

AN APPLICATION MODULE OF IOT

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ABSTRACT

IOT refers to the networked interconnection of objects which are equipped with ubiquitous intelligence. It integrates every object for interaction which leads to highly distributed network of devices communicating with human beings as well as other devices. The paper introduces one such device which will work in collaboration of Ardeno, Sensor and wifi. The device will sense the temperature and humidity of a place after getting installed only once.

Keyword: *IOT, Internet of Things, Big Data, Sensor*

1. INTRODUCTION

The Internet of things (IoT) is the internetworking of physical devices, vehicles, buildings and other items embedded with electronics, software, sensors, actuators, and network connectivity that enable these objects to collect and exchange data [1]. In 2013 the Global Standards Initiative on Internet of Things (IoT-GSI) defined the IoT as "the infrastructure of the information society, enabling advanced services by interconnecting (physical and virtual) things based on existing and evolving interoperable information and communication technologies" and for these purposes a "thing" is "an object of the physical world (physical things) or the information world (virtual things), which is capable of being identified and integrated into communication networks".

The IoT allows objects to be sensed or controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit in addition to reduced human intervention[12]. When IoT is augmented with sensors and actuators, the technology becomes an instance of the more general class of cyber-physical systems, which also encompasses technologies such as smart grids, virtual power plants, smart homes, intelligent transportation and smart cities. Each thing is uniquely identifiable through its embedded computing system but is able to interoperate within the existing Internet infrastructure[15].

The features of a device that can act as a member of an IoT network [2] can be summarized into the following:

1. Collect and transmit data: The device can sense the environment (e.g., your home or your body) and collect information related to it (e.g., temperature and lighting conditions) and transmit it to a different device (can be your mobile phone or your laptop) or to the Internet.
2. Actuate devices based on triggers: It can be programmed to actuate other devices (e.g., turn on the lights or turn off the heating) based on conditions set by you. For instance, you can program the device to turn on the lights when it gets dark in your room.
3. Receive information: One unique characteristic for IoT devices is that they can also receive information from the network they belong to (i.e. other devices) or through the Internet (e.g., information from you like new triggers, new status of operation and in some cases new functionality).
4. Communication assistance: IoT devices that are members of a device network can also assist in communication (i.e. data forwarding) between other nodes of the same network

2. IOT ARCHITECTURE [15], [16]

Internet of things are based on four simple building blocks,

1. Sensors:

Sensors are everywhere, sensors sense data from atmosphere or place. eg. temperature sensor senses temperature from room and shares it through IoT gateway/framework.

They will sniff a wide variety of information ranging from Location, Weather/Environment conditions, running machine, from human body, engine maintenance data to health essentials of a vehicle.

2. IoT Gateways & frameworks:[2]

As the name rightly explains, it is a gateway to internet for all the things/devices that we want to interact with. Gateways act as a carrier between the internal network of sensor nodes with the external Internet or World Wide Web. They do this by collecting the data from sensor nodes and transmitting it to the internet infrastructure.

3. Cloud server:

The data transmitted through gateway is stored & processed securely within the cloud server i.e. in data center using data analytics. The processed data is then used to perform intelligent actions that make all our devices Smart Devices

4. Mobile apps:[3]

The intuitive mobile apps will help end users to control & monitor their devices (ranging from room thermostat to vehicle engines) from remote locations. The apps push the important information on your smart phones, tablet etc Information is shown in the form of graphs, bars and in pi-diagram user friendly interface,

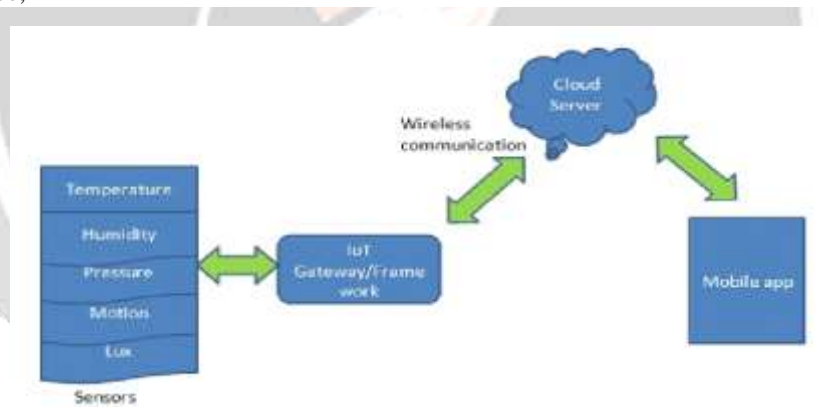


Fig 1 Architecture of IOT

3. ADVANTAGES & DISADVANTAGES

3.1 Advantages

1. **Data:** The more the information, the easier it is to make the right decision. Knowing what to get from the grocery while you are out, without having to check on your own, not only saves time but is convenient as well.
2. **Tracking:** The computers keep a track both on the quality and the viability of things at home. Knowing the expiration date of products before one consumes them improves safety and quality of life. Also, you will never run out of anything when you need it at the last moment.

