

Research Article

The Internet Of Things (IOT) Intelligence Computing Technology for Home Automation

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Abstract

We as humans have used technology to make almost everything faster, easier and safer to use than ever before. While there have been extensive use of technology in industry and work place in general, very little has been done towards home automation using internet. Even the little work that has been done towards home automation and home comfort has been mostly impractical like detection of smoke, gas, temperature and water will be sprinkled by DC pump. The Internet of Things (IoT) can be described as connecting everyday objects likes home application, sensors to the Internet where the devices are intelligently linked together enabling new forms of communication between things and people, and between things themselves. The Internet of Things is a new era of intelligence computing and it's providing a privilege to communicate around the world. The objective of IoT is Anything, Anyone, Anytime, Anyplace, Any service and Any network.

Keywords: Internet of Things (IoT), Software as a Service (Saas), Smart Things Information Service (STIS).

1. Introduction

The Internet of Things may be an emerging topic in the industry but it's not a new concept. In the early 2000's, Kevin Ashton was laying the groundwork for what would become the Internet of Things (IoT) at MIT's Auto ID lab. Ashton was one of the pioneers who conceived this notion as he searched for ways that Proctor & Gamble could improve its business by linking RFID information to the Internet. The concept was simple but powerful. If all objects in daily life were equipped with identifiers and wireless connectivity, these objects could be communicated with each other and be managed by computers. In a 1999 article for the RFID Journal Ashton wrote:

If we had computers that knew everything there was to know about things—using data they gathered without any help from us -- we would be able to track and count everything, and greatly reduce waste, loss and cost We would know when things needed replacing, repairing or recalling, and whether they were fresh or past their best. We need to empower computers with their own means of gathering information, so they can see, hear and smell the world for themselves, in all its random glory. RFID and sensor technology enable computers to observe, identify and understand the world—without the limitations of human-entered data .Homes of the 21st century will

become more and more self-controlled and automated due to the comfort it provides, especially when employed in a private home. A home automation system is a means that allow users to control electric appliances of varying kind. Many existing, well-established home automation systems are based on wired communication. This does not pose a problem until the system is planned well in advance and installed during the physical construction of the building.

As we know human have used technology to make almost everything faster, easier and safer to use than ever before Internet of things is network of devices that are connected to internet that is used everyday, The Internet of Things (IoT) can be described as connecting everyday objects likes home application, sensors to the Internet In IOT the devices are intelligently linked together enabling new forms of communication between things and people, and between things themselves. The Internet of Things is a new era of intelligence computing and it's providing a privilege to communicate around the world. The objective of IoT is Anything, Anyone, Anytime, Anyplace, Any service and Any network.

1.2 Problem Statement

Home automation systems face four main challenges, these are high cost of ownership, inflexibility, poor manageability, and difficulty in achieving security. The

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main objectives of this work is to design and implement a home automation system using IoT that is capable of controlling and automating most of the house appliances through an easy manageable web interface. The proposed system has a great flexibility, by using Wi-Fi technology to interconnect its distributed sensors to home automation server. This will decrease the deployment cost and will increase the ability of upgrading, and system reconfiguration.

1.3 Objectives of IOT

- To detect the home applications using IOT.
- To detect the smoke using CO sensor.
- To detect the temperature using sensor.
- To detect the gas leakage using LPG sensor.

1.4 Scope of IOT

- Internet is used worldwide.
- Internet performs quick actions.
- In IOT Internet is the main factor.
- Use of IOT technology will be cost effective.

2. Literature Review

Analysts estimate that 50 billion devices will get connected to the Internet by 2020. In this exploding Internet of Things (IoT), users, things and cloud services connect using the Internet to enable new use cases and new business models across multiple markets and applications. While internet may not solve all the problems and challenges we have today, it certainly is the one technology that can help solve many of the challenges. We as individuals have taken the internet advantage to help our businesses and careers. Now we could use the same technology to help improve the accessibility to education, resources and help for communities and countries that haven't yet had the opportunity. Internet of Things is sometimes defined as bringing together people, process, data and devices to make the connections more relevant and valuable.

Most of the IoT devices shown as example above were only transmitting information, but innovation is bring devices into existence that can convert this information into actions which will add a completely new capability to the devices and provide richer experience to the consumers. The Internet of Things also brings a new economic opportunity for Individuals, countries, organization and businesses.

The power of Internet grows exponentially as we get more and more devices, data and people to interconnect. Robert Metcalfe, founder of 3Com said that the value of a network increases proportionately to the square of the number of users. With the billions of users [people and devices] getting connected the value becomes incredibly huge. By having the ability to put the Process, People, Data and devices together we have the ability to create the exponential responses to the exceptional challenges the businesses, individuals

and countries face today. Hence the need for Internet of Things has become more relevant than ever.

