Future Generation of Communication and Internet of Things (FGCIOT)

Review paper

An overview of the Internet of Things and its applications in the field of medical engineering

Seyed Yasin Mirmohseni , Samaneh Tolou Askari, maryam kalantariyan

Medical engineering student Islamic Azad University, Semnan Branch, Semnan, Iran,
Department of Sport Science, Mashhad Branch, Islamic Azad University, Iran,
Bachelor, Iran Elementary student, Al-Zahra Campus University of Semnan . iran

yasinn1148@gmail.com, Stolouaskari@gmail.com*, Maryamm1148@gmail.com*

Article Info	Abstract
	The Internet of Things is one of the newest technologies in the field of intelligent materials, goods, equipment and work processes. This concept is especially important because when objects can present themselves digitally, they will eventually become phenomena far beyond the totality that they really are. The purpose of the Internet of Things is to enable objects to connect with anything and anyone at any time and place. In this study, we examine this important.
*Corresponding Author's Email Address: yasinn1148@gmail.com, Maryamm1148@gmail.com	

Introduction

The Internet is a global network that connects all users, but its structure is changing. We now use laptops, tablets and smartphones to communicate with others. Most of the information is exchanged between us and others through web hosting servers and email software. In fact, the Internet is made up of users, devices, and servers; But a new member is being added to this collection. This new member is not a user and is referred to as "Things" or objects. Wireless communication systems are increasingly used as a technology driver for highly intelligent monitoring and control of applications (S. Sicari; et al, 2015. It is clear that the Internet of Things will have a huge impact on the lives of all users). Had (S.H.Lee and D.W.Lee, 2015.

It can be addressed to any device that has a sensor for the "object" of an information exchange. The sensors send information to the destination device so that these devices can make decisions based on the information received; Therefore, in the near future, many of our tasks and information will be exchanged through the Internet and between different people by smart devices (I.Lee and K.Lee, 2015.)

Using Figure 1, it is shown that analysts estimate that by 2020, the number of devices connected to the Internet

will reach more than 50 billion (http://ciot.ir/).

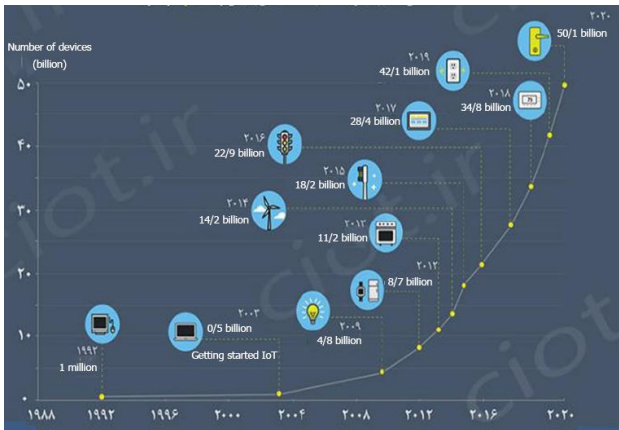presented in an integrated, efficient, and easily interpretable format.

Fig. 1

Fig. 2

I. Research Methods:

In this article, the research method is library and by studying different articles and qualitatively analyzing the content.

II. Research question:

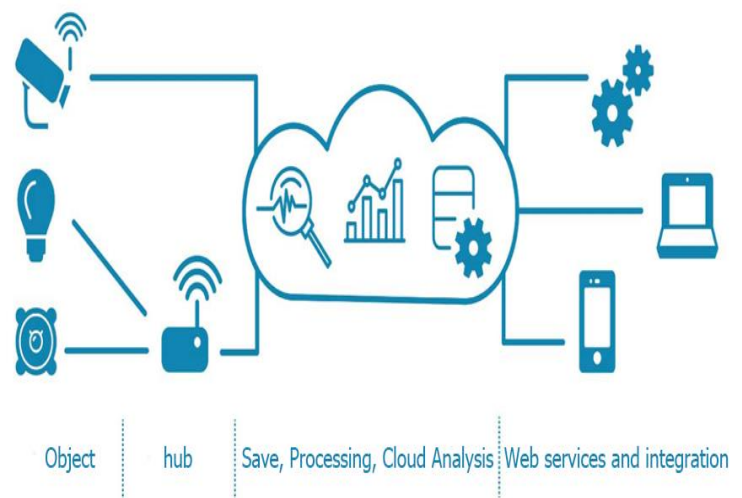What is the Internet of Things and what are its uses in human life?

