Engineering Science
2017; 2(1): 26-29
http://www.sciencepublishinggroup.com/j/es
doi: 10.11648/j.es.20170201.14

SciencePG
Science Publishing Group

Review Article

I-Home: An Intelligent Home Automation Using IoT and Data Mining

Prashant Gadakh, Priyanka Borole, Prajakta Chatte, Shruti Juneja, Kiran Khanekar

Department of Computer Engineering, International Institute of Information Technology, Savitribai Phule Pune University, Pune, Maharashtra

Email address:

prashantgadakh31@gmail.com (P. Gadakh)

To cite this article:

Prashant Gadakh, Priyanka Borole, Prajakta Chatte, Shruti Juneja, Kiran Khanekar. I-Home: An Intelligent Home Automation Using IoT and Data Mining. *Engineering Science.* Vol. 2, No. 1, 2017, pp. 26-29. doi: 10.11648/j.es.20170201.14

Received: October 25, 2016; **Accepted**: March 7, 2017; **Published**: March 27, 2017

Abstract: Today, home automation is playing a vital role in our life. Home automation entitles us to manage and control the household appliance like the tube light, fan, motor, etc. It reduces the human intervention thereby using the energy efficiently and saves the time. The sole aim of this technology is to automate the appliance around us which enables us to control them and helps in warning us during critical situations. It facilitates the communication between many real world objects by collaborating with various technologies and is an emerging novel paradigm. The integration of IoT and cloud computing enables us to process and store the enormous data that is generated by the heterogeneous devices. The main aim of this project is to monitor the appliances with the help of low cost sensors. In case any problem persists with the same then a message/mail would be given to the nearest technician/electrician and to the client. Using the data mining algorithm, we can select the nearest technician for the repairing of the knackered household appliance.

Keywords: IoT, Data Mining, RFID, WI-FI

1. Introduction

In recent era, the Internet of things became more popular and because of it we have improved a lot in different fields like controlling of the environmental conditions, smart city, smart parking, industry for monitoring the devices, home automation etc. Humans usually interact with the appliance by manually changing the settings. If these settings could be made automatic depending on the human behavior, then the automation could be achieved. This automation of devices according to the requirement of inhabitants is termed as intelligent home automation system. The home automation system plays an important role in maintaining the living standards and provides a secure and flexible environment. In general, the intelligent home automation system includes clusters of sensors, collecting and storing of the different types of sensor data (regarding the residents) and that of the utility consumption at home. In home automation, we can see the feature of the automatic switching on/off with respect to the electronic devices when the sensor senses a person around. It is done with the help of speech recognition and with the help of motion sensors.

The advancements in the available technology were needed to fully automate the devices in the environment of home automation. According to the survey conducted we found that there was a need to automatically detect the fault in the household appliances thereby saving the human intervention. By automatically detecting the fault it could inform to the proper technician.

This paper tells us the use of various sensors to monitor home appliances such as LM-35 sensor to monitor the temperature, Light sensor to monitor the light, Vibration sensor to monitor the motors etc. So, the aim of our project is to monitor and control the home appliance and that would also detect a fault in the same. It would therefore take the permission of the user and will only proceed only after getting his allowance to carry out the repairing work.

Therefore, this paper suggests an idea which helps to reduce the human intervention for the repairing work. The algorithm that would be used for choosing the appropriate technician would be the Naïve Bayes algorithm. The rest of the paper is organized as follows. Section II gives the information about the various research activities on home automation systems. Section III discusses about the proposed system. Section IV

gives information about flowchart. Section V concludes the paper with an idea to implement the same as a real time project.

2. Literature Survey

The survey presented in this section is nothing but the observations and current status of automation in actual life of human being. The observation of this survey is that without automation, repairing of home equipment is complex task and consists of human intervention. To avoid this complexity and human intervention we convey our idea to people who uses electric equipment. About more than 70% of people are convinced with this idea and ready to use in daily life. This survey is organized to know more about what user want and what type of product we can deliver to user.

The chart is shown below is diagrammatic representation of survey which is conducted.

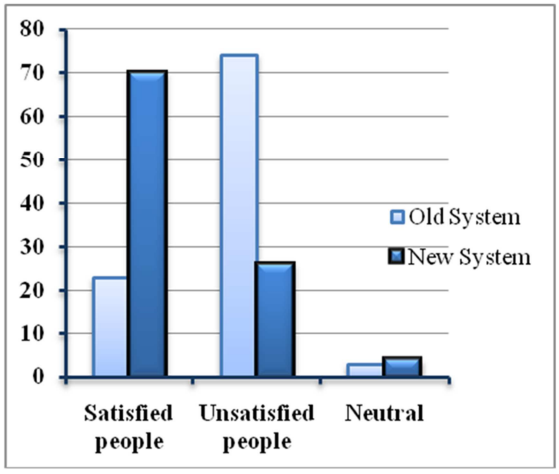

Figure 1. *Survey Chart.*

The purpose of this literature Survey is to convey the system idea to reader that has been established on a topic which is supported by IEEE papers. Many efforts have been taken by authors for doing Literature Survey in domain of IOT, data mining and cloud computing. Some of the paper survey is given in this section.

