

Smart Homes using Internet of Things

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Abstract – The interaction between people through the internet (IOP) is very common. What if the things in the world start interacting with each other? Things can be anything which can sense and communicate each other like human does. Don't think it is a sci-fi this is internet of things (IOT).Sensors->Microcontroller->Gateway->cloud. Example: your coffee machine interacting with your mobile or sensors in your home communicating with the devices. IOT is an emerging technology which is going to dominate the world for the coming decades of period in industries, shopping malls, Education, Hospitals etc. We cannot even predict its scope .wherever the things around us interact intelligently and make an automated system, there will be IOT. The Wireless Home Automation system(WHAS), using IOT devices to control basic home functions from anywhere around the world through the internet and the devices in the home automatically coordinate and share its data of different forms. These kind of automated home is sometimes called as smart home. It helps to save electric power, provide automatic safety and security system and encourage efficient and intelligent way of workability, productivity by human and save human energy.

Key Words: Wireless Home Automation system(WHAS), Smart home, Internet of Things (IoT),Raspberry pi, Secure Hash Algorithm (SHA)

1.INTRODUCTION

A smart home which consists of electrical and electronics devices such as fans, Television, air conditioners, motors, heater, lighting systems and the sensors to sense different circumstances. For example it can have a gas detection system, Fire detection system, motion sensors; temperature sensors etc. A remotely accessible environment is an environment in which each appliance can be remotely accessed and controlled using software as an interface, which includes an Android application or IOS application. Such remotely accessible systems are already available in the market. How this system is suitable for Indian market, how many of them using existing system, Is that affordable to common people. Should we have to create a new system according to middle class's expectation?

2. Existing System

Some of the related works in the field of Home Automation is listed below.

2.1. LEVITON

Leviton provides you products that keep you safe, automate your everyday tasks, manage energy usage and provide a comfortable lifestyle. It features different packages for different income levels and so goes easy on your pocket by simply choosing the automation, energy management, and convenience features as per your needs. Leviton systems can be controlled by your smartphone and can be suitably installed in new or existing.

2.2 Lumina RF Eco-System

This system is intended for commercial applications where the main focus is on energy management in a simple way in order to lessen the business interruption. The services are free of cost and are centrally controlled by a single app and used by franchisees. Omni Security & Automation Systems This service is created for residences and commercial applications providing features like security, access control, video surveillance, temperature control, lighting control, automation of appliances and many more. Third party integrations grow the platform even further by using Z-Wave, Xbee and other communication protocols.

2.3. HONEYWELL HOME AUTOMATION

Home automation features a comfortable automation that extends to automatic temperature control based upon the weather conditions, automatic control of lights according to the sunlight, unlocking your door through your smartphone and many more other features. Honeywell can bring your home to life with a customized and robust solution to work with your lifestyle and adjust according to your growing needs.

2.4. Advanced systems

2.4.1 Amazon echo

Amazon Echo is a smart speaker developed by Amazon The device consists of a 9.25 inch (23.5 cm) tall cylinder speaker with a seven-piece microphone array The device connects to the voice controlled intelligent assistant service Alexa, which responds to the name "Alexa". This "wake word" can be changed by the user to "Amazon", "Echo" or "Computer". The device is capable of voice interaction, music playback, making to-do lists, setting alarms, streaming podcasts,

playing audiobooks, and providing weather, traffic and other real time information. It can also control several smart devices using itself as a home automation hub.

2.4.2 Google Home

Google Home is a Wi-Fi speaker that also works as a smart home control center and an assistant for the whole family. You can use it to playback entertainment throughout your entire home, effortlessly manage everyday tasks, and ask Google things you want to know.

3. Existing market

- Less than 1% people are using smart home in India.
- among that 1%, 90% people belongs to upper middle class and higher class
- 72% among middle class and upper class interested to implement smart home within 2 to 5 years(2020)
- Existing systems are very costly some of the advance system costs around RS. 25000

4.PROPOSED SYSTEM

The proposed system is satisfying all the basic need of the user. It is able to implement the proposed system in a range less than RS. 3500. This rate is affordable by middle class. The system has the capabilities to monitor and control the following components.

