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IoT Sensors: Perspectives & Appliance

Pratima Manhas, Shaveta Thakral, Jyoti Verma

Abstract: ***IoT is defined as smart machines collaborating and communicating with different gadgets, objects, environments and framework, resulting in amount of data generated and that processed the data into useful actions which can be used to command and control things and ultimately help human beings to make life easier. IoT platforms play a central role within this evolution by providing significant building blocks. Major building blocks used in IoT is sensor. Sensors play an important role in IoT that allows the Internet of Things (IoT) by collecting the data for wiser decisions. This paper reviews various types of IoT sensors along with its application.***

Keywords: Blocks, Command, control, Internet of Things, smart, machines

I. INTRODUCTION

In today's world internet application requirement is very high and it can be achieved by using IoT. Various useful applications can be provided with the aid of IoT. Internet of things (IoT) is a network by which all physical devices can be connected with the help of internet via network devices such as routers and that can be used to exchange data. It can be considered as an intelligent technique which reduces human effort and moreover any device can be controlled without human involvement. Major challenges faced by Internet of things in order to provide term less network access are outdated hardware and software, malware, data protection & security. Due to increased in number of devices, these devices are secured during time of purchase and become outdated as more devices are added and become more prone to attacks. The cyber attacks are also increased due to enhancement of more devices. Sometimes it is very difficult to trace whether the device is attacked. So, monitoring of such a large number of IoT devices is difficult. In order to build smarter applications these issues will be considered. Edge computing has been used to send only the useful data on cloud which will reduce the processing cost.

Due to reduction in price of sensors, it becomes more fruitful to add more IoT devices. In today's world the number of connected devices continues to accelerate so, working environments will become filled with more smart products and which will results in beginning of new era.

II. IOT LAYERED ARCHITECTURE

Architecture of Internet of Things (IoT) deals with two major parts: Internet and physical devices (like sensors and actuators). The lower layer of the IoT system is known as sensor connectivity & network which includes sensors (which convert information from outer world into data needed for analysis) and network is used to collect information. Lower layer is a main component of the IoT system and provide network connectivity to the next higher layer which is the gateway and network layer.

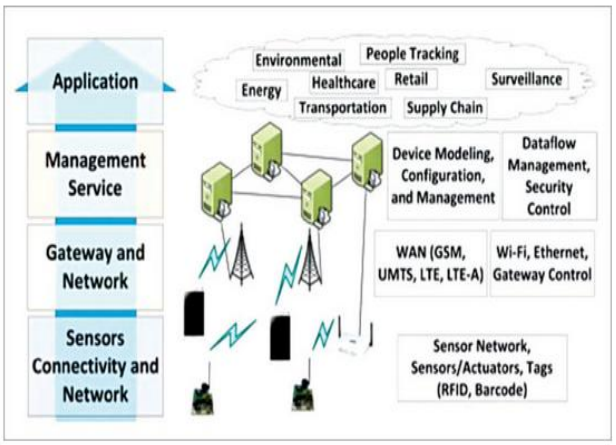

Fig. 1. Block diagram of IoT design architecture

Collection of data from the surrounding environment is done with the help of sensor. Front end comprise of Sensors, or 'things' of the IoT system,. Sensors after signal conversion and processing can be connected directly or indirectly to IoT networks. Sensors can be categorized depending of different IoT applications. Digital sensors are easy to interface as compared to analog sensors.

III. IOT SENSORS TYPES

Sensor is defined as a device to detect changes in environment. Sensor is used to measure physical quantity (light, heat, motion, moisture, pressure, temperature) and convert them into electrical pulses. Sensor has certain properties such as sensitivity, resolution and range.

Sensors can be classified as:

a) Temperature sensors

It can be used not only for manufacturing (to monitor production process) and agriculture but also for health industry. These sensors are used to monitor the temperature of machines.

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* Correspondence Author
Pratima Manhas, Manav Rachna International Institute of Research & Studies, Faridabad, India. E-mail:pratimamehak@gmail.com
Shaveta Thakral, Manav Rachna International Institute of Research & Studies, Faridabad, India. E-mail: shaveta.fet@mriu.edu.in
Jyoti Verma, Manav Rachna International Institute of Research & Studies, Faridabad, India. E-mail: Jyotiverma.fet@mriu.edu.in

b) Pressure Sensors

Pressure sensors sense pressure and found to be useful in agriculture, smart vehicles, manufacturing, water system maintenance and aircrafts. Smart ecosystems are getting attention with pressure sensor enabled IOT environment. Many smart systems and devices that are pressure propelled can be easily monitored in pressure sensor enabled IOT environment.