Use of IEEE 1451 protocol by combining with CPLD architecture for water monitoring system is given by the base paper. This system is suitable for real time. But this system is having some limitations like improper datasets management because of use of spreadsheet. It only monitors the sensors and equipment, no any controlling part was introduced. Another one is, in which it focused in resource constraint node with constraint application protocol (COAP) with ubiquitous ID (UID) architecture. But to use this system architecture tiny OS are used. These tiny OS are not opted for building complex applications. Monitoring system based on combination of pervasive distributed sensing unit, information system for data aggregation and reasoning is given in one paper.

Unavailability of IP-v6 is biggest limitation of this paper. Better compression technique can be implemented rather than this paper. An analysis on the state of the art of routing algorithm using RFID, Bluetooth and wi-fi for device to device communication in IoT is given in one survey section. It mainly gives decision making without human intervention. Provision of security in complex and heterogeneous IoT system is limitation of this system. Also there is lack of security for authenticating devices. The system which is based on Naïve Bayes algorithm and ant colony optimization to reduce the problem of finding objects with reducing human intervention using IoT. This system can use distributed solution for carrying out search activity. Depending on all these technique used and limitations of system we generate the new problem statement that is to generate a system in IoT that uses data mining concepts to ping the nearest electrician for the repairing of faulty electrical equipment. The proposed system section will give the detail explanation of this in further paper.

3. Proposed System

The diagram gives us a pictorial view of the i-Home system. Here we are trying to design a system which integrates cloud and database server going hand in hand to fetch the information. This device can be widely used as IoT application to detect the fault in the appliances. We use a hardware unit in which we are going to use a microcontroller chip, a signal conditioner, a relay board, a device driver and ADC. We are going to use sensors i.e. temperature sensor, light sensor, vibration senor on appliances such as tube light, fan, motor, electric geyser. Firstly, the sensors need to be attached to the appliances and then they need to be connected to the micro-controller with the help of device drivers. The sensor values will come to the micro-controller and the values will be sent to the signal conditioner which prepares it for the next stage of processing. The sensor values now are with ADC which converts analog value to digital value which is readable by computers.

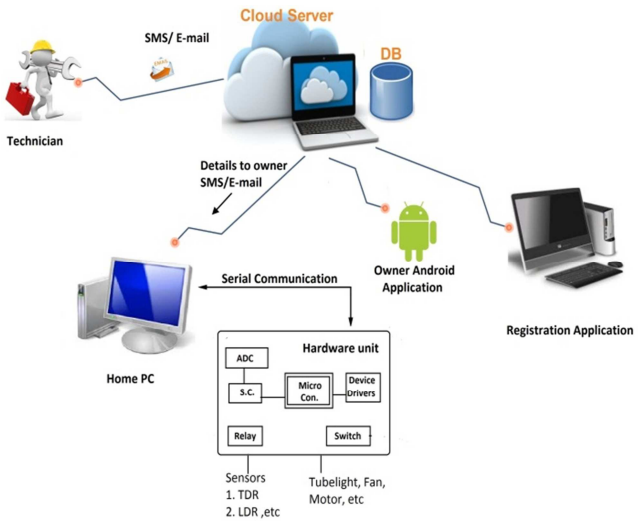

Figure 2. *Architecture diagram.*

Now, the digital value is sent to the Admin PC with the help of serial communication (i.e. MAX-232 cable). Admin PC continuously keeps a check on the working of the sensors as well as monitors the sensors values. The Admin PC is provided with threshold values of the sensor; the task of the Admin PC is to check whether the sensor value exceeds the threshold value and if this is true then it will send the information to the cloud server. The cloud server is used to store all the information about the technicians. We are using a registration application in which the technicians will enter their data with the help of database application. We are also store the information about the super market vendors, technicians etc. The record of the date/time when the technician is available as well as his area of expertise is also available. So now when the sensor value exceeds the threshold value the Admin PC will notify the cloud server about it. The cloud server will go the database and apply the data mining algorithm (in our case Naïve Bays) on the dataset i.e. the technician's data. Our parameters for Prediction of the technicians are:

1) His present location
2) His availability of time/date
3) Cost

We also provide an application to the user in which he/she has to select the type of technician i.e. Local technician or specific brand's system engineer. After the user selects the type of technician the request goes to the cloud server and the data mining algorithm is applied accordingly. Finally, after the selection of the technician the cloud server sends message to both technician and owner. After the confirmation of the owner the technician is sent to his/her place.