3. Designing of IOT

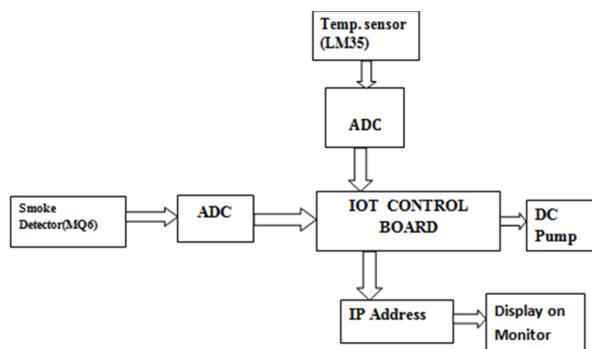


Fig 3.1-Basic Block Diagram

This project represents connecting everyday objects like home applications, sensors to the internet where devices are intelligently linked together. We used IOT (Internet of things) control board like Raspberry pi, Intel. Using IOT (Internet of things) we can communicate around the world. If we are out of town or city and we want to know whether our home is safe or not for that IOT (Internet of things) can be used. In this the Home gateway is connecting to Internet over IP. Since Ethernet is already supports IP stack, we have focused on implementing software to connect it to the remote user.

When IOT (Internet of things) started it enters the configuration state. During this state Ethernet module establishes connection with LAN (Local Area Network) using static IP address. Once IOT (Internet of things) has been initialized, it gets into idle state until any command is received. Once command is received, the appropriate control action is taken. These actions can be either actuation or sensing.

If gas leaked in home then the smoke will be detected using smoke sensor and then the alarm activates and due to IOT (Internet of things) control board the person having the LAN (Local Area Network) connection will get a notification of having problem and so he/she can take proper actions to avoid or to deal with the situation.

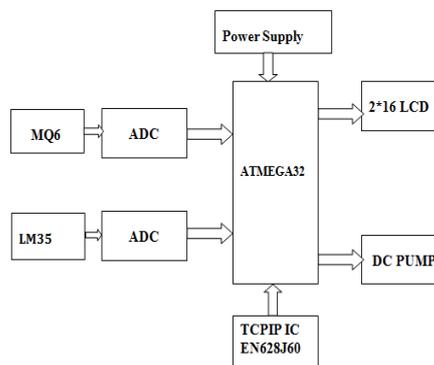


Fig 3.2-Transmitter Diagram

- MQ6: High Sensitivity to LPG.Sensitive Material of MQ-6 sensor is SnO₂ which with lower conductivity in Clean air.The sensor's conductivity is higher along with gas concentration rising.
- LM 35: Precision Centigrade Temp. Sensor. Does not required Calibration in Kelvin.It is an Analog sensor.
- Power supply: SMPS Power Supply. Voltage required: 3.3V.
- 16*2 LCD: Liquid Crystal Display.16 character by 2 line display.
- ATMEGA 32: It is of low cost.Serial peripheral Interface based.It has ADC.Frequency of AVR is 16MHZ.
- DC Pump: Switched by Transistor.It is a digital sensor.
- TCP/IP Protocol: EN628J60.Sent data continuously.

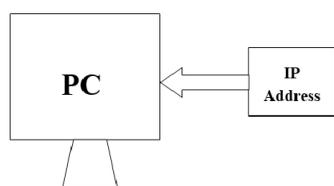


Fig 4.3 Receiver Diagram

- Internet connection.
- Main need is of Internet Protocol (IP) Address.
- Local Area Network Cable is used.
- PC to LAN connection.

4. Block Schematic of Hardware

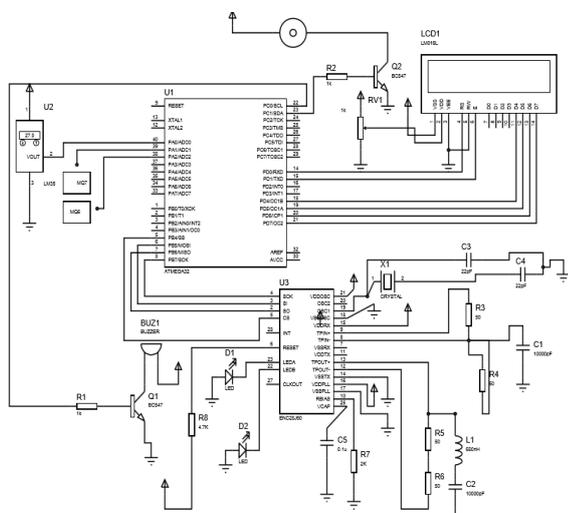


Fig.4.4 Schematic of hardware

4.1 Algorithms for IOT Device

- 1) Start.
- 2) Initialize all the ports and sensor.
- 3) Read the values from connected sensor& process it.

- 4) Convert the data as per required frame.
- 5) Send the frame through the Ethernet IC on the specify IC.
- 6) Repeat the procedure from step 3.
- 7) Stop.

Note: Computer must be connected to LAN or internet.

4.2 algorithms for IOT web server

- 1) Start.
- 2) Login to specify IC.
- 3) Access the parameter as per the designed Browser.
- 4) Repeat the procedure from step 3.
- 5) Stop.

