ISSN: 2277-3754
ISO 9001:2008 Certified
International Journal of Engineering and Innovative Technology (IJEIT)
Volume 5, Issue 10, April 2016

IOT Based Smart Home

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Abstract- A Smart Home provides its home owners comfort, security, energy efficiency (low operating costs) and convenience at all times, regardless of whether anyone at home. This project details the installation and configuring the sensors in a person's home. Next will be to monitor the environmental condition and to control the house hold appliances as per user comfort. The IoT gateway will allow the online wireless sensor monitoring and notification system without the need of computer. Necessary security implementations are done to notify the owner on event occurrence.

I. INTRODUCTION

This paper demonstrates functioning of smart home using IOT (Internet of Things). Imagine a world where every device in your home, workplace and car are connected. A world where the lights automatically turn on when the car approaches the road, the coffee starts brewing when the morning alarm goes off and the front door automatically unlocks when approached by a member of your house, but stays locked when a stranger arrives on the front step. That is the type of world the Internet of Things can create. Currently, the "Internet of Things" is not a second Internet – it's a network of devices that are connected to the Internet that are used every day to search, upload images and connect with friends. It's a network of things that are connected to the Internet, thus they have their own IP address and can connect to each other to automate simple tasks.

Based on application domain, IoT products can be classified into five different categories: smart wearable, smart home, smart city, smart environment, and smart enterprise. Place all the world's latest and most advanced smart devices at your home, still it wouldn't make your home a Smart Home. For a home to be called a Smart Home, it actually needs to be smart. As a growing trend of urbanization, aging and individual-oriented lifestyle continues, the expectation for Smart Home is higher than ever. Smart phone apps that interact with one's home will increase exponentially over the next few years. Want to check the temperature of your refrigerator, turn on the oven, or start the laundry? Well, there's an app for that.

II. LITERATURE SURVEY

This paper mainly focuses on sensor selection and monitoring. The paper was based on the monitoring the activities of elderly people. The iMonnit Server is the locally hosted enterprise software which helps to maintain the sensor data nodes. The novelty in this project is that instead of setting up an artificial test bed of sensors within the University, the sensors have been setup in a subject's home so that data can be collected in a real, not artificial, environment [1].

III.METHODOLOGY

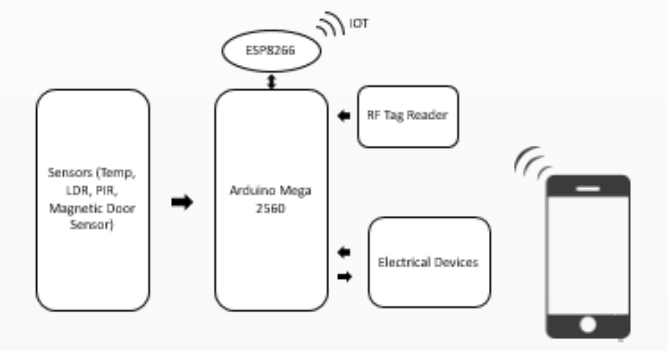

Fig 1: Block Diagram

Passive sensors like Temperature, LDR, PIR and Magnetic door sensor senses the environment upon changes and report to the MCU. RF tag reader is used for user authentication purpose. ESP8266 is the wifi module which acts as a transceiver. These data's can be accessed using ESP8266. They are viewed from an android Smartphone. Also a few electrical appliances can be turned on right from your Smartphone.

IV.HARDWARE DESIGN

A. ARDUINO Mega 2560

The ARDUINO Mega 2560 has 54 digital I/O pins (of which 15 can be used as PWM outputs), 4 UART's (hardware serial ports), 16 analog inputs, a 16 MHz crystal oscillator, a port to USB connect, a power jack, an ICSP header, and a reset button. It contains everything that are needed to support the microcontroller; just connect it to a computer with an USB or power it with a AC-to-DC adapter or battery to get started.

This board can be powered by usb connection or external supply. The power source is chosen automatically.

Now rather that pressing a physical button to reset the MCU, it can be done from the software.