4. Flow Chart

The flowchart tells us the main functioning of the whole system that would be used and the flow that would be followed. The main task where the fault would be detected will be at the step where the sensor values coming from the device would be compared with the threshold value. Then the work of the admin starts where it reports to the cloud server. The server then sends a message to the owner. The owner selects the appropriate technician and then the repairing work is carried out accordingly. With the help of flow chart we can easily say that what are the functions of task a how system flow.

When process is start first hardware is activate and check the sensor are working properly, id they are working properly sense the value from sensors and convert the value into digital and if no then repair and change the hardware. We always compare the threshold value with obtained value. Admin will report to cloud server, server will send message to owner. Owner will choose the technician, cloud server will send message or mail to proper technician. Technician will come and repair the device. This process will do continually and last stop the process. We are trying to design a system which integrates cloud and database server going hand in hand to fetch the information. This device can be widely used as IoT application to detect the fault in the appliances. We use a hardware unit in which we are going to use a microcontroller chip, a signal conditioner, a relay board, a device driver and ADC.

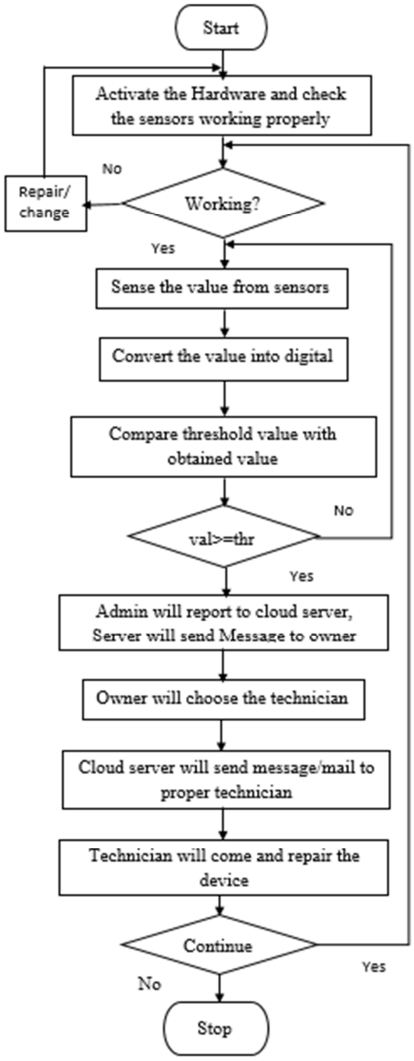

Figure 3. *Flow chart.*

5. Conclusion and Future Work

In this paper we have introduced the concept of the smart sensor interface. The setup of a cloud based home automation was a proof of the powerful and simple low cost alternative to the available commercial solutions. The key idea of this system is to propose a method that considers a low cost mechanism for integrating IoT with the home monitoring system. The concepts that had been proposed earlier considered the systems such as the water monitoring systems. They collected the various sensor values but didn't actually do anything with the collected data. Our system thus collects the related sensor values, focuses to putting it into some worth by making use of it. The advantages of the proposed system, the feasibility offered to the humans by reducing the human intervention. Another great advantage of the system is that it suggests a low cost option to the user

for the repairing of the appliance. The further advances in the system would be the introduction of an android app for the same.

References

[1] Qingping Chi, Hairong Yan, Chuan Zhang, Zhibo Pang, and Li Da Xu, Senior Member, "A Reconfigurable Smart Sensor Interface for Industrial WSN in IoT Environment", IEEE transactions on industrial informatics, VOL. 10, pp. 1551-3203, May 2014.

[2] Sean Dieter Tebje Kelly, Nagender Kumar Suryadevara, and Subhas Chandra Mukhopadhyay, Fellow," Towards the Implementation of IoT for Environmental Condition Monitoring in Homes" IEEE sensors journal, Vol. 13, October 2013.

[3] Takeshi Yashiro, Shinsuke Kobayashi, Noboru Koshizuka, and Ken Sakamura, "An Internet of Things (IoT) Architecture for Embedded Appliances", IEEE R10-HTC2013, Aug. 2013.

[4] L. Atzori, A. Iera, and G. Morabito, "The Internet of Things: A survey" Computer Network, vol. 54, pp. 2787–2805, Oct. 2010. [Online] Available: http://dx.doi.org/10.1016/j.comnet.2010.05.010.

[5] D. Surie, O. Laguionie, and T. Pederson, "Wireless sensor networking of everyday objects in a smart home environment," in Proc. Int. Conf. Intell. Sensors, Sensor Netw. Inf. Process, pp. 189–194, 2008.

