A Review on Various Sensor used in IoT for Real Time Applications

S. Balaji, S. Karthik and T.S. Balaji
Department of ECE, SRM University, Vadapalani, Chennai, India

Abstract: With increase in modernization day by day we expect all our work to be done in a simple way on its own with reduced human effort. Ultimately, it has led to advent of new technology called internet of things. IoT is an emerging technology which enables different devices to be interconnected between them and to communicate among them for various information exchange using internet. With world stepping into advanced communication technology new smart objects are getting evolved day by day with the applications of IoT. When IoT is implemented the main key role is played by a vital element called sensor. This study throws light on various sensors that are used in different application that makes use of IoT. This study also highlights various parameters of using sensors based on effectiveness, economic concern, efficiency, power consumption, availability, flexibility and compatibility.

Key words: IoT, played, implemented, emerging, technology, modernization

INTRODUCTION

Internet of things provides an easy platform to interface different electronic devices with each other, so as to enhance communication among them through internet to make things done in an automated fashion without interference of humans. When devices start to communicate among themselves, they take necessary decision on their own to fulfil the needs of humans. Many real time IoT technology implemented projects are developed day by day by focusing on wireless, secured and power efficient factors (Yeh, 2016). When things are getting automated the potential of humans to work hard is slowly converted into smart work. The moment automation is done through IoT then the major role is played effectively by an electronic component called sensor. Yes, sensor is entirely responsible for executing an automated system successfully.

In today's advanced world even the metro rails in many countries are fully automated which purely depends on the reliable information updated by the sensor. Since, IoT has become very popular in making things done in an easier way the sensor used in devising such a system comes into main consideration. Wireless sensor networks implemented for various real time applications of IoT should be highly reliable, should consume less power, compactable and highly efficient. Failure of such sensors due to some reasons would bring down the overall performance of the IoT system. Hence, this study compares about different sensor used to implement IoT for different real time applications.
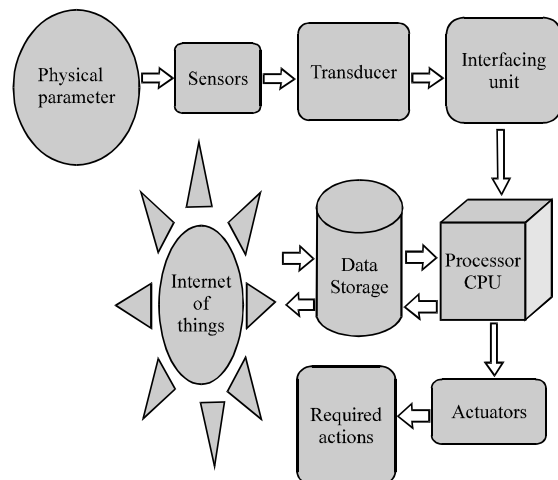

Fig. 1: Block diagram of IoT

EXISTING SYSTEM

In an existing manually controlled system many sensors are implanted at the place where physical parameters are to be monitored and the time to time updated data are sent to the control room for allowing the humans to take decision of accordingly, suppose in the absence of humans there can be a chance for occurrence of accident.

Wherein IoT system consist of wireless sensor networks interfaced with processor such as Raspberry Pi through internet and data are collected and stored in cloud and recommended actions are taken dynamically by the processor and executed correspondingly through actuators as shown in block diagram of IoT in Fig. 1.

