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ABSTRACT

Internet of things (IoT) is an ecosphere of integrated physical devices that can be accessible through the internet. In IoT devices can communicate without human interference. It is the cyberspace of physical devices which is composed of an embedded system with sensors, network and actuators connectivity that enable to gather and exchange data.

IoT in Healthcare field helps to empower the health control of the patient. IoT can bring a big change in the process of treatment and diagnosis in monitoring in monitoring the patient. Wellness tracker and personal fitness are already in famed. By recent study it was found that 90 % of the Healthcare IT sectors are set to adapt IoT based solution. With IoT as a strength enabler, innovative apps and wearable are taking strong roots in Healthcare ecosphere.

Internet of thing (IOT)

Internet of things describe as a network management and control system wherein devices communicate with each other through sensing devices like Radio Frequency Identification (RFID), infrared sensors, GPS, laser scanners or other devices. These devices form an intelligent network when we make them compatible to work on Internet/ mobile network. That's why it is also called sensing network.

By using IOT we can save the cost and provide technological strength to the global economic.

Presently the use of IOT is rapidly increasing and due to usefulness and ease of use, this application has been covering to almost all major segment with strong economic growth.

Expert understands that economic horizon of IOT will play on more than trillion-scale in coming time and recognise as next trillion scale IT industry.

Principle

Integrated application makes effective use of information technology consisting of sensor technology, integrated circuit and data.

In IOT devices can inter communicate without human interference.

Industrial field of IOT can be classified into 4 parts.

1. Identifying
2. Sensing
3. Processing
4. Information transmission

The key technology of identity is RFID (radio frequency identification), sensing is through sensor devices, processing is through programmed chip and transmission through wireless network.

The three main technology of IOT are terminal sensing, network connection and background computation.

RFID consist the tag and reader and it communicates through RFID air interface.

IOT FRAMEWORK

IOT framework means configuration of network management and control system.

These are consisting of three section and all the sections has been accepted and implemented by the industry to a very great extent. The three sections of framework are as follows

1. Sensing layer
2. Network layer
3. Application layer

The sensing layer predominantly determines the collection of physical information, automotive identification and intelligent control.

Since any objects, they are incapable to communicate with

Sensors, executors, intelligent devices and objects

Through Radio frequency ID. Bar code ID is required to interchange information with the gateway. Gateway utilise communication module in the communication sub layer. When scan the barcode pasted on the object, it matches with the original saved images or data and allow devices to proceed for further step. If it does not matched with the original image then it will not allow to next step until you correct the input and saved images.

Sensing layer device can also form an extending network and interchange the information with the gateway. The extending network comprises sensors,

wireless personal area network (WPAN), home network and industrial bus etc.

The network layer incorporate various sort of wireless or cable gateway, access network, and core network. It usually realises two-way transmission route and control between sensing layer data and the controlling information.

The network layer can rely on many different telecom networks, Internet. Also it can rely on corporate private networks or Industrial network.

The application layer includes supporting sub layer and many types of practical based IOT applications.

IOT use Supporting sub layer with general supporting services and ability calling interface.

Many kinds of applications in IOT field can be performed on public platforms including industrial professional and public applications through supporting sub layer.

Design Characteristics

Design characteristics as listed below, that will help to IoT team while designing the product.

1. Intelligence: Compatibility of Software and hardware together make the product smart.

Algorithms and compute should be compatible with each other so that we could get the most accurate output and could connect with wifi or any other network efficiently.

Also it should be east to use and commercially viable.

2. Connectivity: Product connectivity design must be accessible to wifi module and on telecom network.

   Ability to consume and produce data.

3. Sensing: Sensing the physical object.

   Sensing technological advancement create a good experience of the awareness of physical world.

4. Expressing: Expressing enables the interactivity with people, physical world and environment.

   Expressing provides a means to create good products that could interact intelligently with the real world.

5. Energy: Power efficiency, energy harvesting and charging are the important parameter while designing the power supply panel in product. Considering the input power voltage and frequency requirement of that country.

   Auto charging thru solar is better.

   Material used in the product designed should be environment friendly.

6. Safety: Design the product that must be safe at both end; creators and recipients. This also includes the safety of

Our personal data. In case of software corrupt or malfunctioning, data could be easily retrieve.

IOT Networks

Embedded systems are already playing a crucial role in the development of the IoT. There are four main components of an IoT system:

- The Thing itself (the device)
- The Local Network; this can include a gateway, which translates proprietary communication protocols to Internet Protocol
- The Internet
- Back-End Services; enterprise data systems, or PCs and mobile devices

Applications of IoT

IoT is playing very important role in multiple field due to usefulness and easy to use.

