A Survey on Emerging IOT Applications

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Abstract: *This paper describes overview of emerging applications of IoT and different Protocols used in IoT. IoT:"Internet of Things" is emerging technology in this era. Different things are connected on internet i.e. non living or living things we can club together, and establish a protocol, so that they can communicate effectively. The IoT includes four components like sensors, cloud, analytics & Mobile. The data which to be generated by sensors is collected and processed via different microcomputer like Arduino-Uno, Raspberry-Pi ,beagle board's etc.Then this processed data is send to cloud. Next phase is analytics .Analytics is used to discover meaningful data & apply it to take effective decision.*
The Data is available on cloud can be accessed through a mobile application. Mobile application provides data in graphical format as well as different beneficial services to keep monitoring & controlling the things connected to internet.
Key Word*: IoT; sensors; microcomputer*

I. Introduction

Internet of Things (IoT) is a promising prototype to combine several technologies and communication solutions.Iot based applications contains electronic devices such as sensors, the data collected by the sensors has to be stored and processed according to algorithm written in order to derive useful data from it. A mobile phone or even a microwave oven can be used as a sensor as long as it provides inputs about its current state (internal state + environment).second hardware element is IoT hardware processor like Arduino-Uno or Raspberry Pi or Beagle board according to requirement of application.

IoT technology mainly focuses on controlling and monitoring of different activities. These are more promising to reach the human needs. In 1999 Kevin Ashton was put the concept Internet of Things in the context of supply chain management. Now a day's nearly 9 billion devices are connected together over internet. In last two decades there is large impact of IoT on industry and society also. Consider the all appliances in home are connected on internet and house owner is able to monitor and control devices via mobile applications. Isn't it amazing? The role of IoT is very vital in our life to improve quality of lives. There are many applications are based on The Internet of Things like in health care, smart farming, water quality monitoring, weather monitoring, education, entertainment, social life, energy conservation, home automation, and transport systems and many more. We will discussed some emerging IoT applications in section III.

II. Hardware Requirement

I)Sensors

Sensors play a vital role in IoT system, without sensors one cannot think about IoT system. Sensors are used to sense & collect the data from environment. Sensors are actually small physical devices with low cost and less power consumption. Overview of some sensors used in IoT applications.

A)Smart Home Automation and Farming
1)Temprature Sensor

The LM35 is an integrated circuit sensor that can be used to measure temperature with an electrical output proportional to the temperature (in oC). Temperature Sensor is shown in Fig3. The scale factor is .01V/oC. The LM35 does not require any external calibration or trimming and maintains an accuracy of +/- 0.4oC at room temperature and +/- 0.8oC over a range of 0oC to +100oC

2)Light intensity sensor/LDR

It is the cheapest sensor that can use to measure the intensity of light. It is light controlled variable resistor. The resistance of photo resistor decreases with increasing incident light intensity. This sensor is used to control light (streetlight/passage light/Home light etc), as sufficient light falling on LDR it causes to turn off streetlight/passage light.

3) Soil moisture sensor
 This sensor is used to measure moisture in soil. Data collected by this sensor is used to decide whether water is necessary for particular crop or not. It is used to save water as well as crop life. It is very simple and cheap sensor.

B)Air Pollutant Measurement Sensors
1) Carbon Monoxide (CO) Sensor
This sensor is used for sensing CO concentrations in the air. The MQ-7 can detect CO-gas concentrations anywhere from 20 to 2000ppm.This sensor has a high sensitivity and fast response time. The sensor's output is an analog resistance. The drive circuit is very simple; all you need to do is power the heater coil with 5V, add a load resistance, and connect the output to an ADC.
2)MQ135:
It is used in air quality control equipment for building/office. It is used for detecting of NH3, NOx,smoke,CO2 etc..
3) PM-2.5
        Pm 2.5 is a mixture of solid and liquid particles that are suspended in the air. These are categorized in to fine and ultrafine. This sensor measures the fine particles in the air. Coarse particles have a diameter of 2.5 micrometer to 10 micrometer, are relatively heavier and tend to settle. The PM 2.5 sensor is the first Particulate sensor for used in automobile industry.

C) Medical Sensors
        The Internet of Things can be really beneficial for health care applications. We can use sensors, which can measure and monitor various medical parameters in the human body [2]. These applications can aim at monitoring a patient's health when they are not in hospital or when they are alone. Subsequently, they can provide real time feedback to the doctor, relatives, or the patient. For example heart rate monitoring sensor, Blood pressure sensor, Neural sensor etc.