Corresponding Author: S. Balaji, Department of ECE, SRM University, Vadapalani, Chennai, India
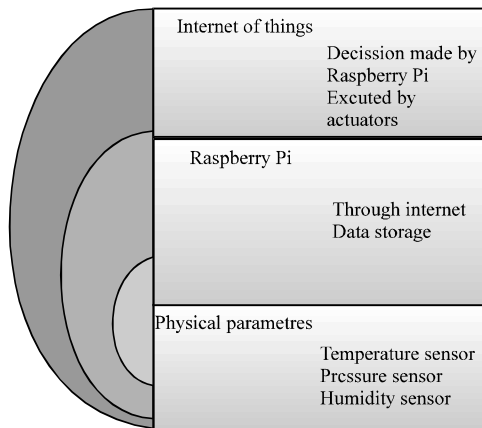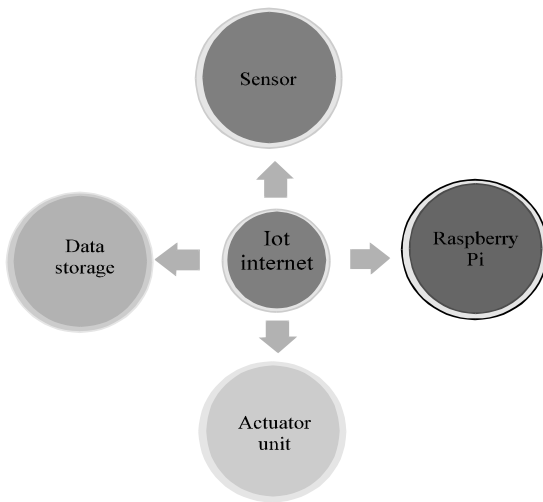
Fig. 2: Interlinked IoT module

Fig. 3: Centralized IoT connectivity

In Fig. 2, the interlinking of components of IoT module is shown. Raspberry Pi is a debit card sized CPU processor which allows different device to be interfaced to it and provides hdmi and usb slots to connect monitor, external memory devices and high definition cameras. The centralized control of IoT is shown in Fig. 3.

DIFFERENT SNSORS

Bio-sensors in IoT: In this study, the resaercher describes how bio-medical sensor are implemented to humans with the advent of IoT technology and also explains how sensors are been chosen rightly and ways for interfacing them in IoT technology using internet. Since, the advancement of smart objects is popular every day, this have paved way for development of wireless sensor network architecture (Yeh, 2016). Sensor
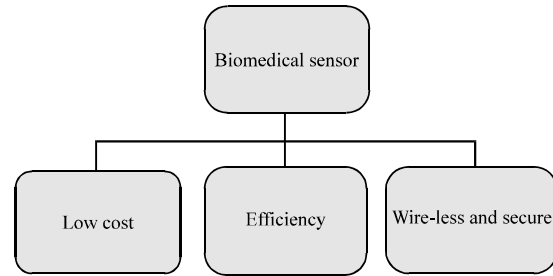

Fig. 4: Senor considering factors

selectivity primarily focused on wireless, economy, efficiency and security as shown in Fig. 4. Data extracted from modern devices in a real time implementation in patient body is further processed and necessary initiatives are reflected in the patient body. The different sensors that are implanted in human body includes blood pressure sensor, temperature sensor, accelerometer sensor, heart beat sensor and GPS sensors. This study highlights the importance of the security feature that has to be provided to the data that is retrieved using IoT technology. Though IoT have given way for development of smart applications it also has raised other type of privacy threats. Indeed, certain IoT application which were developed for children may include live interaction with the child including the family members trough camera, this may give way for hackers to spy on their privacy aspects (Gibbs, 2015).

Home automation sensors in IoT: Many accidents happen every day due to the carelessness of the people in handling the electrical appliances that are being installed in their houses for daily application. Every time when question is rises about the cause for the accident the answer is found to be as human mistake. When appliances are not turned off properly after the work is done, it malfunctions due to voltage fluctuations and results in domestic accident, so as a solution sensor are being implanted which monitors the home appliances keenly and at the time of trouble, sensors send information through wireless networks to the processor, depending on the current scenario decisions are taken according to pre-programmed program by the processor and execution of decision is done with IoT technology which makes all devices interconnected through internet (Venayagamoorthy, 2011).