Following are some important applications where IoT has proven his usefulness

1. Medical and healthcare
2. Manufacturing
3. Agriculture
4. Energy management
5. Automation
6. Transportation
7. Consumer application
8. Building and home automation

Building and home automation

Regarding building and home automation, IoT is the main element to create a smart rooms and smart cities.

Agriculture and smart Farming

a. IoT in farming and agriculture industries increases yields and allocation of resources in better manner.

b. Purpose is to increase agriculture production at a lower cost.

c. IoT applications in agriculture incorporate tracking of farm vehicle, livestock monitoring, storage monitoring and many more..

d. Livestock sensors can identify ranchers when animals are out of the herd.

e. Identify sick animals so they can be pulled from the herd. By this way we can prevent the spread of disease.

f. Monitoring plant and soil conditions like sensing for soil moisture and nutrients, controlling water usage, determine the best time to plant and harvest. Also report the weather conditions.

g. Self driving tractors can be controlled remotely may resulting in saving of labour cost.

IoT-Advantages

Here are some advantages of IoT that are practically useful

1. Data: More and more information can be saved and can be easily track if we need to know any particular information. It saves our time and also convenient as well.

2. Tracking: Quality and viability of things at home can be tracked. We can know the expiry date of products before one consumes. This improves safety and quality of life. Sometimes when you require anything urgently at last moment then in such situation, you never have to run out.

3. Time: Much time can be saved in monitoring.

4. Better patient engagement

5. Real time data for medical care management

6. Timely health alerts

7. Better chronic care management

8. Reduced error scope

9. Economical benefit: Due to technology advancement, it replaces humans. Less manpower is required and no human error.

IoT- Disadvantages

Some disadvantages of IoT are as follows

1. Compatibility: Tagging and monitoring are non standard. Uniform concept like USB or Bluetooth is required.

2. Complexity: System designed is very complex and sometime product failure and errors may occur.

3. Security/Privacy: Privacy is a big issue with IoT. All the data in the system must be encrypted so that it could not be disclose at any situation.

4. Safety: Chances of software hacked and misuse of your personal information. All the safety risks become the consumer's responsibility.

IoT in Healthcare Field:

Various application of IOT is implied in healthcare industry. IOT allows medical centres to function more

Competently and patient can obtain better treatment.

There are many prospects to improve the quality and efficiency of treatment and improve the health of the patients by using of IOT based healthcare system.

I am listing below some application out of them

a. Real Time Location Service

b. Monitoring the status of patient in real time.

c. Compliance of Hand hygiene

d. Analyse the accuracy of the equipment in protein research and composition.

Real Time Monitoring in healthcare

Real-time monitoring through connected devices can save lives in case of a medical emergency like heart failure, asthma attacks, etc. With real-time monitoring, a smart medical instrument attached to a Smartphone app can gather together medical and other required health facts and transfer collected information to a practioner.

The IoT device collects and transfers health data like blood pressure, oxygen and blood sugar levels, weight, and ECGs. These data are stored in the cloud and can be shared with an authorized person that could be your family doctor, insurance company and they look at the collected data regardless of their place, time, or device.

IoT can automate patient care workflow with the help healthcare mobility solution. IoT allow machine-to-machine transmission, interoperability, data exchange, and data movement that make healthcare service delivery productive.

Huge amount of data thru a healthcare device can be sent in a very short time. A healthcare provider can acquire details from several devices and sources and examine it manually is a tough bet. On-time alert is critical in event of life-threatening circumstances. IoT permit devices to collect necessary information and carry it to physician for real time tracking, while dropping notifications to people about critical segment via mobile apps and other associated gadgets.

Reports and alerts give a firm judgment about a patient's state, regardless of place and time. It also helps to make fast and accurate decisions and to give on-time treatment to patients.

Conclusion from above that, IoT changes the way the facilities are delivered to the healthcare industry.

Cloud computing in Healthcare

IoT devices can collect report and analyses the data in real-time and cut the need to store the raw data. This all can happen over cloud with the providers and can access the final reports with graphs.

Moreover, healthcare operations permit organizations to get necessary healthcare analytics and rate up the decision making. Also these are less liable to delusion.

Perspectives and challenges in healthcare for data storage

The challenges and opportunities associated with IoT big data in healthcare research are identified.

