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Technology analysis for internet of things using big data learning

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Abstract. We implemented a n efficient smart home automation system through the Internet of Things (IoT) including different type of sensors, this whole module will helps to the human beings to understand and provide the information about their home security system we are also going to apply Big Data Analysis to analyze the data that we are getting from different type of sensors in this module. We are using some sensors in our module to sense some type of things or object that makes our home standard and also introducing the face recognition system with an efficient algorithm into the module to make it more impressive and provide standardization in advance era.

1. Introduction:

There are so many projects based on the Home Automation or can say to making a Smart Home and they have used so many techniques in that, In our System module we are also going to make a smart home with the security in our System module the aim is to provide a security to human beings from any unwanted presents in their houses and any accident by their mistakes. Our System module provides some security to the human beings and some facility for their convenient as their use inside the house.

Need of introducing the Big Data in this thesis and with this System module for analysis purpose. In our System module we are using different type of sensors and we will get a large amount of data to analyze that large data we need Big Data analysis tools. After analysis the data we get the final use full information that will help to decide that whether the home is secure or not.

There are some projects are going on with home automation only but here we are going to perform the analysis on the Internet of Things (IoT). There are many universities projects are going on the same topic that is home automation where there are performing some advance technologies but here we are going to analyze the data and finally getting some use full results.

Proposed methodology of our System is having two modules - one is building sample module using Internet of Things (IoT) technique and then the second module is the analysis part through Big Data Analysis. Each sensors and device in our module is connected to a single device called as Arduino Leonardo. Through that we can control the each and every device and sensor activity. We can control the ranges and activity through the Arduino and all the information that we are getting from the sensors we are storing in our cloud for future use and analysis. The storing data that we have on our cloud is going to use for the analysis using Big Data Analysis and the finally result will be announce to the user or can say the owner of the house.



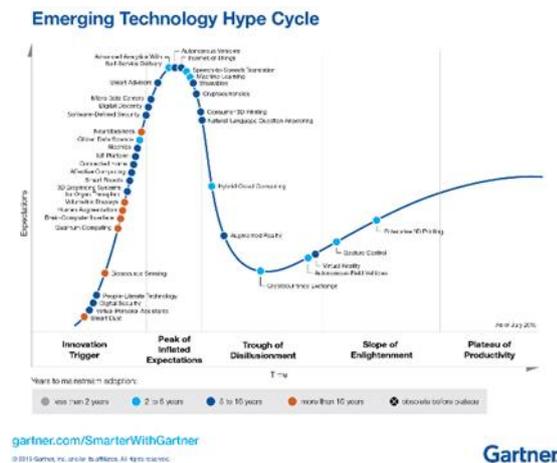


Fig. 1. Gartner Technology Curve

2. Literature survey:

2.1 Internet of Things (IoT)

Internet of things (IoT) is a technique using that communication can be possible between things to things or things to human that is without any human interruption. Internet of Things (IoT) is an advance technology or can say an advance era of standardization introduced by the world. There are many contraries working on the Internet of Things (IoT) technology because the Internet of Things helps to the people or human beings to complete their work in an efficient way and in an easy way with accuracy. Internet of Things (IoT) introduced in world before decades at that time it was not that much familiar with the people but for now everyone want to live with it and enjoy their life with standardization. Using Internet of Things can exchange the data between machine to machine. Internet of Things (IoT) allows to the objects to be sensed and can be remotely accessed within the existing network structure. Using Internet of Things (IoT) many projects have been done based on smart home, smart grids, smart city and traffic system etc. It provides accuracy and availability to the human beings.

Even the expert says that Internet of Things (IoT) will consist more than 50 billion before 2020 in future. There are many "Things" can be sense like we use Ultrasonic sensor to sense movement of any object and Temperature sensor to sense the temperature on the current places and Gas sensor to sense any Gas leakage inside the room or anywhere and Humidity sensor to sense the humidity at the particular place and using these type of different sensor we get the use full data that we can use for as per our need. Mainly the government use Internet of Things (IoT) for robotics.