The evolution of IoT technology has enabled a wide market for sensors and paved a great opportunity for enhancing growth and development of various other smart devices. The market for IoT based wireless sensor can be expanded when cost of sensor and power
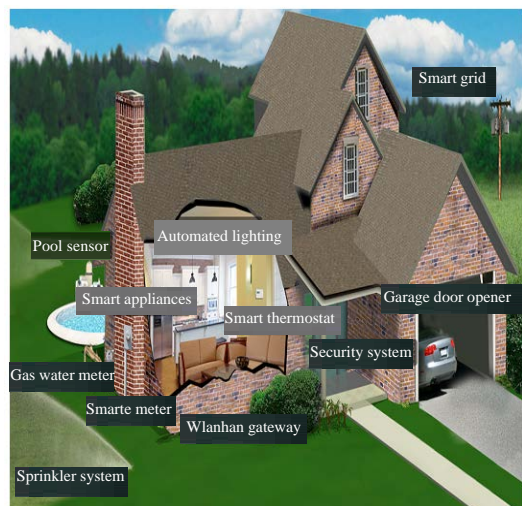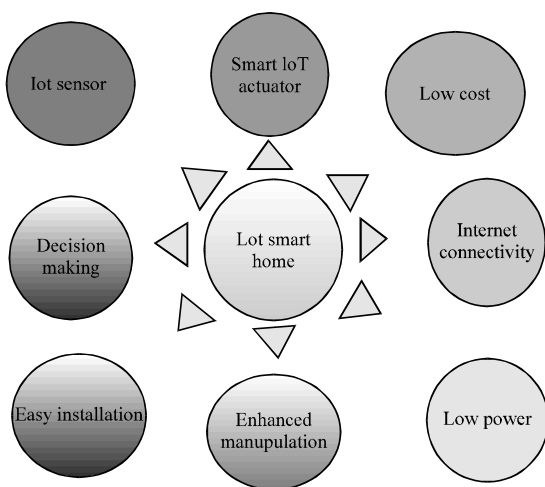
Fig. 5: IoT sensor installed smart home

Fig. 6: Features of IoT sensor based smart home

consumed by sensor is reduced considerably. In industries IoT sensors are getting more popular one (Anonymous, 2013). A house which is fully installed with smart IoT sensor using IoT technology through internet is shown in Fig. 5.

Factors affecting implementation of IoT automation system includes poor network coverage, lack of internet connectivity, slow internet data rate, unreliable sensors ,complexity of system, radiation threat due wireless sensor network (Bedi *et al.*, 2016). Some of the sensors used in home automation includes temperature sensor, humidity sensor, pressure sensor, gas sensor, vision sensor, motion sensor and light sensor. Features of IoT sensor based smart home is clearly shown in Fig. 6.

Environmental monitoring smart IoT sensors: In recent years with the development of urban boundaries, ultimately increases pollution and makes the environment unsuitable for people to live a peaceful life. As industries and vehicles are increasing every day, the unwanted smoke getting out of them also makes the air poisonous. So, here is a solution offered by smart IoT sensors which when installed in different places would monitor the smoke and hazardous gas coming out of industries and vehicles. The collected real time data's are sent to the processor through internet and violations of rules done by industries are brought into light and necessary actions are taken by corresponding government officials. A very dangerous threat for environment is caused due to nuclear power plant. Technicians and workers are deployed continuously in monitoring the nuclear power plants and sampling the air at every instan and ensuring the environment around the plant is safe (Ding *et al.*, 2009).

Various works on smarts sensor networks, data storage and dynamic decision execution using processor for monitoring and providing real time radioactive leakages and their risk are presented (Vax *et al.*, 2009; Brennan *et al.*, 2005).

Continuous monitoring manually may result in failure, due to humans interventions, so, IoT technology provides a platform to build a smart wireless sensor networks which monitors the environment and takes necessary action when radiation is emitted from the plant. When implementing a smart wireless network using IoT technology, it should be cost efficient and less power consuming system (Tocchi *et al.*, 2017).