[6] S. Li, L. Xu, X. Wang, and J. Wang, "Integration of hybrid wireless networks in cloud services oriented enterprise information systems," Enterp. Inf. Syst., vol. 6, pp. 165–187, 2012.

[7] http://hubpages.com/living/Home-Automation-Sensors

[8] Device-to-Device Communication in the Internet of Things", IEEE systems journal,Vol. 10, pp. 1932-8184, 2014.

[9] Rupali Shanbhag, Radha Shankarmani, "Architecture for Internet of Things to Minimize Human Intervention", International Conference on Advances in Computing, Communications and Informatics, 978-1-4799-8792-4/1, 2015.

[10] Him shekhar Das; L. C. Saikia, "GSM enabled smart energy meter and automation of home appliances" IEEE Conference on Energy, Power and Environment: Towards Sustainable Growth (ICEPE), 978-1-4678-6503-1/1, 2015.

[11] MihalySagi, DejanMijia, DejanMilinkov, BojanBogovac, "Smart home automation ",20th Telecommunications forum TELFOR, 978-1-4673-2984-2/12, Nov. 2012.

[12] AbdelhakimAhmim, Tam Le, Esther Ososanya and SasanHaghani, "Design and Implementation of a Home Automation System for Smart Grid Applications", IEEE International Conference on Consumer Electronics (ICCE), 978-1-4673-8364-6/16, 2016.

[13] https://en.wikipedia.org/wiki/Naive_Bayes_classifier

[14] Kaylee Moser, Jesse Harder, Simon G. M. Koo, "Internet of Things in Home Automation and Energy Efficient Smart Home Technologies", IEEE International Conference on Systems, Man, and Cybernetics, 978-1-4799-3840-7/14, October-2014.

[15] TahaMehrabi, Alan S. Fung, KaamranRaahemifar, "Optimization of Home Automation Systems Based on Human Motion and Behaviour", IEEE Canadian Conference on Electrical and Computer Engineering (CCECE), 978-1-4799-3010-9/14, 2014.

[16] ShaikMasthanBabu, A. Jaya Lakshmi, B.Thirumala Rao, "A Study on Cloud based Internet of Things: CloudIoT", IEEE Global Conference on Communication Technologies, 978-1-4799-8553-1/15, 2015.

[17] D. Surie, O. Laguionie, T. Pederson, "Wireless sensor networking of everyday objects in a smart home environment", Proceedings of the International Conference on Intelligent Sensors, Sensor Networks and Information Processing-ISSNIP- 2008, pp. 189 – 194.

[18] J. Gubbi, R. Buyya, S. Marusic, and M. Palaniswami, "Internet of Things (IoT): A vision, architectural elements, and future directions," Future Gener. Comput. Syst., vol. 29, no. 7, pp. 1645–1660, Sep. 2013.

[19] M. Eisenhauer, P. Rosengren, P. Antolin, "A Development Platform for Integrating Wireless Devices and Sensors into Ambient Intelligence Systems", Proceedings of the 6th Annual IEEE Communications Society Sensor, Mesh and Ad Hoc Communications and Networks Workshops, SECON, pp.1-3, 2009.

[20] Y. Fan, Y. Yin, L. Xu, Y. Zeng, and F. Wu, "IoT based smart rehabilitation system," IEEE Trans. Ind. Informat., vol. 10, no. 2, pp. 1568–1577, 2014.

[21] Y. Chen and V. Dinavahi, "Multi-FPGA digital hardware design for detailed large-scale real-time electromagnetic transient simulation of power systems," IET Gener. Transmiss. Distrib. vol. 7, no. 5, pp. 451–463, 2013.

[22] F. Salvadori et al., "Monitoring in industrial systems using wireless sensor network with dynamic power management," IEEE Trans. Instrum. Meas., vol. 58, no. 9, pp. 3104–3111, Sep. 2009.

[23] D. Evans, "The Internet of things: How the next evolution of the Internet is changing everything," Cisco IBSG, San Francisco, CA, USA, Apr. 2011. [Online]. Available: http://www.cisco.com/web/about/ac79/docs/innov/IoT_IBSG_0411FINAL.pdf

[24] K. Johnsson, S. Talwar, and N. Himayat, "Mobile device and method for cellular assisted device-to-device communication," WO 2013022471A1, Feb. 2013. [Online]. Available: https://www.google.com/patents/ WO2013022471A1?cl=en

[25] Molderink, V. Bakker, M. Bosman Johann, L. Hurink, and G. J. M. Smit, "Management and control of domestic smart grid technology," IEEE Transactions on Smart Grid, vol. 1, no. 2, pp. 109–119, 2010.