c) Humidity sensors

They are used to monitor humidity level and are important in manufacturing unit.

d) Motion sensors

They are used in automatic door controls, automatic parking systems, automated sinks, automated toilet flushers and hand dryers.

e) Gas sensors

Toxic gases can be identified using gas sensors.They used various sensing technologies such as electrochemical, photo-ionization and semiconductor.

f) Smoke sensors

They are quite frequently used in homes and industries applications. Additional features are also added in smoke sensors using wireless connection which impart many features such as safety and convenience [3].

g) Proximity sensors

Smart technology with proximity sensors made life easy and safe at parking places like at airports and malls. Proximity sensors sense objects and their associated properties and useful in retails, surveillance, metal and non metal objects detection etc.

h) Water Quality Sensors

Water is the most important element of life and contaminated water can cause lot of health issues. Water quality sensors enabled IOT environment helps in health management. Water germs, bacteria, PH level, organic elements, solid compounds, dissolved compounds can be easily traced with the help of water quality sensors[4].

i) Chemical Sensors

Quality of air plays another important role on health of human being and other creatures on this earth. Recent studies on quality of air reported that numerous diseases may be caused by air pollution. Therefore quality of air need to be analyzed and chemical sensors enables that access. Chemical sensors sense change in liquid or air and found to be useful for detecting healthy industrial environment. Lot of accidents can be avoided with the help of chemical sensors.
Other popular sensors are level sensors, accelerometer sensors, gyroscope sensors and optical sensors. A brief overview of IOT sensors is presented in Fig. 2.

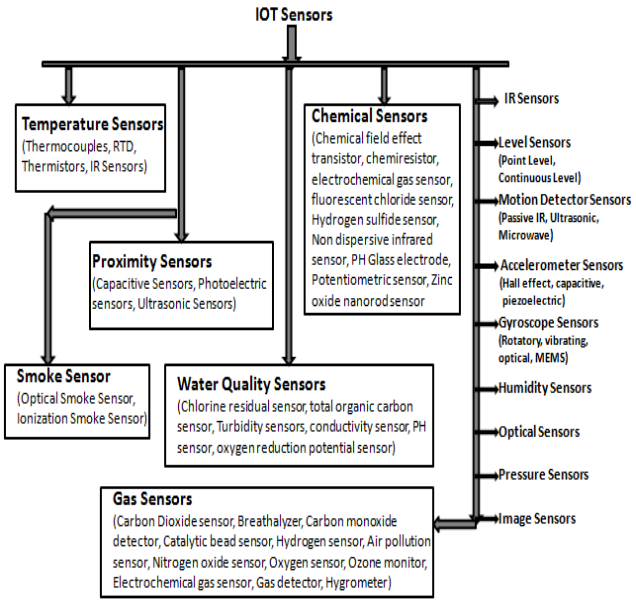


Fig. 2. IoT Sensors

IV. IMPLEMENTATION OF PROPOSED WORK USING TEMPERATURE SENSOR

This proposed IOT sensor work deals with the monitoring of temperature on IOT platform. For implementation of this work following components are required such as Arduino Software, LM35 temperature sensor, Wi-fi module ESP8266, Thingspeak Cloud and Arduino UNO board. The block diagram of proposed work is shown in fig.3.

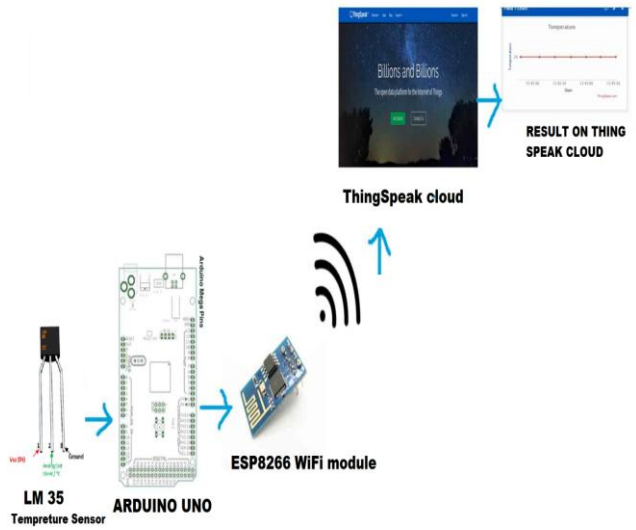


Fig.3.Block Diagram of proposed Work (Temperature Monitoring on Thing Speak Cloud)

First of all data is sensed by using LM 35 temperature sensor. The sensed data is connected to analog channel A0 of Arduino board.