PROCESS FLOW

Process flow in IoT senor selection as shown in Fig. 7, involves various step that includes selection of a feasible sensor out of many sensors for particular parameter measurement whose criteria falls positively for the conditions mentioned in the Table.1.When sensors are chosen consideration about failure of different sensor at abnormal conditions are taken into account and such sensor which have encountered failures are neglected. After successfully selecting the sensor, wireless networks are adapted and processor like Raspberry Pi is interfaced with senor network and the entire system is interconnected through internet.

Through, IoT technology the real time data's are sensed by the IoT wireless network sensor system and the data is carried to the processor, here, referred as Raspberry Pi and adaptive and dynamic decisions are taken by Raspberry Pi and successfully implemented at
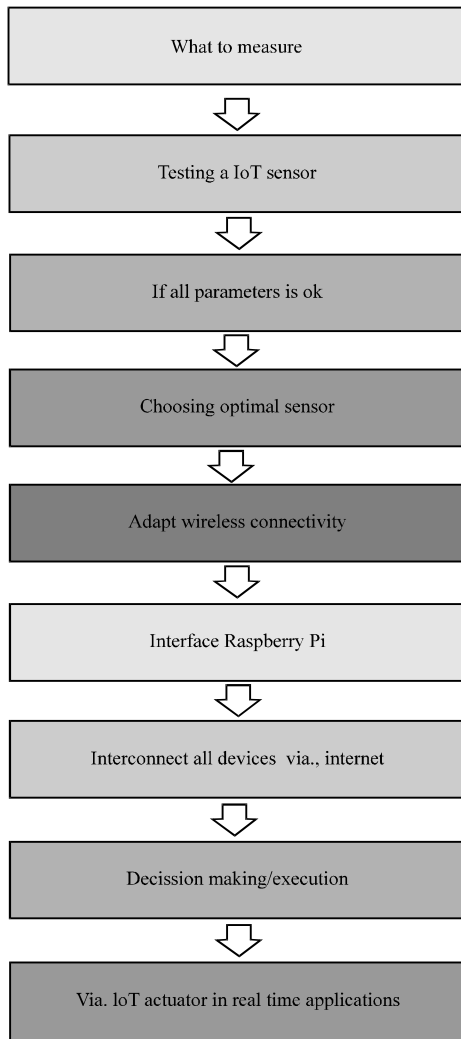
Fig. 7: Process flow involved in choosing an IoT senor for implanting in real time application

Fig. 8: Growth chart for IoT technology

Table 1: Parameter for selecting a sensor

Parameters for sensor selection	High	Low	Medium
Cost	-	√	-
Performance	√	-	-
Efficency	√	-	-
Power consuption	-	√	-
Eco friendly-less hazard	√	-	-
Size	-	-	√
Compactible	√	-	-
Reliability	√	-	-
Sensitivity	√	-	-

the real time applications through the smart actuators and hence making the life for humans more comfort than ever before

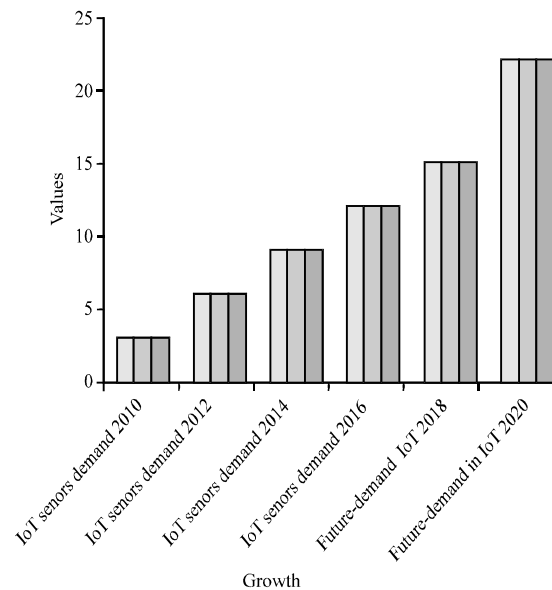**Increasing growth Of IoT:** With increasing in smart system day by day, it ultimately leads to increase in demand for IoT sensor technology for society growth and development. Though, IoT evolved in early 1990's few It is very seriously viewed in recent years and it is predicted that futuristic demand for IoT based sensor will increase massively as shown in Fig. 8. When IoT based smart applications are developed then all devices interconnected will have unique ID for identification of themselves with world of connected devices (Babu *et al.*, 2016).