Cloud computing can provide a virtual infrastructure for such computing that integrates monitoring devices, storage, analytics tools, and visualization platforms. The cost-based model provided by cloud service providers provides end-to-end services for businesses and users to access applications on demand.

III. Support knowledge

A. Internet of Things

The term IoT was first coined in 1999 by the British Kevin Ashton. Ashton introduced the concept in the context of a world in which everything and every object has a digital identity and is controlled and managed by computers. The Internet of Things, or Internet of Things, is a relatively new paradigm that is growing rapidly in modern wireless communication scenarios. The basic idea behind this concept is the ubiquitous presence of objects around us, including RFID tags, sensors, actuators, cell phones, etc. - which, through unique addressing schemes, are able to communicate with each other and work together to achieve common goals. . In the Internet of Things (IoT) paradigm, many of the objects that surround us are located in one or more forms on the network. Sensor network technologies are emerging to meet this new challenge, in which invisible information and communication systems are embedded in our environment. This generates a large amount of information that must be stored, processed, and
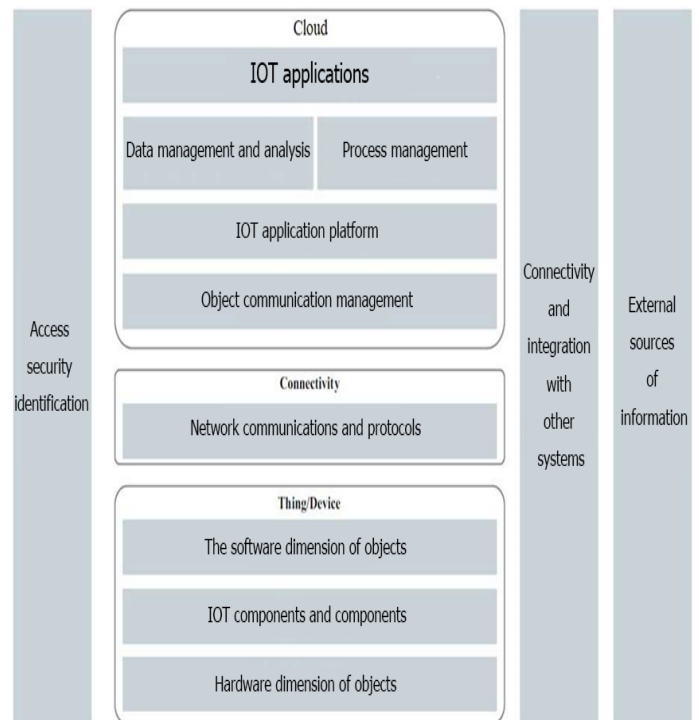

Fig. 3

Fig. 4

IV.   Internet of Things (IoT) applications

Undoubtedly, the main power of the Internet of Things is the great impact it can have on various aspects of daily life and the behavior of potential users. From a user's perspective, IoT applications will be visible in both business and personal life. In everyday and personal applications, comfort in lifestyle, health, advanced learning, entertainment, reducing energy costs are just some of the possible application scenarios that the new paradigm will play an important role in the near future. Similarly, from the perspective of business users, the facilitation of items such as automation and industrial production, logistics, business / process management, medical applications, health, security, and intelligent transportation of people and goods can be seen. In a report, Forrester identifies two key opportunities in the Internet of Things:

•Smart products: companies take advantage of modern IoT features in smart products and create new experiences for users

•Business intelligence: companies use the Internet of Things to increase information and operational productivity

The following are some of the applications of the Internet of Things in different industries.
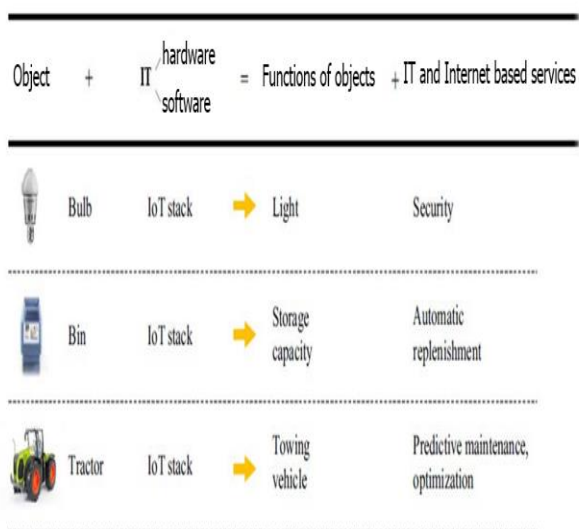
V.   Smart lighting:

Imagine for a second you were transposed into the karmic driven world of Earl. Lighting is a powerful technology that can enhance our daily lives in many ways while maintaining the energy of our homes, organizations and cities.