2.2 Big Data learning

We are living in the Big Data Era. Means of Big Data is large number of data that can't be easy to process. Big Data has some characteristics that sown by 7 V's (Volume, Value, Variety, Velocity, Valence, Visualization, Veracity). Data processing of Big Data is very high. Big data can be structure or non-structure or semi-structure processing of data is depend on the type of data we have for process. Big Data learning is a type of learning from the Big Data. To process the Big Data we need to transform the data into structure data. Big Data can be like the data we get from social media like Facebook, Twitter and Instagram etc. To analysis the big data we can use some of Big Data tools like Apache Hadoop, Mongo DB and Casandra and Spark etc.

Now using these tools we can analyze the data easily. Then the results we can apply easily on real domain where we are working. In this thesis we are introducing Big Data learning because we are going to analyze the data that we are getting from different sensors.

For the analysis we are going to store our data on the private cloud and there we are going to perform the big data analysis to analyze the final result. To perform that analysis we have to check the data should store in the right manner no mistake or any wrong storage should not be there mean that the data that we are going to store in the cloud should be true and that data we can get from the running module.

Big data era can be called as cloud computing or On-demand computing. Where that cloud computing have two phase that makes it:

“Computing anywhere and anytime +Dynamic and scalable data analysis”

We have some characteristics of big data:

- Volume (Scale or Size of data)
- Velocity(Speed of analyze of stream data)
- Varity (Different form of Data)
- Valence (Connectedness of big data in form of graph)
- Veracity (Quality that may be noicy or unstructured)
- Value (Importance of data)

All these characteristics of big data comes when we have huge data with different variety that must be processed quickly.

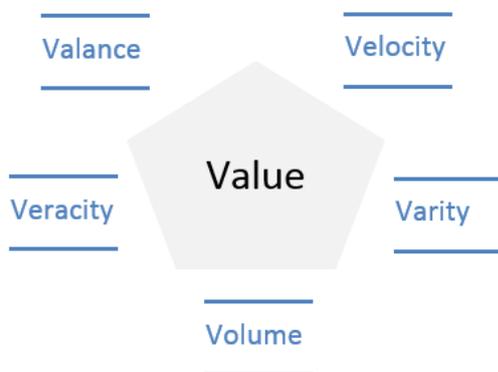


Fig. 2. Overall System Design

3. DETAILED SYSTEM DESIGN

We have three module with different result. In the first phase all these three module are running simultaneously and providing different type of result as per there instruction. And as we know the data we get from the sensor that can be huge because in particular time it will provide the different result and that result we have to store in private cloud database for the future use.

In the second phase as we can see that all the sensors are interconnected to the Arduino with the Wi-Fi module that will help us to correlate their result to each other and easy to store in the private cloud database. Now the question comes that what is the need of storing into the cloud database the information or data that we are getting from the different module those are running simultaneously. For the analysis purpose we have to store in the private cloud database so that we can perform the analysis according to that data that has been store into the cloud.

In the third phase or final phase we are performing analysis on the data that we have stored in the private cloud database. Requirement of analysis in this system model introduce here the big data analysis technic that will help us to analyze the data in an efficient way so that we can find the possible result with the accuracy and effectiveness. According to the analysis report of the final module we will be able to decide that weather the home is secure or not. As we discussed before also that if all the three module will return the true value that means that home is secure and if anyone of them returns false that makes home insecure or can say that means home is not secure and it will send the alert message to the user.