When IoT based smart sensor are installed in homes then we don't have to bother about control of gas cylinder, tap valve, motor, lights and fans because the actuator and sensors will be sensing these devices and controls dynamically through processor that is interconnected to it through internet (Babu *et al.*, 2016).

CONCLUSION

Thus, a review about different sensors used in real time IoT application module is briefly discussed and various parameters influencing selection of appropriate sensors for particular application are discussed. IoT integrates many different devices into single stuffed devices and enables it to measure, monitor, decide and execute independently without human intervention and enabling humans to live a sophisticated life of higher degree of comfort. For devising any real time IoT module successfully, the primary responsibility lies on selection of eminent sensor, so, this study focuses many parameters that has to be considered while a choosing a sensor.

REFERENCES

Anonymous, 2013. The evolution of wireless sensor networks. Silicon Laboratories Inc., Austin, Texas, USA.

Babu, K.R., S.J. George and P. Samuel, 2016. Optimal sensor selection from sensor pool in IoT environment. Proceedings of the 2nd International Conference on Applied and Theoretical Computing and Communication Technology (iCATccT), July 21-23, 2016, IEEE, Bangalore, India, ISBN:978-1-5090-2400-1, pp: 697-702.

Bedi, G., G.K. Venayagamoorthy and R. Singh, 2016. Internet of things (IoT) sensors for smart home electric energy usage management. Proceedings of the IEEE International Conference on Information and Automation for Sustainability (ICIAS'16), December 16-19, 2016, IEEE, Galle, Sri Lanka, ISBN:978-1-5090-6133-4, pp: 1-6.

Brennan, S.M., A.M. Mielke and D.C. Torney, 2005. Radioactive source detection by sensor networks. IEEE. Trans. Nucl. Sci., 52: 813-819.

Ding, F., G. Song, K. Yin, J. Li and A. Song, 2009. A GPS-enabled wireless sensor network for monitoring radioactive materials. Sens. Actuators A. Phys., 155: 210-215.

Gibbs, S., 2015. Hackers can hijack Wi-Fi hello Barbie to SPY on your children. The Guardian Inc., Orlando, Florida, USA.

Tocchi, A., V. Roca, L. Angrisani, F. Bonavolonta and R.S.L. Moriello, 2017. First step towards an IoT implementation of a wireless sensors network for environmental radiation monitoring. Proceedings of the IEEE International Conference on Instrumentation and Measurement Technology (I2MTC), May 22-25, 2017, IEEE, Turin, Italy, ISBN:978-1-5090-3597-7, pp: 1-6.

Vax, E., B. Sarusi, M. Sheinfeld, S. Levinson and I. Brandys et al., 2009. An integrated approach for multi-purpose fast deployment environmental radiation monitoring system. Proceedings of the IEEE Conference on Nuclear Science Symposium Conference Record (NSS/MIC), October 24-November 1, 2009, IEEE, Orlando, Florida, USA., ISBN:978-1-4244-3961-4, pp: 912-913.

Venayagamoorthy, G.K., 2011. Dynamic, stochastic, computational and scalable technologies for smart grids. IEEE Comput. Intell. Mag., 6: 22-35.

Yeh, K.H., 2016. A secure IoT-based healthcare system with body sensor networks. IEEE. Access, 4: 10288-10299.