The analog ouput voltage of the sensor is converted into integer value by in built ADC using analogRead(A0) function. This integer value is calibrated in the program to display the correct temperature reading on the IOT platform. The output of Arduino board is interfaced with wi-fi module for transmitting it to Thing Speak cloud. The sensed data can be displayed in public channel or private channel depending upon the application.

V. PROPOSED WORKFLOW

Following are the steps to perform the proposed work:

1. Firstly, connect the ESP8266 wifi module with Arduino (straight connection).
2. Upload the blank code to the Arduino.

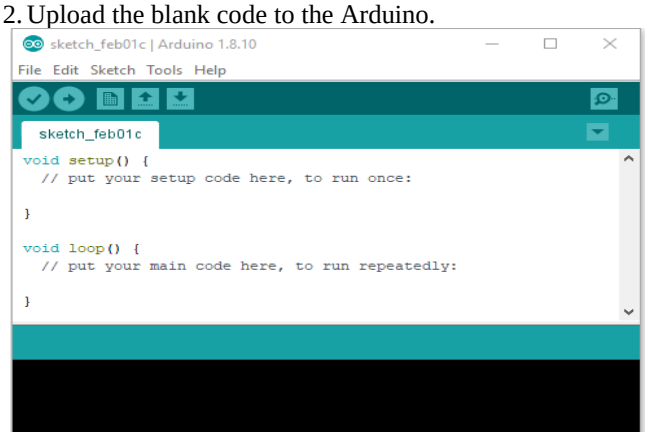


Fig.4. Uploading of blank code to Arduino

3. Press Ctrl+Shift+M for the serial console module to open and do the AT check and connect to the wifi.

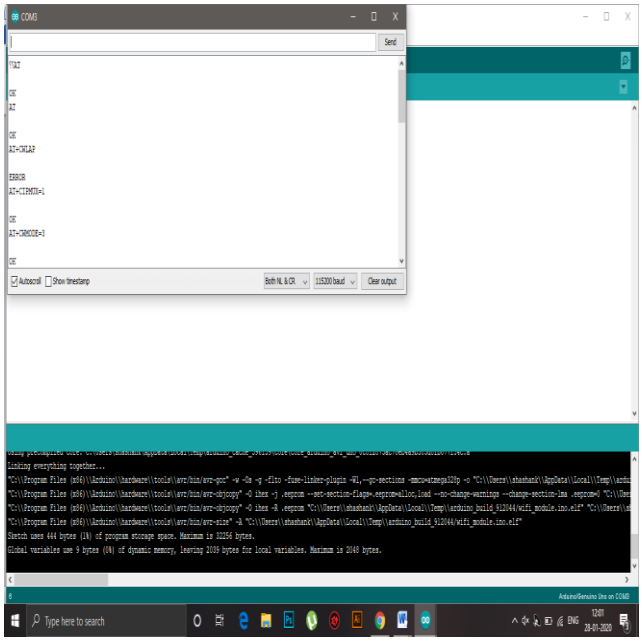