4. System Architecture:

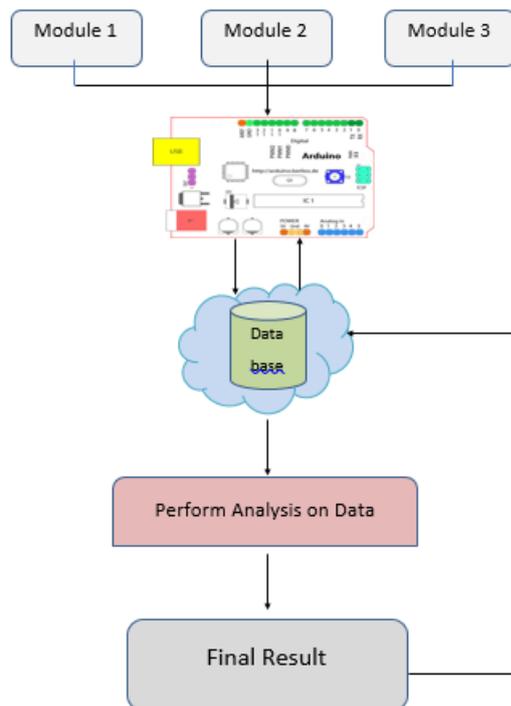


Fig. 3. Overall System Architecture

5. Data flow diagram:

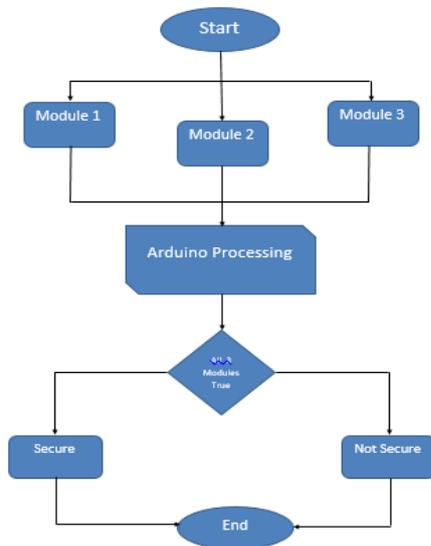


Fig. 4. Data Flow Diagram

6. Prototype

To develop a working prototype following are the list of hardware and software used –

6.1 Hardware requirements:

- Processor :Pentium-IV
- Speed : 2.4 GHZ
- RAM : 6 GB RAM
- Hard disk : 20 GB
- Capturing device: Webcam
- Arduino Leonardo or Arduino Uno : 2
- Male and Female wires : 40-50
- LED : 20
- LCD : 1
- Ultrasonic Sensor : 3
- GAS Sensor : 1
- Camera : 1
- Wi fi module : 1
- Servo motors : 4
- 9 volt battery : 1

6.2 Software Requirements:

Operating System: Linux/Windows 7/8/10
 Programming Packag: Java, android, Embedded
 Tools :Hadoop
 Private Cloud database

6.3 MODULES

Controlling the Fan speed with Temperature sensor
 Emergency Alarm with Ultrasonic Sensor
 Capture images of Object through OV7670 Camera Module
 Blow led when Gas leakage with MQ-2 GAS Sensor

Control on each door lock Servo motor
 Storage on Private Cloud using ESVP8266 Wi-Fi Module
 Analysis of data using Big Data Learning
 Home Entrance with Face Recognition(Future work)

7 Home Entrance with Face Recognition (Future work)

Main objective of Face Recognition in our module is to provide the authentication to the human being.

We have Face Recognition System on the main entrance in our System module it is the calculation of the weightage of new image that we are getting as input.

It extracts some feature of face like mouth, nose, eyes etc.

After all this it allocates some separate pixel weightage for the new face.

And if it matches with the stored face the authentication will be provide to the person and can also access the other feature inside the home.

7.1 Controlling Fan Speed using Temperature Sensor

This module is just to provide the relaxation to any human being inside the home.

Once the person entered inside the room Fan will start automatically without any interruption of human being.

After that Fan speed will be controlled automatically according to the temperature of the room.

When the person will leave the room Fan will stop automatically.

7.2 Emergency Alarm with Ultrasonic sensor

Emergency alarm is to give the sign that an unwanted object detected in restricted area in our home.

It will be located in any restricted area inside the room and if any object comes inside that range then the emergency alarm will start.

Buzzer will start and all the red led will on inside the home.

7.3 Capture images of Object through OV7670 Camera Module

We have some money and gold in our private room and we want to secure that for that security purpose in our system module we are using OV7670 Camera module to take the picture of Object.

It will rotate according to the movement of the object and take the picture of the object and send to the owner of the home on using internet.

7.4 Blow led when Gas leakage

In this module we are using MQ-2 Gas sensor to detect the gas inside the kitchen in our home.