1. Temperature and humidity
2. Motion detection
3. Fire and smoke detection
4. Lights ON/OFF/DIM
5. Fan ON/OFF.
6. ON/OFF different appliances.
7. Switch ON and OFF the stair case light by detecting human motion when he climbs the stairs.
8. Detect the gas leakage informs the house owner and fire department.

5. Software and Hardware requirements

Software requirements

Operating System : Debian(Flavour of LINUX)+Windows for mobile application development Programming Language : JAVA

Drivers :USB to serial Converter to connect customized hardware to Ri

Tools :Android studio

Hardware Requirements

Processor :1.8 GHZ and above, User: A mobile handset

Memory :4 GB

Any other devices :Raspberry Pi Kit or arduino Creating a customized model using microcontroller ,Power Regulators and power slots for connecting load, motion sensor, gas sensor, temperature sensor, wireless router

6. System Design

6.1 Architecture diagram

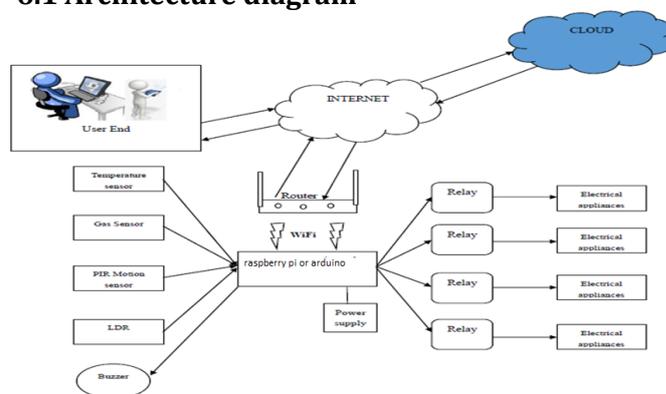


Fig-1: implementation model

6.2 Data Flow Diagram

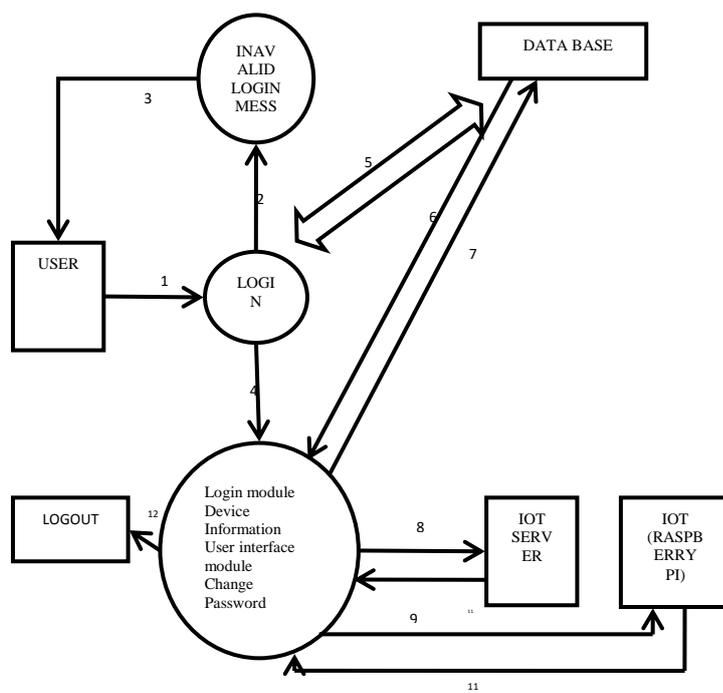


Fig-2: Data flow

1. Request for login.
2. Login fail.
3. Return to login page.
4. Login successful.
5. Checking the authentication in the data base.
6. Storing into database.
7. Retrieving from the database.
8. Requesting for the ticket for IOT server to establishing the communication between user and IOT(raspberry pi).
9. Sends ticket to the user.
10. Sends the command to be performed along with the ticket.
11. Returns the acknowledgment of action performed.
12. Users can logout.