Fig.5. AT check commands

4. Now connect LM35 temperature sensor to the Arduino UNO (cross connection).

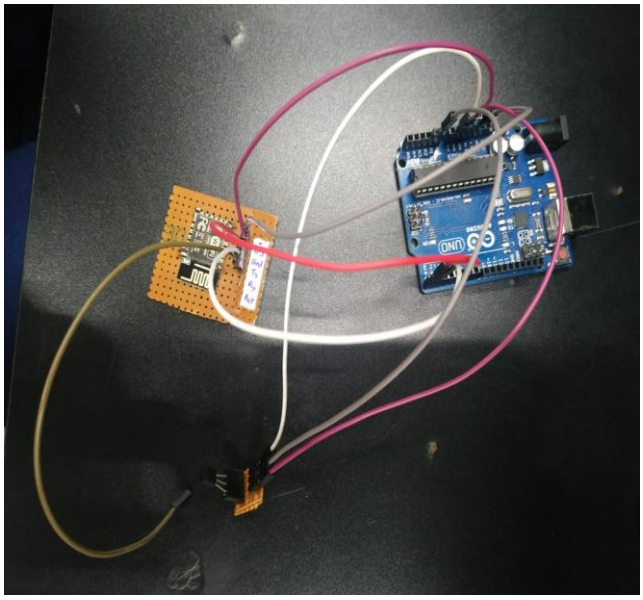


Fig.6. Wired connection to the proposed work

5. Sign into the thingspeak account, clear the channel and copy the API request link.

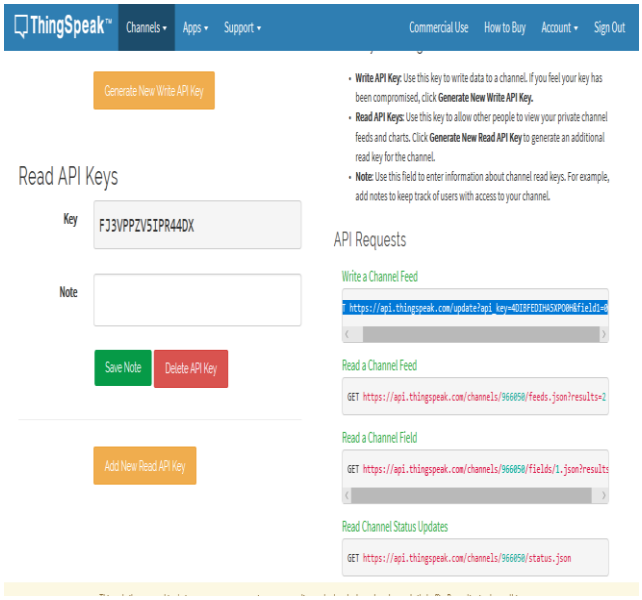
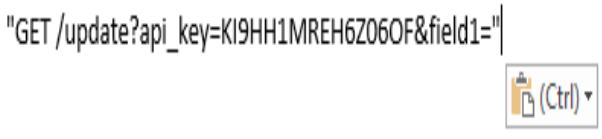


Fig.7. Thingspeak account for clearing channel

6. Paste and edit the link to use it in the code.



7. Upload the code to the Arduino UNO board.

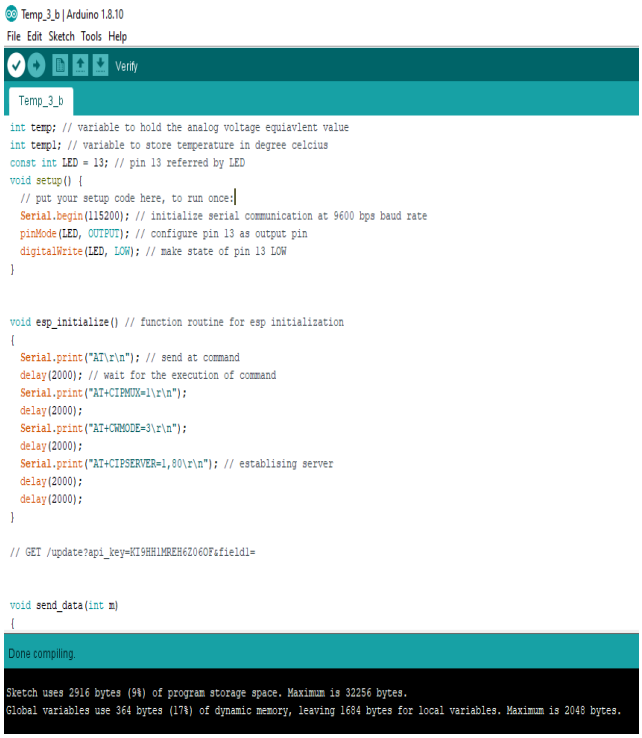


Fig.8. Code uploading on Arduino board

8. Open the serial monitor and we can see the code being executed.

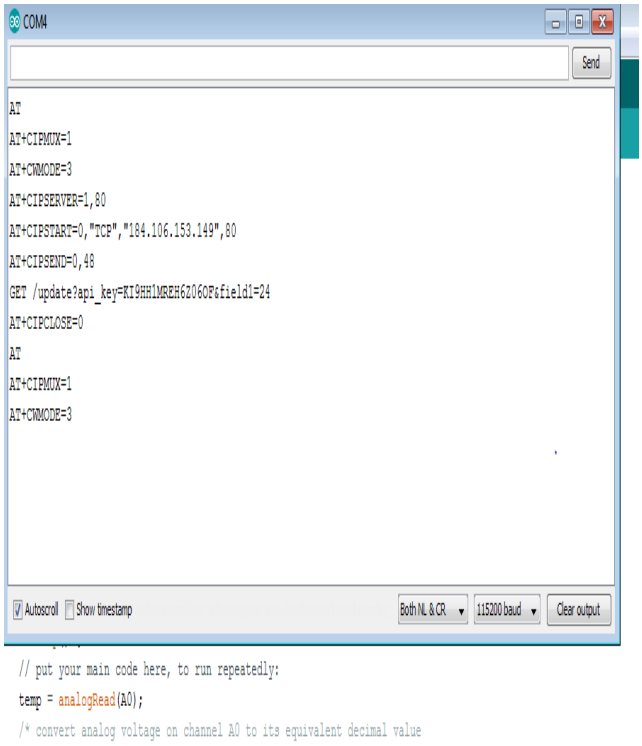


Fig.9. Execution of Code

VI. RESULTS

Output will be displayed in the Thingspeak account and it is shown in the fig. 10.