If any Gas leakage is there inside the kitchen it will start the buzzer and blow all the red LED inside the home.

7.5 Control on each door lock through Servo Motor

For the door locking system we are using Servo motor in our module.

Servo motors works with angels that we are using to unlo0ck the door easily for this sample module.

7.6 Storage on Private Cloud using ESO8266 Wi-Fi Module

We are using ESP8266 Wi-Fi module in our System module to connect Arduino with the cloud.

ESP8266 Wi-Fi Module is use to build the connection between Arduino and Private cloud so that we can store our data on Cloud for Analysis of that data.

7.7 Analysis of Data Using Big Data Learning

Analysis of Data that we got from different type of sensor and stored on our Private cloud is to be done in this module.

We compare all the results and analyze the data that we have in our datasets fetched from the cloud.

And provide the final result or can say Output to the owner of home that whether your home is secure or not.

8 FUTURE ENHANCEMENT:

In this system model we did our implementation with three module but for the future enhancement we have some other module that we already mentioned in modules. Though for the future we are going to add a different and advanced module that is face recognition for the entrance inside the room. The main advantage of adding face recognition system here to ensure the security inside the home unknown person or any object can't get the entrance inside the home.

Through this module it will provide the more security to the entrance in the house and only members of family or can say that only the known person can enter inside the home for that we are going to use database with private cloud where we will store the known faces on the cloud and according to that recognition it is going to provide the authority to anyone who wants to enter inside the home. And as we know there are many live project those are still going on in face recognition system so if we will make this feature the part of our project in our system module that would give us the more advancement in our project.

9 Experimental research:

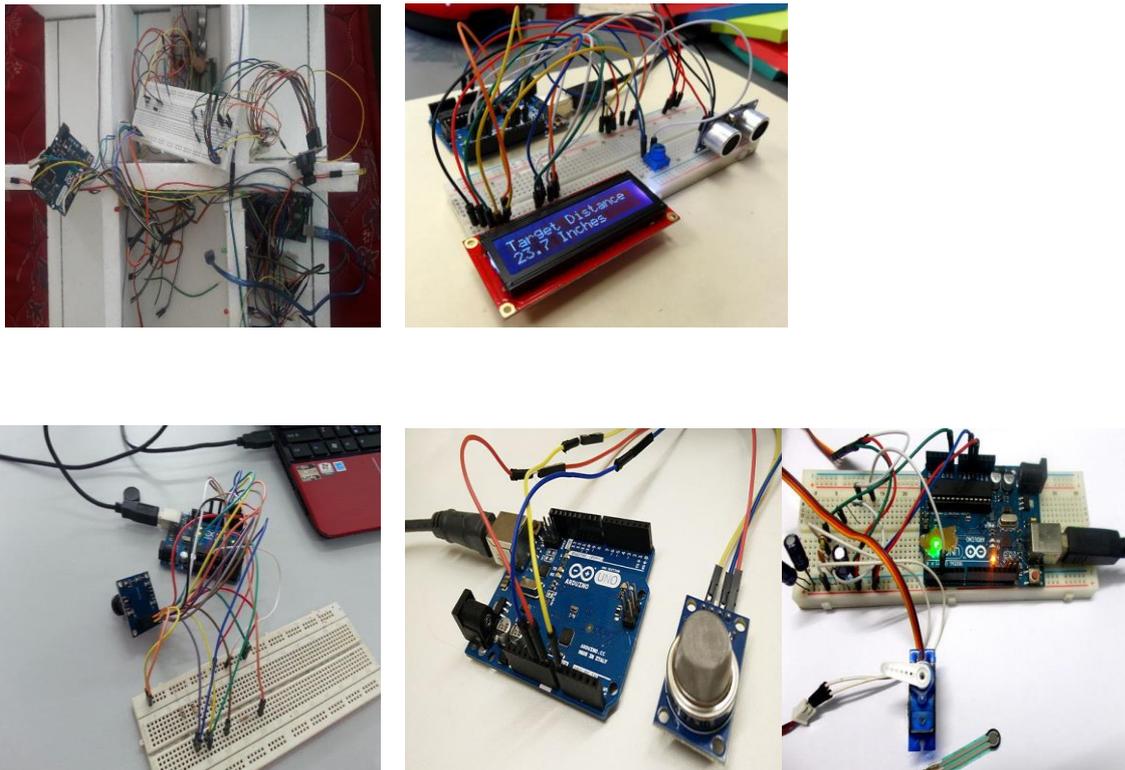


Fig. 5. Working Modules Proposed Method

9. Conclusion

The conclusion of this system model is based on the module that we have. And we checked each and every module is working with accuracy and in an efficient way so whenever any one of the module