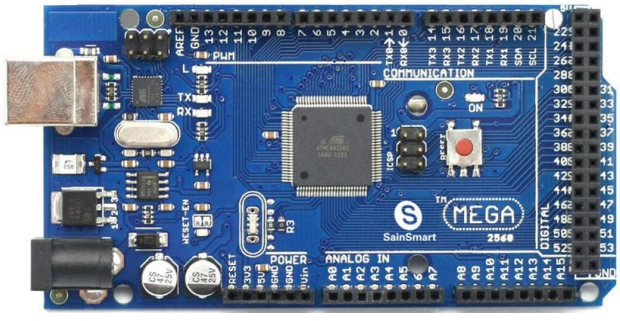

Fig 2: ARDUINO Mega 2560

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Microcontroller	ATmega2560
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limit)	6-20V
Digital I/O Pins	54 (of which 15 provide PWM output)
Analog Input Pins	16
DC Current per I/O Pin	20 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	256 KB of which 8 KB used by bootloader
SRAM	8 KB
EEPROM	4 KB
Clock Speed	16 MHz
Length	101.52 mm
Width	53.3 mm
Weight	37 g

B.ESP8266

The ESP8266 (WiFi Module) is a self-contained SOC (System-on-Chip) with integrated TCP/IP protocol stack that can give any microcontroller access to a WiFi network. The ESP8266 is capable of offloading all Wi-Fi networking functions or hosting an application from another application processor. Each ESP8266 module comes with a pre-programmed AT command set firmware, which means, you can simply hook this up to your Arduino device. This module has a powerful enough on-board processing and storage capability that allows it to integrate with sensors and other application specific devices through its GPIO's with minimal development up-front and minimal loading runtime. Its high degree of on-chip integration allows it for minimal external circuitry, including the front-end module which is designed to occupy minimal PCB area. The ESP8266 supports APSD (Automatic Power Save Delivery) for VoIP applications and Bluetooth interfaces, it contains a self-calibrated RF that allows it to work under all operating conditions and it requires no external RF parts.

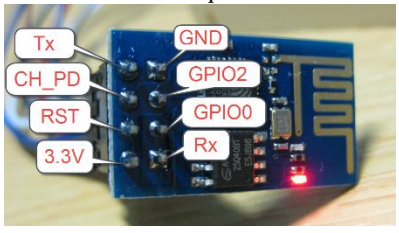

Fig 3: ESP8266

Features

- 802.11 b/g/n
- Wi-Fi Direct (P2P), soft-AP
- Integrated TCP/IP protocol stack
- Integrated TR switch, balun, LNA, power amplifier and matching network
- Integrated PLLs, regulators, DCXO and power management units
- +19.5dBm output power in 802.11b mode
- Power down leakage current of <10uA
- 1MB Flash Memory
- Integrated low power 32-bit CPU could be used as application processor
- SDIO 1.1 / 2.0, SPI, UART
- STBC, 1×1 MIMO, 2×1 MIMO
- A-MPDU & A-MSDU aggregation & 0.4ms guard interval
- Wake up and transmit packets in < 2ms
- Standby power consumption of < 1.0mW (DTIM3)

C.RF Tag Reader

Radio-frequency identification uses electromagnetic field to transfer data wireless, for the purposes of automatic identification and tracking tags attached to objects. The tags contain electronically stored information. A few tags are powered by electromagnetic induction that are produced near the reader. Some types collect energy from the interrogating radio waves and they act as a passive transponder. Other types have a local power source such as a battery and may operate at hundreds of meters from the reader. Unlike a barcode, the tag doesn't have to be within line of sight of the reader and also they may be embedded in the tracked object. RFID is one method for Automatic Identification and Data Capture (AIDC).

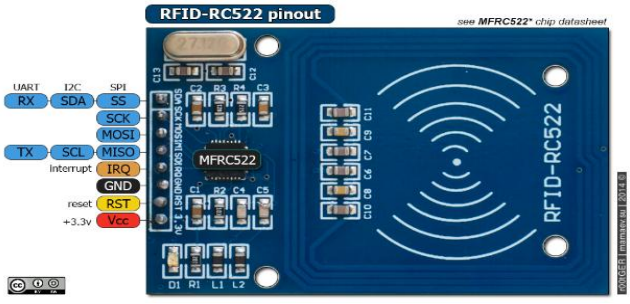

Fig 4: RF Tag Reader

Fig 5: RF Tag

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V. SOFTWARE IMPLEMENTATION

A. Arduino IDE

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

Steps:

1. Open the Program Arduino IDE.
2. Type the program.
3. Select the board.
4. Select the Baud rate.
5. Compile the program.
6. Upload.

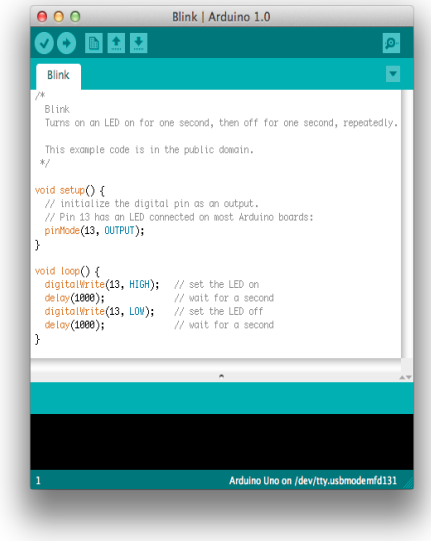

Fig 6: Arduino IDE

B. Burning the code into Microcontroller

The steps used to run a code in an Arduino M0 board are:

1. Connect the USB to the board. A green LED blink ensures the power is ON
2. Open Arduino and write the program
3. Click 'Verify' Button to check if the code is error free
4. Click 'Upload' Button to dump the code to the microcontroller
5. Open 'Serial Monitor' on the Right top to view the output.

