solar heat is transferred from where it is collected and stored to different areas of the house by conduction, convection, and radiation.

d) Control strategies. Properly sized roof overhangs can provide shade to vertical south windows during summer months. Other control approaches include electronic sensing devices, such as a differential thermostat that signals a fan to turn on; operable vents and dampers that allow or restrict heat flow; low-emissivity blinds; operable insulating shutters; and awnings.

e) Active solar heating uses the sun to heat air or liquids. The heat is then ducted or blown into living space or stored for later use. Solar water heaters can preheat water for radiators or radiant floor heat. Both liquid and air systems can supplement forced air systems (i.e., furnaces or heat pumps).

f) Heat pumps are an efficient option for all-electric houses or houses with central propane or oil. Heat pumps are generally air-source or ground-source and can be used for both heating and cooling. See the section on Heat Pumps for more information.

g) Electric heating includes central forced-air electric furnaces, as well as wall-mounted or baseboard heating. Electric heat can be more expensive than other fuel options. If electricity is the only choice, heat pumps are preferable in most climates.

h) Wood and pellet-fuel stoves heat homes using biomass or waste sources.

3. HOME AUTOMATION TECHNIQUES

Depending upon the level of automation required there are two techniques. One is through wi-fi module and other is through Bluetooth module. Bluetooth is the most suitable wireless technology for short range communication. The main disadvantage with Bluetooth module is security will be minimized. There will be high power consumption due to Bluetooth connectivity. To overcome these disadvantages wi-fi module is used. It increases the range of communication. Security will also be provided using this. There are other techniques which are based on cloud. Instead of Arduino if we have used raspberry pi it has in built internet connectivity. Wi-fi will be operated at a faster rate than the Bluetooth. Bluetooth speed is limited. Router can be connected to our microcontroller to get information wherever we are through internet.

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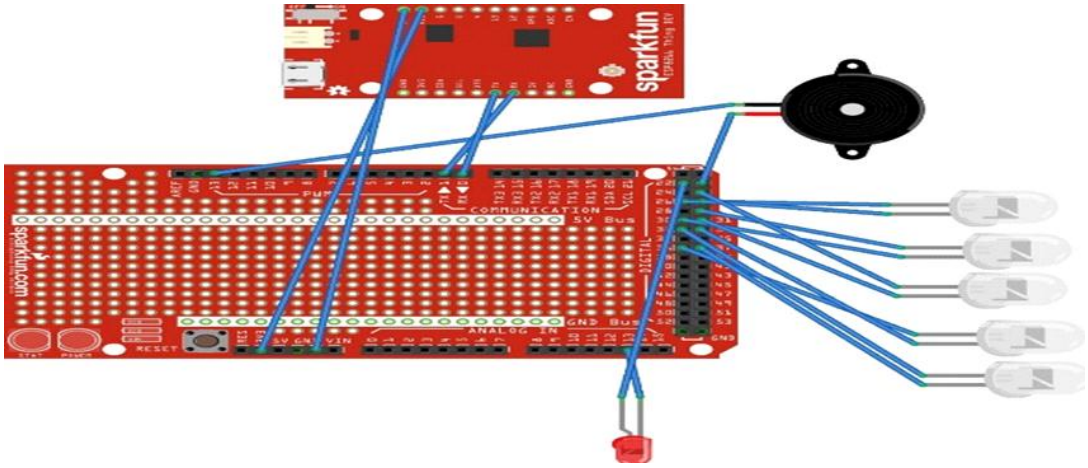

Fig 3.1: Circuit Diagram

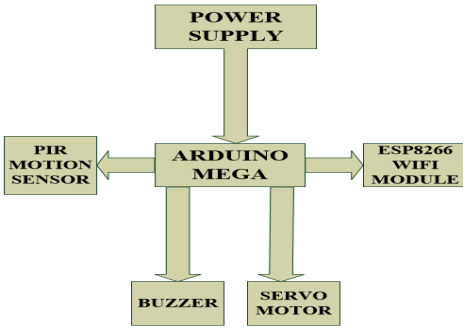

Fig: 3.2 Line diagram for home automation

3.1 Components Used For Control Of Lights

Depending upon the no. of devices control required we can use different components.In our project we are using

- Arduino Mega
- Wifi Module

3.1.1 Arduino Mega:

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.

3.1.2 SPECIFICATIONS:

Table 1. Arduino Mega Specifications

Microcontroller	ATmega2560
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limits)	6-20V
Digital I/O Pins	54 (of which 15 provide PWM output)
Analog Input Pins	16

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DC Current per I/O Pin	40 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	128 KB of which 4 KB used by bootloader
SRAM	8 KB
EEPROM	4 KB

3.1.3 The power pins are as follows:

Vin. The input voltage to the board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.

5V. This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack (7 - 12V), the USB connector (5V), or the VIN pin of the board (7-12V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage your board.

3V3. A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.