returned false value it will send the emergency message to the user and according to the requirement it starts the security system inside the house also. According to the return value that we are getting from the different module and storing into the private cloud data base for analysis at the last that will decide final result for the home weather it is secure or not secure. Whenever we get the true value from the all three module that says home is safe and if any problem occur it inform to the user.

For now in our thesis we get some test sample according to the output that we get after analysis and based on that final result only it will inform to the users. For today era this system module provide an advanced life style with security assurance and gives a reason to learn and aware with new technology in the world and provide a confidence to walk with the new world development. It this system module we did our implementation with two new advanced technology that will helps to learn people and how can we use them in our real life.

References

- [1] Gartner
<http://www.gartner.com/smarterwithgartner/whats-new-in-gartners-hype-cycle-for-emerging-technologies-2015/>
- [2] Android 6 api <http://developer.android.com/about/versions/marshmallow/android-6.0.html>
- [3] Voice Pod Technologies <http://www.voicepod.com/>
- [4] Vera Smart Home Systems <http://getvera.com/controllers/veralite/>
- [5] <https://en.wikipedia.org/wiki/Gartner>.
- [6] A survey on IoT architectures and protocols, Real world implementation By Surapon Kraijak1 , Panwit Tuwanut.
- [7] International Journal of Computer Networks & Communications, vol.6 (1), pp. 33-43, 2014.
- [8] Kaushik Ghosh, 2Rushikesh Kalbhor, Disha Tejpal, Sayali Haral Department of Computer Engineering, Savitribai Phule Pune University.
- [9] Controlling Home Appliances Remotely through Voice Command (International Journal of Computer Applications (0975 – 888) Volume 48– No.17, June 2012).
- [10] Department of Electrical Engineering National Institute of Technology, Rourkela Rourkela-769008, Odisha, India May 2014.
- [11] Remote Household Appliance Control System Using GSM R. Chutia, D. Sonowal and S. Sharma Department of Electronics and Communication Engineering Tezpur Central University Tezpur, Assam, India.
- [12] A Framework for Cloud-based Smart Home by Xiaojing Ye.
- [13] Restful Design and Implementation of Smart Appliances for Smart Home Sehoon Kim; Jin-Young Hong; Seil Kim; Sung-Hoon Kim; Jun-Hyung Kim; Jake Chun.
- [14] A Smart Home Based on Resource Name Service By Cui Ye Tian; Zongming Feng; Wei Mao.
- [15] Implementation of pervasive computing based high-secure smart home system S. Ventylees Raj.
- [16] D. Bandyopadhyay, and J. Sen, (2011) "Internet of Things: Applications and Challengers in Technology and Standardization," Wireless Pers Commum Springer, Vol. 58, pp. 49-69.
- [17] L. Atzori, A. Iera, and G. Morabito, (2010) "The Internet of Things: A survey," Computer Networks, Vol. 54, Iss. 15, pp. 2787-2805.

- [18] L. Atzori, A. Iera, G. Morabito, and M. Nitti, (2012) “The Social Internet of Things (SIoT) – When social networks meet the Internet of Things: Concept, architecture and network characterization,” *Computer Networks*, Vol. 56, Iss. 16, pp. 3594-3608.
- [19] S. Lohr, (2012) *The Age of Big Data*, The New York Times, February 11, 2012.
- [20] N. R. Shikalgar, and D. Badgujar, (2013) “Online Review Mining for Forecasting Sales.”
- [21] *International Journal of Research in Engineering and Technology*, Vol. 2, Iss. 12, pp. 53-55.