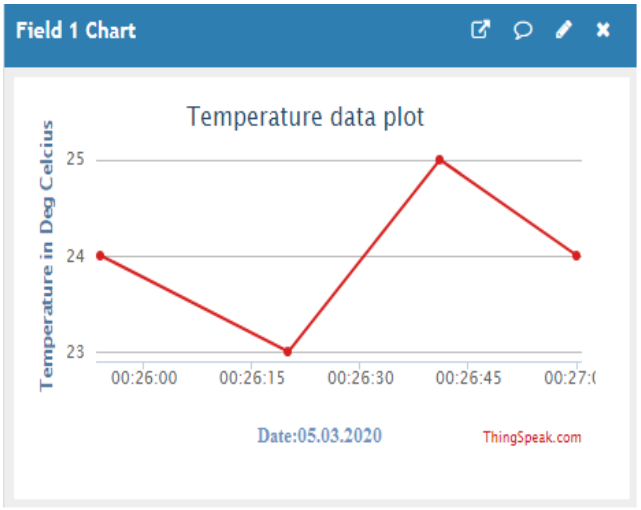


Fig.10. Display of temperature on cloud

Fig 10 indicates the variation in temperature at different time interval on particular date. So, the variation of temperature can be easily monitored on cloud.

VII. CHALLENGES IN IOT

Security and data protection are major issues that deal with IoT. It is very important to secure that data. One more issue is connectivity as internet is not available everywhere at same speed [6]. As the number of devices keeps on increasing, so it is very difficult to handle the unstructured data on the basics of volume and variety. So, one of the challenge for any organization is to decide the valuable data that need to used further.

Many times various flaws are present in old and new software codes but various IoT devices are unable to patch it. Many challenges are also related to Hackers which permanently hacked routers and webcams. So, all these issues must be considering while working with IoT devices [7].

VIII. CONCLUSIONS

IoT is considered as a boon and as it connects thing to the internet and sometimes things become susceptible to cyber threats. Many researchers are doing their best to solve these issues. As IoT deals with a structure that subsist things into real world, and sensors combined to these things, connected to the Internet through wired and wireless network structure. In the proposed work the variation of temperature has been viewed on IOT platform means uploading of content on IOT platform. So, sensors play an important role in IoT.

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AUTHORS PROFILE

Dr. Pratima Manhas has B.Tech ,M.Tech in Electronics and Communication Engineering .She completed her PhD in 2018 from Manav Rachna International Institute of Research and Studies, Faridabad, India. Moreover she had done MBA in Operations research from IGNOU, Delhi in 2007.She had over **15 years** of teaching experience and presently she is Associate Professor in the Electronics and Communication Engineering Department of Manav Rachna International Institute of Research and Studies, Faridabad, India. She had more than **42 papers published** in various international and national indexed journals. Four Mtech dissertations had completed under her guidance. Her areas of interest are Wireless communication, Digital Communication, Data communication, Digital System Design, Hardware Digital Design and Computer networks. She was adjudged the Best paper presentation award at IEEE based International Conference on Reliability, Infocom Technologies and Optimization at Amity University, Noida in 2015. She is a member of IAENG.

Shaveta Thakral, is presently working as an Associate Professor in Electronics & communication department, Faculty of Engineering and technology, MRIIRS, Faridabad. She obtained her BE in Electronics and communication from Lingayas Institute of management and Technology, Faridabad; MTECH from IASE Deemed University, Rajasthan. Currently she is pursuing PhD from MRIIRS, Faridabad. Her current research area includes Analog and Digital circuits, VLSI and Microprocessor. She has work experience of 15 years. She has published 40 research papers in prestigious indexed journals and conferences.

Dr. Jyoti Verma, works as an Assistant professor in ECE department. She completed her PhD in ECE from Manav Rachna International University (MRIU) in 2018, M.Tech &B.Tech in ECE from Maharishi DayanandUniversity, Rohtak, Haryana, India in 2009 & 2004 respectively.She has a rich experience of 14 years in academics. Her interests includeWireless Networks, Digital System Design, Microcontrollers, &Microprocessors. She is a life member ofThe Indian Society for Technical Education (ISTE), International Association for the Engineers (IAENG), & The Institution of Engineers', Calcutta, India and many more.