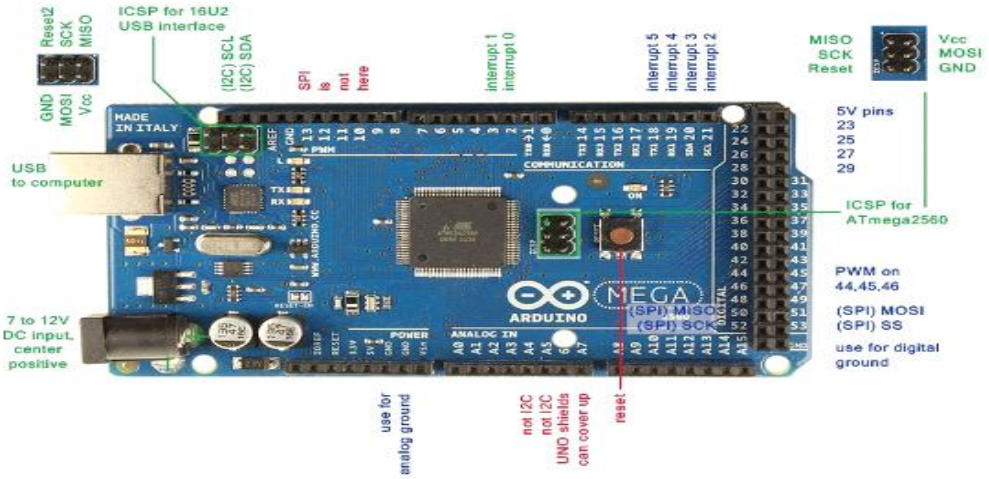

Fig: 3.3 Arduino Bord Structure

GND. Ground pins

IOREF. This pin on the board provides the voltage reference with which the microcontroller operates. A properly configured shield can read the IOREF pin voltage and select the appropriate power source or enable voltage translators on the outputs for work in with the 5V or 3.3V.

ESP8266 WIFI MODULE

The ESP8266 Wi-Fi Module is a self contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much Wi-Fi-ability as a Wi-Fi Shield offers. The ESP8266 module is an extremely cost effective board with a huge, and ever growing, community.

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This module has a powerful enough on-board processing and storage capability that allows it to be integrated with the sensors and other application specific devices through its GPIOs with minimal development up-front and minimal loading during runtime. Its high degree of on-chip integration allows for minimal external circuitry, including the front-end module, is designed to occupy minimal PCB area. The ESP8266 supports APSD for VoIP applications and Bluetooth co-existance interfaces, it contains a self-calibrated RF allowing it to work under all operating conditions, and requires no external RF parts.

Table 2: wifi module and its pin description

Label	Signal
VCC	3.3V(3.6V max) supply voltage
GND	Ground
TXD	Transmit Data (3.3V level)
RXD	Receive Data (3.3 V level)
CH_PD	Chip power down: (LOW = power down activate)
GPIO0	General purpose I/O 0
GPIO2	General purpose I/O 2
RST	Reset (Reset = LOW active)

App Used For Interface

There are many apps which are designed for interfacing our home with wifi module. Out of those we have used ESP8266 WIFI CONTROLLER app. In that for login we have to know our wifi module IP address and the port we have assigned for it.

Fig: 3.4 APP View

4. HOME SECURITY

Security has becoming an important issue everywhere. Home security is becoming necessary nowadays as the possibilities of intrusion are increasing day by day. In our project we are using sensor along with alarm system for providing security. Depending upon the level of security required sensors will be varied.

4.1 Pir Motion Sensor

PIR sensor detects a human being moving around within approximately 10m from the sensor. This is an average value, as the actual detection range is between 5m and 12m at an angle of 15degrees.PIR are fundamentally made of a pyro electric sensor, which can detect levels of infrared radiation. Most PIR sensors have a 3-pin connection at the side or bottom. One pin will be ground, another will be signal and the last pin will be power. Power is usually up to 5V. Sometimes bigger modules don't have direct output and instead just operate a relay which case there is ground, power and the two switch associations. Interfacing PIR with microcontroller is very easy and simple.

The PIR acts as a digital output so all you need to do is listening for the pin to flip high or low. The motion can be detected by checking for a high signal on a single I/O pin. Once the sensor warms up the output will remain low until there is motion, at which time the output will swing high for a couple of seconds, then return low. If motion continues the output will cycle in this manner until the sensors line of sight of still again. The PIR sensor needs a warm-up time with a specific end goal to capacity fittingly. This is because of the settling time included in studying nature's domain. This could be anyplace from 10-60 seconds. The output can be used to control the motion of door.

Basically motion detection use light sensors to detect either the presence of infrared light emitted from a warm object or absence of infrared light when a object interrupts a beam emitted by another part of the device.

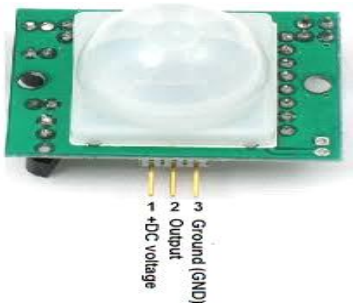

Fig.4.1: PIR motion sensor

4.2 Dc Servo Motor And Buzzer

In our project we are using buzzer as alerting system. When PIR motion sensor detects any motion its digital pin will be high. Then Buzzer give some sound as an alert. DC Servo Motor is used as a camera in our project for showing the direction in which motion is detected.

5. CONCLUSION AND FUTURE SCOPE

The prime objective of our project is to use the Smartphone to control the home appliances effectively. The overall implementation cost is low and can be easily configured. In this project we have implemented home automation with provided home security using wi-fi module. This project can be extended using cloud services which gives control for a wide range. Instead of dc servo motor we can place mini camera and we can record the situation. Android based home automation makes the system more flexible and provides attractive user interface over other home automation systems. Our project can be more helpful to disabled persons as they can easily control their home lights without moving. In future we can use solar panels for house. Finally we want to conclude that IoT has the potential to change the world, We have to just engage in it for a better life.

6. REFFERENCE

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