Following Boards widely used in IoT applications
A)Raspberry PI
        It is small credit card sized minicomputer. It comes with a Linux Operating system which has capability to process input in audio, video format. It can be used as personal minicomputer like we can connect it to monitor instead of CPU.User can directly start coding, no other components are required. Raspberry pi consist of on chip memory (RAM and ROM), DAC, PORTS like USB, Ethernet, Audio video Jack, Camera connector. Mainly HDMI port to connect it with TV, Monitor or projector. The first generation of of Raspberry pi includes a 700 MHZ Arm 11 processor, graphics processing unit(GPU) and RAM. It has L1 cache of 16Kb and L2 cache of 128kb is used by the GPU. Raspberry pi is used to process the data collected by sensors.

B) Arduino Uno
        It is open source microcontroller board based on the microchip ATmega328p microcontroller and developed by Arduino .The board is consist of sets of analog and digital input/output Pins for external interfaced. It can be powered by USB cable or using external power supply. By using input and output pin different sensors are connected to board. And as per coding done by programmer it process data and give required information. The ATmega328 on the Arduino Uno comes preprogrammed with a boot loader that allows uploading new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol. The Uno also differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it uses the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.

C) Beagle Board's
It is low power open source single board computer. It has different ports like USB, JTAG/HDMI/Audio .the board uses up to 2w of power and can be powered from the USB connector or a separate 5v power supply. No cooling system is required because of low power consumption.

III.   Applications of IoT
1) Smart Home Automation:
        In today's era Home automation is become very popular. Home automation refers to handling and controlling home appliances by using micro-controller or computer technology. Automation is popular now days because it provides ease, security and efficiency. Also people trust on technology to have quality life. In

this system different sensors are deployed in home to switch on or off home appliances. Like LDR sensor used to turn off light, similarly other electronics appliances turn off. It conserves electricity.

Motion sensor is used typically for automation as well as for security purpose. For example, an application can automatically turn on the AC when the humidity rises. Or, when there is a gas leak, it can turn all the lights off. This system is beneficial for differently abled person, working women having kid alone at home.
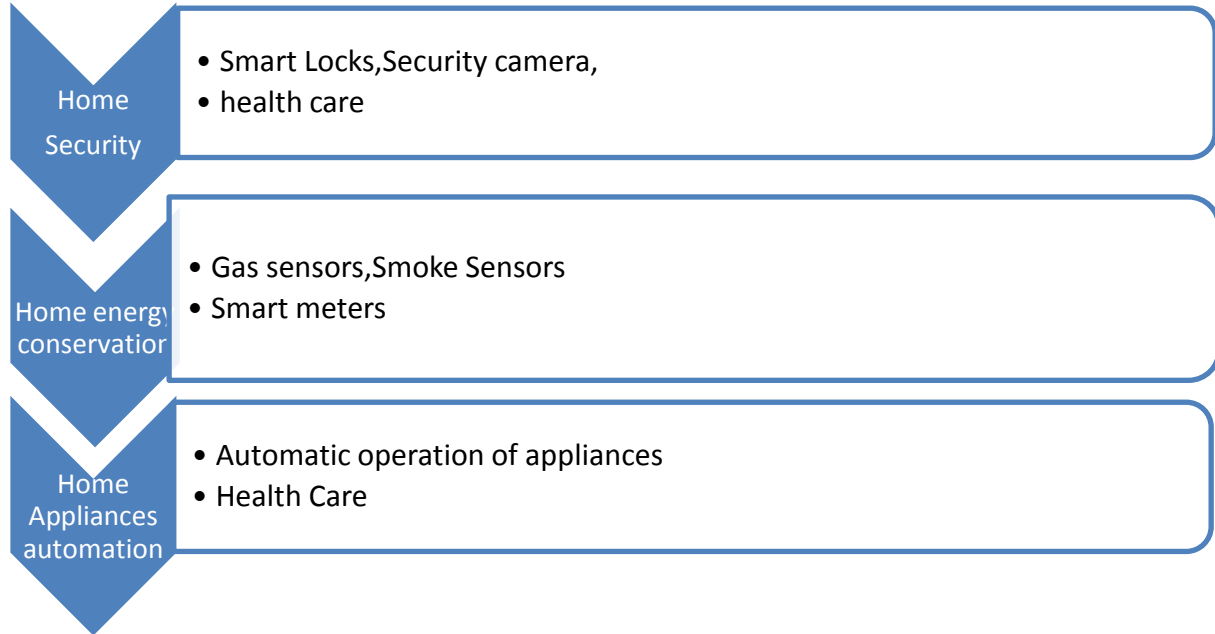
Fig.1. Smart Home Automation Block Diagram