Since massive data has been generated by many distributed sensors. Big problem for healthcare enterprises is how to acquire, integrate, store, process and use these data to achieve fast decision. Researchers and engineers both are facing the challenge of handling these massive heterogeneous data in highly distributed environments, especially in cloud platforms.

1. Multisource High Heterogeneity Data: IoT applications acquire data from different distributed sensors. How to integrate these distributed data from multisource is fundamental work for healthcare application development.

2. Inaccuracy Data: Some experiments show that most sensing systems can only capture 1/3 correct data caused by unreliable reading, which brings difficulties to medical practitioner.

IOT Healthcare Security

1. Increased flow of information brings risks that health IT professional need to address. This may harm the patient safety and health, loss of PHI and unauthorised access to devices.

2. Devices entering hospitals through a variety of channels and they would not have any common control surrounding them.

3. When someone may be a hacker puts standalone devices onto an isolated network or bridged his network to hospital network and the system has not been alerted that these devices have even been connected. It means multiple risks and vulnerabilities are introduced. Professional. These devices lacking evidence capture and forensic logged capabilities

Steps to achieve better healthcare IoT security

1. Device access should be limited, Firmware being sent to the device is verified and device to device communication undergoes scrutiny

2. Include encryption and conducting a secure boot.

Secure boot makes sure when a device is turned on, none of its configuration has been modified.

Wearables, IoT, and Healthcare

Wearable devices can be defined as technology infused devices that can be worn on the human body. They could be smart wristbands, watches, shoes, shirts, caps, necklaces, headbands, eyeglasses, etc. These smart devices contain some sort of sensors that help in gathering/collecting raw data and relaying it into a database or software. Through this software, we can gather insights and analyze our health.

The insights can alert the person wearing the smart device or a physician who can then take corrective action. Simultaneously, nutritionists can view the data and advice a better diet plan, based on activity level and aliments.

- Location-Based Real-Time Services. Through IoT, healthcare professionals can track patient whereabouts. ...
- Improve Patient Experience. IoT devices help in improving the patient experience
- Hygiene Compliance. For hospitals, preventing infection is imperative.
- Remote Monitoring
- Risks of IoT in Healthcare

Augmented Reality in Healthcare

Augmented Reality refers to technology that produces figure or information that can be stratified on top of real-world objects. It differs from Virtual Reality which creates a completely artificial scene. In forthcoming market it

will play a major technological and economic role for Augmented Reality in healthcare.

Healthcare market suggests that augmented reality will transform the traditional healthcare business model.

- Augmented reality can enhance the surgeon's capability to task in small extent and on complicated circumstances by giving detailed picturing. Applied to uncomplicated procedures as well as complicated operations like glandular tumors, AR gives an advanced level of exactness.
- Spine surgery summons surgeons for the constant risk of damage to the irreplaceable nerve connections in the spinal column. AR provides models for organising a surgical outlook and a advisor for exactness during a spine methodology.
- Technology innovations in software contribute to the 3D reconstruction of tumors. It actually gives a surgeon a real-time x-ray perspective of the surgical object but without prolonged subjection to radiation.
- Augmented reality is very useful in cardiology and dentistry also.

Although it is in a very early stage to say about full scale application of augmented reality technologogies in healthcare. Advance research is going on at this time on AR. Despite a highly promising sphere, healthcare businesses are concerned about the hardware diversity and security-related issues.

Key Challenges to Adoption of Augmented Reality for Healthcare

1. Financial Limitations

   AR in healthcare is still in its early stages of development. AR technologies have benefits in 3D imaging, medical education and surgical planning. Investors are looking for class defining solutions and hospital budgets for AR equipment to use at clinical simulation centers.

2. Technology Limitations

   Despite of many major surgical procedures, battery life concerns present an obstacle in the way of adoption of AR systems. Glass exemplary supplies 3 to 5 hours of consumption, and uninterrupted recording a video may exhaust the battery in less than an hour. Charging headsets poses difficulty in the midway of surgery. Battery life for these tools must continue to become better before they can be expected to enter regular service in many medical conditions.

Conclusion

IoT have many advantages as it made the human life easier. Although it has quite a few drawbacks but its advantages of saving consumer time and money prove it more useful and economical.

This technology driven structure brings down the cost, by cutting down un needed visits, make use of better standard resources, and upgrading the allocation and planning.

Thus, IoT legalize real-time tracking, alerting, and monitoring, which allows hands-on treatments, better exactness and appropriate operation by doctors and refine complete patient care delivery results.

However extra provision is required while using and implementing IoT due to data security issues. Organization needs to use an extra layer of security while leveraging the welfare of connected devices.