VI.   Smart cars:

Smart cars can contribute to the safety and security of occupants. These cars provide the driver with information about road conditions, traffic and other obstacles. Sensors embedded in vehicles help identify the surroundings and position. Communication applications can automatically call emergency centers in the event of an accident, as well as vehicle repairs and maintenance, which is a preventative way to ensure vehicle safety, to avoid sudden breakdowns and unexpected costs.

VII.   Environmental protection:

IoT can have a major impact on environmental protection. Increasing productivity through the Internet of Things helps reduce energy consumption, and big data, with the help of monitoring systems, provides valuable information about the environments that affect our health. The IoT has innovative methods for controlling various aspects of environmental protection, climate change, and preventing poaching and deforestation.

VIII.   IoT and its benefits and challenges in the field of health:

With the integration of IoT and life, significant improvements in health and hospital services are taking place. IoT-based systems in other areas have proven that remote object monitoring can be achieved by collecting data and reporting. Therefore, it can be extended to monitor people's health and report it to relevant groups such as supervisors, doctors, emergency services and health centers. Research in related fields has shown that remote monitoring of patients is acceptable but more important is the benefits it can provide in various fields. Remote patient monitoring can be used to monitor patients who are not in critical condition instead of going to the hospital, which reduces the pressure on hospital resources such as doctors and beds. It can be used to provide better access to health care for those living in

rural areas or to allow the elderly to live longer at home. Essentially, it improves access to health resources, while reducing the pressure on health systems and can give people better control over their health (Baker, S.B. Et al, 2017).

The Internet of Things can be used in a variety of medical fields, including remote patient care systems, emergency alert systems, fitness programs, chronic illnesses, and geriatric care. These can include heart rate measurement system, blood pressure measurement system, health monitoring systems, artificial pacemakers and hearing aids (Namazi et al., 2015).

IX.   IoT stakeholders in the field of health

To become more familiar with the various applications of the Internet of Things in the field of health, the applications of the Internet of Things have been categorized according to the actors related to this field.

•patients

Empower and receive health services with greater efficiency, faster diagnosis and treatment of diseases based on information

More accurate and with less inconvenience for their lives and less cost, help many patients like the elderly for

Better independent life and longer.

•Health care providers

Rapidly improve the quality of patient care, avoid admission costs and reduce overload on staff,

Help these organizations to do their daily work more effectively.

•Pharmacists and contracted research organizations

Learn more and better about clinical trials, gain new ways of pricing, especially aligning the cost of individual clinical measurements, increasing efficiency in the manufacturing process and supply chain.

•Manufacturers of medical equipment

Construction of large medical equipment with the ability to connect to the Internet of Things) such as blood glucose monitoring device for

Diabetics and battery sensors to ensure the health of shock devices when needed.(

•drug stores

Use smart devices to refill prescriptions, avoid delays and errors, promptly remind patients to take medication, and comply with physician prescriptions via smart tablet boxes.

Governments and the body of industry

Use large-scale datasets that analyze the effects of treatment, track the spread of disease, and understand

Macro trends in population health have been obtained to make policy decisions.

•Insurance companies and insurance payers

Gain new levels of information about patients and their health to provide new services and enable the company to manage when at risk.

X.   The benefits of the Internet of Things in the field of health

There are many benefits to using IoT technology in the field of health, the most important of which are:

•Reduce the huge cost of treatment

The medical sector in each country accounts for a significant portion of that country's costs. For example per capita cost

Health in the Islamic Republic of Iran is 6% of GDP equivalent to $ 836. If used

IoT in the field of health can significantly reduce this cost. The US Federal Bureau of Communications predicts that by reducing the number of hospitalizations, reducing infections and remote monitoring of patients will reduce the average cost by US $ 12 per patient.