2) City Air-pollution Tracker:

The level of pollution has increased with times due to lot of factors like the increase in population, increased vehicle use, industrialization and urbanization which results in harmful effects on human well being by directly affecting health of population exposed to it. In order to monitor air pollutants an IOT Based "City Air Pollution Tracker" system is developed in which people able to monitor the air pollutants over a web server using internet and will trigger a pop up message when the air quality goes down beyond a certain level, means when there are amount of harmful gases are present in the air increases like CO_2, CO, smoke, alcohol, benzene and NH_3.

Even the amount of pollutants according to Pollution tracker system installed in particular area able to display on GIS map using color scheme.
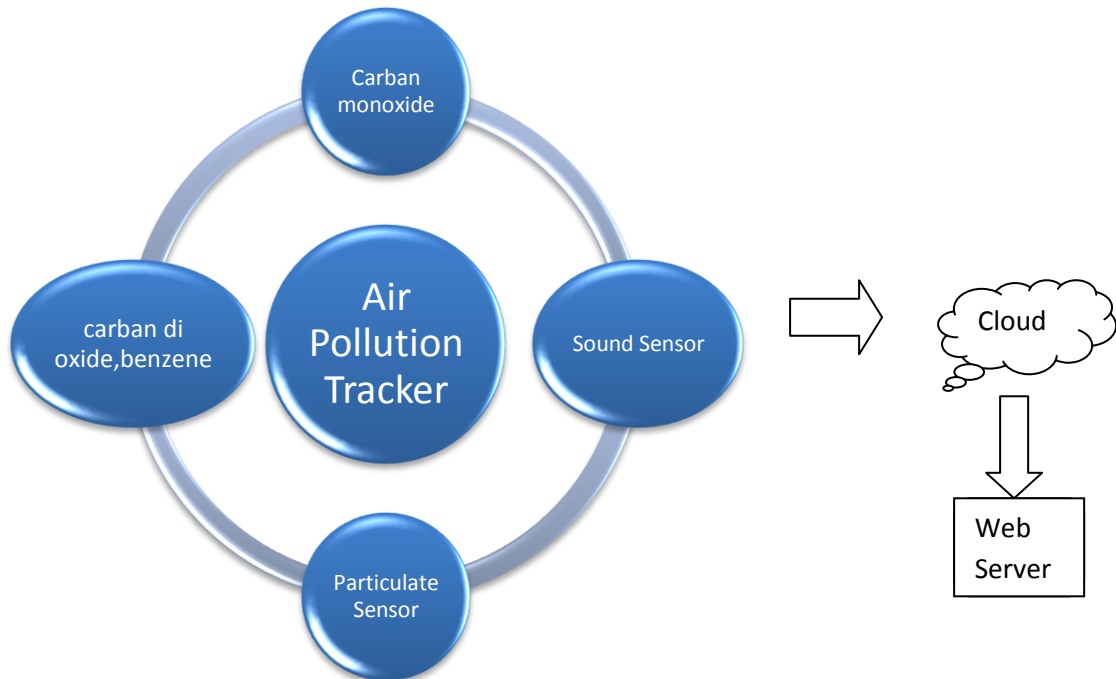
Fig.2. Block Diagram of city Air Pollution Tracker

3) Smart Agriculture

In traditional agriculture there is uncertainty in the production of crops, lack of using technology though in India whole GDP depends on agriculture. Due to uncertainty in the irrigation process the crops may also dry up. So to get rid of some extend modernization included in farming. Using IOT and some other technology smart farming can be done. By using some cheapest sensors only many new technologies are implemented. Like soil moisture sensor is used to measure moisture in the soil. The data collected by this sensor given to water motor pump. If that that soil moisture value below threshold value then only water motor stared and water is supplied to crop.