4.6 Flow Chart

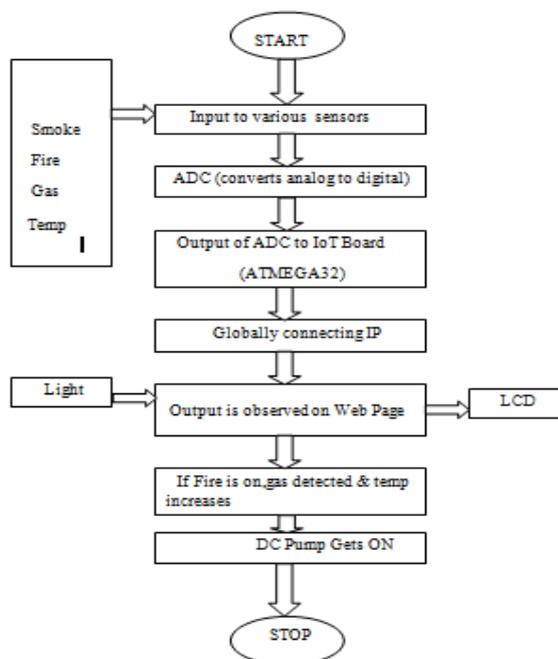


Fig 4.5.Flow chart

5. Advantages

Now a days, wireless systems like Wi-Fi have become more and more common in home networking. Also in home and building automation systems, the use of wireless technologies gives several advantages that could not be achieved using a wired network only.

Reduced installation costs: First and foremost, installation costs are significantly reduced since no cabling is necessary. Wired solutions require cabling, where material as well as the professional laying of cables (e.g. into walls) is expensive.

System scalability and easy extension: Deploying a wireless network is especially advantageous when, due to new or changed requirements, extension of the network is necessary. In contrast to wired installations,

in which cabling extension is tedious. This makes wireless installations a seminal investment.

Aesthetical benefits: Apart from covering a larger area, this attribute helps to full aesthetical requirements as well. Examples include representative buildings with all-glass architecture and historical buildings where design or conservatory reasons do not allow laying of cables.

Integration of mobile devices: With wireless networks, associating mobile devices such as PDAs and Smartphones with the automation system becomes possible everywhere and at any time, as a device's exact physical location is no longer crucial for a connection (as long as the device is in reach of the network). For all these reasons, wireless technology is not only an attractive choice in renovation and refurbishment, but also for new installations.

6. Challenges

1) Precision Is (More) Essential: Building the consumer Internet was and is a complex challenge, but the IOT is more daunting still. Both involve connecting devices and systems all across the globe, but the IOT adds stricter requirements to its local networks for latency, determinism and bandwidth, the NI report notes.

2) Adaptability and Scalability Is Paramount: Adopting the Industrial Internet of Things will require a change in the way organizations design and augment their industrial systems. IOT systems must be adaptive and scalable through software or added functionality that integrates with the overall solution, Stark off notes.

3) Security Is a Key Issue: Security too, is paramount in industrial Internet applications. These applications can be built on tens of thousands of sensor nodes, increasing your threat surface area by orders of magnitude. And bad data injected into your system has the potential to be as damaging as data extracted from your systems via data breach.

4) The IoT Must Be Built for Maintenance and Updates: Industrial Internet components need to be built with maintenance and updates in mind. Industrial systems need to be continually modified and maintained to meet changing requirements. As more capabilities are added, software updates are needed or more systems must be added, the report says. Soon a tangled web of interconnected components starts to form. The new system has to integrate not only with the original system but also all of the other systems

6.1. Applications

From building and home automation to wearable, the IoT touches every facet of our lives. TI makes developing applications easier with hardware, software and support to get anything connected within the IoT. We have identified six key markets for the IoT with potential for exponential growth.

1) Building & home automation: From enhancing security to reducing energy and maintenance costs, TI offers a wide range of innovative IoT technologies for monitor and control of intelligent buildings and smart homes.

Smoke Detection
Temperature

2) Smart cities: Reduce cost and resource consumption with TI's IoT products for lighting, surveillance, centralized & integrated system control and more.

Traffic control
Smart street light
Pipeline leakage detector

3) Smart Manufacturing: The benefits of TI's IoT products include tools, software and hardware that ease and accelerate design time for your next smart manufacturing application.

Flow optimization
Firmware updates

4) Health care: TI is shaping technology to improve the quality and accessibility of digital products that are revolutionizing the health and fitness industries.

Remote Monitoring
Drug tracking

7. Result

After the successful connection to the server, the data of sensor are sent to the web server for monitoring of the system. The web server page which will allow us to monitor and control the system. By entering the assigned IP address in the web browser this web server page will appear. The web server gives the information about the temperature in different places of the house and motion state in the house.

Conclusion

The internet of things is closer to being implemented than the person would think. Most of the necessary technological advances needed for it have been already made and some manufactures and agencies have already begins implementing a small scale version of it.

The home automation using Internet of Things has been experimentally proven to work satisfactorily by connecting simple appliances to it and the appliances were successfully controlled remotely through internet. The designed system not only monitors the sensor data, like temperature, gas but also actuates a process according to the requirement, for example fire is occurred pump is available and automatically start. It also stores the sensor parameters in the cloud (IP address) in a timely manner. This will help the user to analyze the condition of various parameters in the home anytime, anywhere.

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