C. Android Application

An Android app is a software application that runs on the Android platform. An Android app is designed for a Smartphone or a tablet running on the Android OS.Android apps are written in Java programming language and use Java core libraries.

Type in the IP address and port number to connect to the ESP8266.

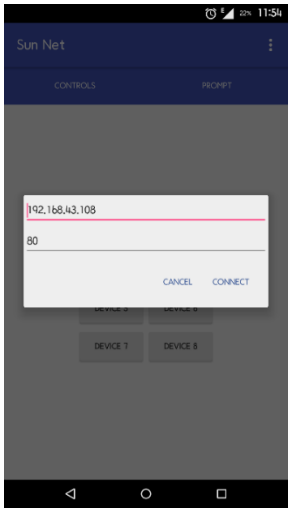

Fig 7: Android Application

VI. RESULT

The setup is tested by getting inputs from sensors and the values/status is displayed in the Android App. The first figure shows the hardware connection.

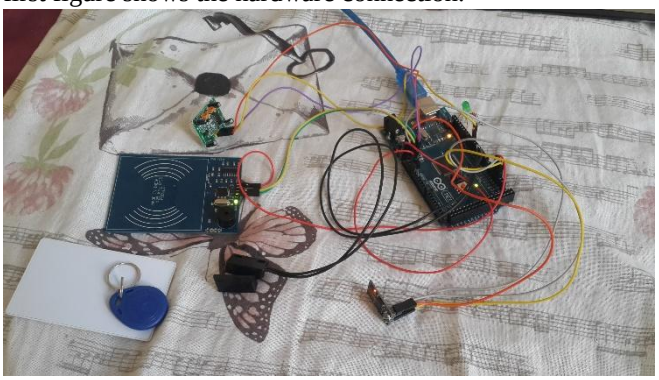

Fig 8: Hardware

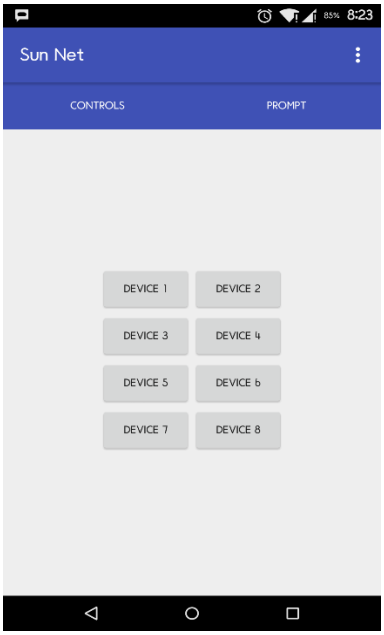

Fig 9: Android App showing Buttons

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Fig 10: Sensor data Displayed under PROMPT tab

The next figure shows the outputs displayed in Android App. The outputs from the sensors are displayed in the PROMT tab. This tab gets constantly updated with the latest sensor readings.

Also a few electrical devices that are connected to the ARDUINO can me be controlled (ON/OFF) via the app using the buttons under the Controls tab.

VII. CONCLUSION

The main aim of this project is to monitor certain parameters in a home and display it to the user. Preventive security implementations are done to safeguard the home. Based on the status of electric devices in the home they can be controlled remotely by the user which involves Internet of Things.

REFERENCES

[1] Debraj Basu, Giovanni Moretti, Gourab Sen Gupta, Stephen Marsland "Wireless Sensor Network based Smart Home: Sensor selection Deployment and Monitoring" published on international IEEE conference – 2013.

[2] Mansour H.Assaf, Ronald Mootoo, Sunil R.Das, Emil M.Petriu, Voicu Groza "Sensor based Home Automation and Security System" published on international IEEE conference – 2012.

[3] V.A.Saptari,"Securing IoT for smart home system "PhD Thesis, MIT, 2004.

[4] A.Tura,A.Maran and G.Pacini, "Smart Home System Based on IOT Technologies" Elsevier J. of Diabetes Research and Clinical Practice,Vol 77,2007

[5] https://evothings.com/how-to-connect-your-phone-to-your-esp8266-module/

[6] http://allaboutee.com/2015/01/20/esp8266-android-application-for-arduino-pin-control/

[7]