6.3 Use diagram

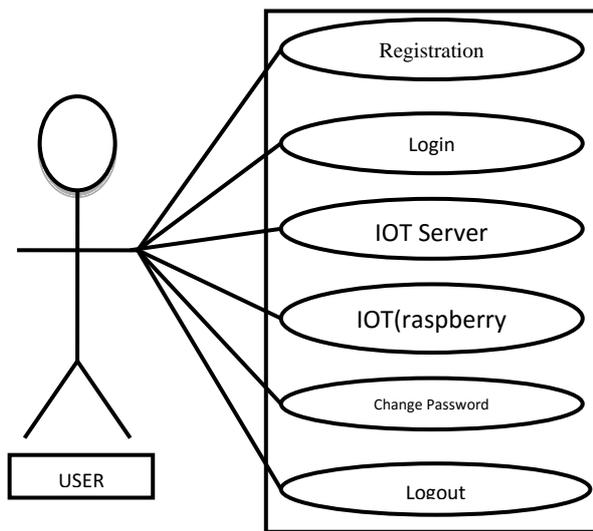


Fig 3: use diagram

6.4 Sequence Diagram

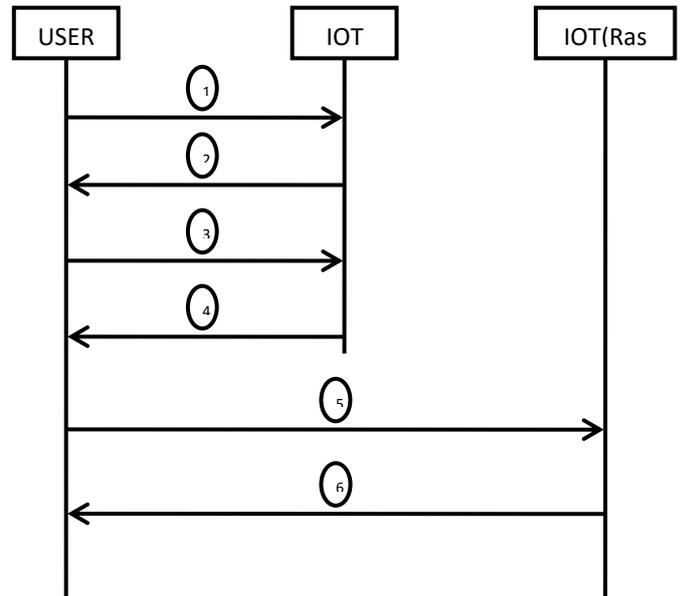


Fig 4: Sequence Diagram

1. User logs in and request for the ticket to IOT server to establish communication between user and IOT(raspberry pie)
2. IOT server creates a ticket which is encrypted by user public key and sent to user
3. User decrypts it using is private key and hash it using hashing function and sends to IOT server
4. IOT server sends and acknowledgment back to server
5. Now a secure connection is established between user and IOT (rasberry pie). User send the ticket and a command to be operated.
6. In-return the IOT(Raspberry pie) sends an acknowledgement back to user.