Similarly Green House is also Control micro-climate conditions to maximize the production of fruits and vegetables and its quality. Infected crop's leaves detection. To identify contaminated fruits and vegetables.
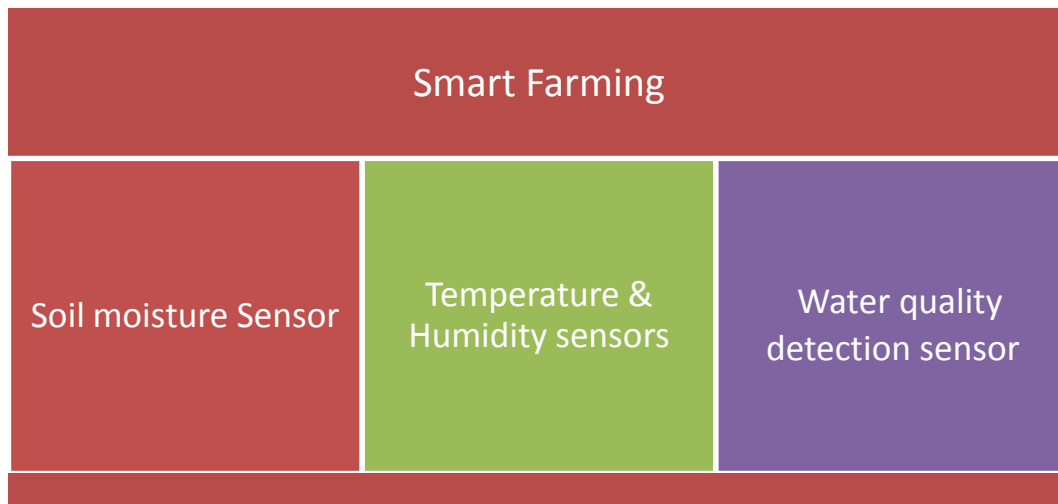

Fig.3.Block Diagram of Smart Farming

4) Medical Field:

IoT appliances have proven really beneficial in the health and wellness domains. Many wearable devices are being developed, which monitor a person's health condition. IoT applications can be used in finding out surges in blood sugar and blood pressure. Due to wearable devices which consist of sensors is used to find out Stress recognition, blood pressure. For example Nike Shoes Company put a sensor in shoe and one app is suggested to customer to download. That sensor gives the record of number of steps walked by customer, to cloud. And same data is given to gym, fitness expert; dietian etc.This data is used for marketing purpose.

IoT in medical field is very useful for differently abled person. As data from wearable device is transfer to cloud and to personal doctor even a family member. According to information obtained from sensor doctor suggest a medicine to patient. Many more possible helpful applications of IoT in medical field.
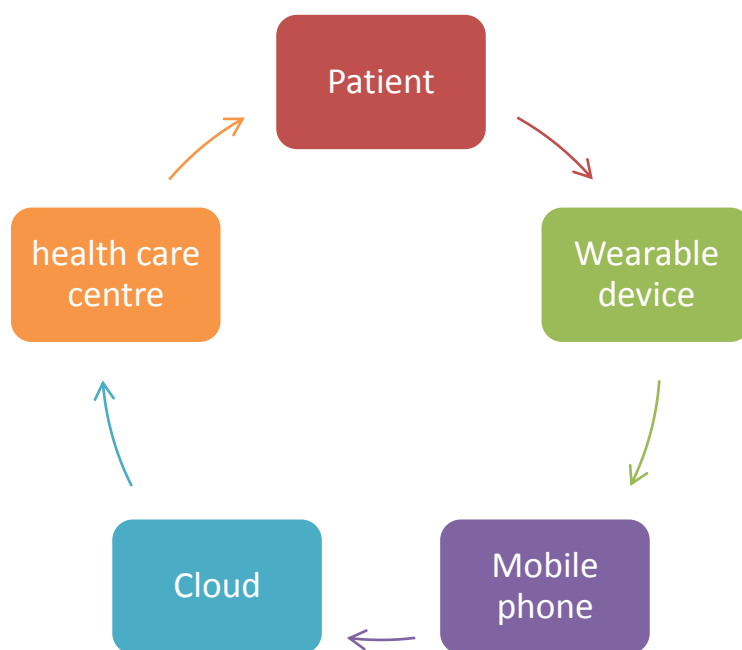

Fig.4. Block Diagram of IOT application In Medical Field

IV. Conclusion

IoT systems allow users to achieve deeper automation, analysis, and integration within a system. They improve the reach of many areas and their accuracy. IoT utilizes existing and emerging technology for sensing, networking. In this paper we focused on what is IoT? Hardware used in most popular IoT applications. Survey on on some emerging application of IoT used in current situation. Many more application of IoT's   are available. We can say today's era is of IoT and it affecting economy in metro city's as well as in farming.

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