3. **Time:** The amount of time saved in monitoring and the number of trips done otherwise would be tremendous.
4. **Money:** The financial aspect is the best advantage. This technology could replace humans who are in charge of monitoring and maintaining supplies

3.2 Disadvantages

1. **Compatibility:** As of now, there is no standard for tagging and monitoring with sensors. A uniform concept like the USB or Bluetooth is required which should not be that difficult to do.
2. **Complexity:** There are several opportunities for failure with complex systems. For example, both you and your spouse may receive messages that the milk is over and both of you may end up buying the same. That leaves you with double the quantity required. Or there is a software bug causing the printer to order ink multiple times when it requires a single cartridge.
3. **Privacy/Security:** Privacy is a big issue with IoT. All the data must be encrypted so that data about your financial status or how much milk you consume isn't common knowledge at the work place or with your friends.[4]
4. **Safety:** There is a chance that the software can be hacked and your personal information misused. The possibilities are endless. Your prescription being changed or your account details being hacked could put you at risk. Hence, all the safety risks become the consumer's responsibility

4. METHODOLOGY

4.1 Working Modules [7],[10]

1. ARDUINO:[18]

Arduino is a computer hardware and software company, project, and user community that designs and manufactures microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical world. The project's products are distributed as open-source hardware and software, which are licensed under the GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL), permitting the manufacture of Arduino boards and software distribution by anyone. Arduino boards are available commercially in preassembled form, or as do-it-yourself kits.

2. SENSORS:

Sensors are devices that can measure a physical quantity (like temperature, humidity, etc.) and convert it into a signal, which can be read and interpreted by the microcontroller unit. They are the devices that are most likely attached to the input pins of the microcontroller. Sensors are of two types: analog and digital sensors. A sensor's sensitivity indicates how much the sensor's output changes when the input quantity being measured changes.

3. WiFi MODULE [13]

The ESP8266 is a low-cost Wi-Fi chip with full TCP/IP stack and MCU (microcontroller unit) capability. This small module allows microcontrollers to connect to a Wi-Fi network and make simple TCP/IP connections using Hayes-style commands.

4.2 Working Principle [9]

Following steps are followed for the IOT module to work :

1. To sense the Input Data from] temperature and humidity sensor
2. Arduino extracts the sensor's data as suitable number in percentage and Celsius scale, and sends it to Wi-Fi Module.

3. WiFi module sends the data to IOT server(Interface)
4. Display the output over IOT

5. APPLICATIONS OF IOT [8], [14], [17]

IOT encounters many applications. Some major ones are enlisted and explained as follows.

1. Infrastructure Management [11]

Infrastructure Management is useful for monitoring and tracking if there is any problem in urban or rural Infrastructure such as bridge, railway or etc to diminish and reduce risk of danger and any failure in strength would be tested and alarm as soon as possible to repair it.

2. Industrial Applications

Industrial Applications investigate the quality of product in order to real time optimizing to have a good marketing, such as who are most interested to which product and how this product can find marketing with which tiny changes

3. Energy Management [6]

Energy Management are categorized with systems which are connected to internet and with some sensor to reduce power consumption such as cloud based, remote control for oven , lamp and etc

4. Medical and Healthcare Systems

Healthcare Systems helps to improve patient state better by monitoring and controlling their heart rate or blood pressure or even for their diet. smart tablet which show us how much dose with which gradient can helps patient to get better.

5. Building and Home Automation [11]

It is related to everything in home which have the potential to monitor and remote control such as air condition , security lock lightening, heating, ventilation, telephone system, tv to make a comfort , secure , with low energy consumption.

6. Transport Systems [5]

Transport Systems makes regular city and environment without less employeer for police or station such as automatic configuration in traffic lights, smart arking , traffic camera to detect which road has heavy traffic and offer automatically less crowd road, or smart camera which fine driver in high speed.

6. CONCLUSION

“Temperature and Humidity E-Monitor” as a working system involves a temperature and humidity sensor, Arduino board and wifi module. Sensor provides the necessary inputs to the arduino microcontroller. Arduino provides the necessary interface required for IoT. Arduino processes the inputs and sends the data to the Terminal Window. It then sends the data to the IoT Server. It is a compact hardware easy to install with minimum power supply. Wifi Module provides the required internet access to the Arduino Microcontroller to upload data to the IoT interface. “nirantardhara.com” is the IoT Interface used. It provides GUI to the user with a database. Registration using the MAC Address of the wifi module is required on IoT to identify the device. This device provides an ease to monitor a certain area over a definite period of time. The data is accessible using Internet which eliminates the range problems which is usually countered with Bluetooth or zigbee modules.

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