6.5 Activity Diagram

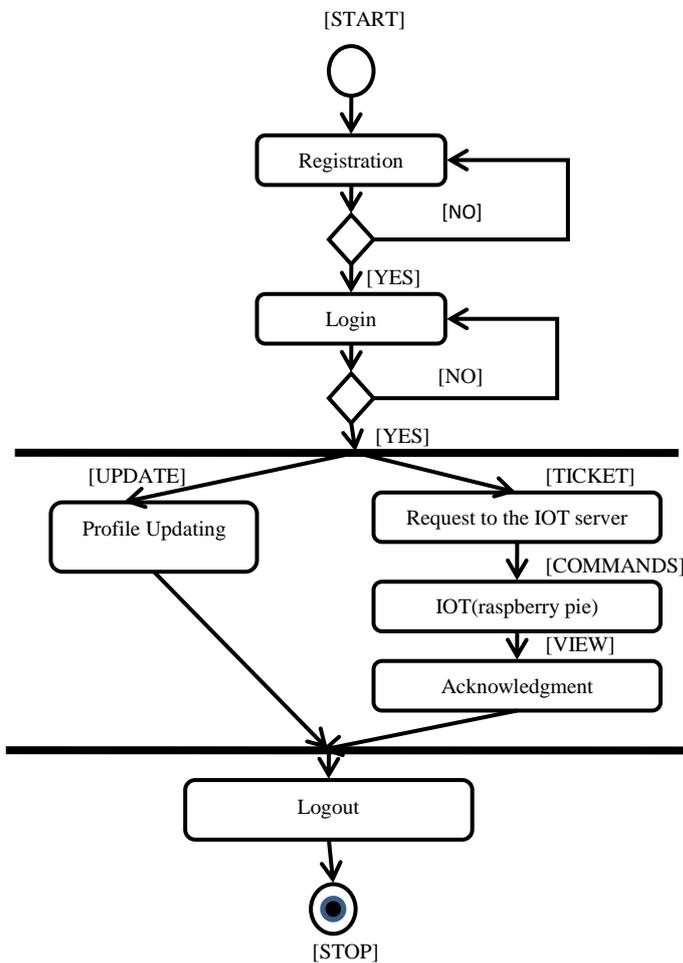


Fig-5: Activity Diagram

7. Primary Motivator

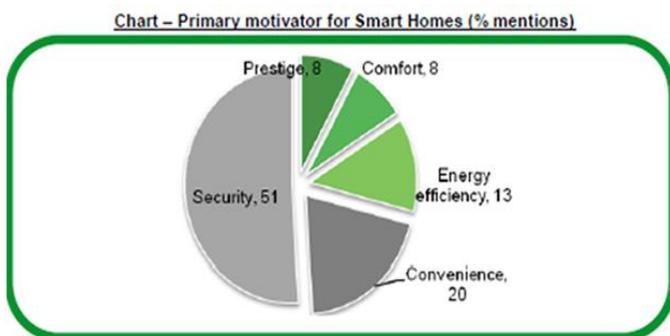


Fig-6: Primary motivations for smart homes

Security

Security is one of the most important criteria in a smart home system. Proposed system provides gas leaking and fire detection system with notifying and giving alarms to the house owner and fire department. Since proposed system detects motion inside home it helps house owner to get to know if some robbery happened in his home when he is out. The Secure Hash Algorithm (SHA) used by security system to prevent unauthorized access of smart home system.

Energy efficiency

Smart home helps us to save energy without human effort. It detects the house owner movement and switch ON and OFF lights. It also facilitates monitoring of entire house even though the user is not at home and the house owner can manually control appliances such as fan, light, TV etc through his smart phone .it cut down the wastage of electricity completely. Through this smart home the owner is not only saving his money but also saves national energy.

Convenience and Comfort

The automated way of working makes the smart home really convenient. The smart home making things controllable from one point helps the user a lot. The User interface is developed in a very simple way to avoid the complications of using it.

8. SHA

This standard specifies a Secure Hash Algorithm (SHA-1) which can be used to generate a condensed representation of a message called a message digest. The SHA-1 is required for use with the Digital Signature Algorithm (DSA) as specified in the Digital Signature Standard (DSS) and whenever a secure hash algorithm is required for federal applications. The SHA-1 is used by both the transmitter and intended receiver of a message in computing and verifying a digital signature.

Name of Standard: Secure Hash Standard.

Category of Standard: Computer Security.

Explanation: This Standard specifies a secure hash algorithm, SHA-1, for computing a condensed representation of a message or a data file. When a message of any length < 264 bits is input, the SHA-1 produces a 160-bit output called a message digest. The message digest can then be input to the Digital Signature Algorithm (DSA) which generates or verifies the signature for the message. Signing the message digest rather than the message often improves the efficiency of the process because the message digest is usually much smaller in size than the message. The same hash algorithm must be used by the verifier of a digital signature as was used by the creator of the digital signature.

9. CONCLUSIONS

It is very important to develop a smart home system which is affordable to everyone and which can accomplish the user's daily needs. More than that the people should know the usability of the current technology how it can be a part of their life and make them more productive.

Currently the people are with the conventional methods. They are bullied by them and not ready to go with a smart home having a mind-set that its installation and maintenance are very expensive. The awareness on the technologies and making it more affordable can make the difference.

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