•Decrease in mortality from nosocomial infections

Research in the United States shows that about two million people get nosocomial infections each year, and about 00,900 of them die. Nosocomial infections increase the length of hospital stay by an average of seven to nine days, with about $ 35 billion spent annually in hospitals in the United States. There are no exact statistics on this

issue in Iran, but the prevalence of nosocomial infections in our country is estimated at an average of 10 to 15% (about 600,000 people per year). By reducing the length of hospital stay and remote monitoring of the patient can Reducing nosocomial infections and thereby dying was also expected to reduce costs.

•Establishment of a database for each patient

The information obtained by the devices from birth to death can all be stored in a large database and, if needed, will be available anywhere or anytime, or the information obtained from medical research can be used. And reduces the cost of medical research.

XI.   IoT services and applications in medical care

IoT-based medical care can be used for a variety of areas, including care for young patients and

Elderly, Chronic Disease Surveillance and Private Health Management and Physical Health and Fitness. To better understand this broad topic, this article categorizes the discussion into two dimensions: services and applications.

Services

The Internet of Things (IoT) is expected to activate many medical care services, including alert services, resource sharing services, Internet services, and basic communication protocols. The following sections include IoT-based medical care services.

B.   AMBIENT ASSISTED LIVING

In general, a smart home or an ordinary IoT-based medical service will inevitably have to provide specialized services to the elderly. That is, separate IoT services are required. An IoT platform that works with artificial intelligence, which can help care for the elderly and disabled, is called living with the help of the environment.

(AAL): The purpose of the AAL is to prolong the independent living of the elderly in their place of residence in a suitable and safe manner.

C.   m-HEALTH

m-HEALTH is nothing but mobile computing, medical sensors and communication technologies for healthcare.

In theory, m-IoT introduces a new health communication model that connects 6LoWPAN to conventional 4G networks for future IoT-based health services.

applications

In addition to application development services are used, while applications are used directly by users and patients. Thus, services are development-oriented, while applications are user-centric. The following are the types of IoT-based medical care applications.

XII.   ·Feel the level of clogs
Diabetes is a group of metabolic diseases in which high blood sugar is present over a long period of time. Blood glucose monitoring shows individual patterns of changes in blood glucose and helps plan meals, activities, and medication times.

XIII.   ·Electrocardiographic monitoring
Electrocardiogram (ECG) monitoring means the electrical activity of the heart that is recorded by electrography radiographs.

Includes simple measurement of heart rate and determination of multifaceted arrhythmias, myocardial ischemia, and long intervals. Using the IoT for ECG monitoring has the potential to provide maximum information and can

Used to the fullest.

•Monitor blood pressure

High blood pressure is a known risk factor for cardiovascular disease, including heart attack. It is also one of the most common chronic diseases that affects 42% of Iranians. Of those affected, 54% were unaware of their illness. Thus, the inclusion of blood pressure monitoring in the medical care unit provides vital information for many patients.

D. Rehabilitation system

Because physical medicine and rehabilitation can improve the functional ability and quality of life of people with physical disabilities, they are a vital branch of health. IoT has the potential to enhance rehabilitation systems by reducing the problems associated with the aging population and the shortage of health professionals.

E.Wheelchair management

Many researchers have worked to develop fully automated smart wheelchairs for people with disabilities.

The Internet of Things has the potential to speed things up.

F.Big data:

The Internet of Things is like an ocean of big data that can help cities make accurate forecasts, provide timely medical care, repair and maintain machinery, and provide businesses with insights into this data. With the advancement of the Internet of Things and its growing applications, the amount of data generated by actuators and sensors will increase, providing many opportunities for businesses.

Production:

The use of the Internet of Things in production will lead to lower production costs and higher quality. Smart devices and sensors do not make mistakes and do their job with high accuracy and efficiency. For those manufacturers who produce complex products such as aircraft components, it is important to ensure the seamless connection of components. Using tracking technologies, in addition to avoiding additional costs, can quickly prevent mistakes that are occurring.

Agriculture:

IoT applications are increasingly being developed to meet the needs of the agricultural sector on a daily basis, leading to more efficient processes with greater efficiency. For example, collecting data on planting conditions and soil improves the management of resources such as water and fertilizer; GPS signals can provide accurate weather information that can be analyzed and integrated with irrigation and monitoring systems. Drones and sensors can collect real-time data on agricultural, irrigation and livestock products and integrate with other systems.

IoT security and related risks:

In the IoT, the protection of user data is also very important. To do this, IoT systems must be able to detect malware or threats in terms of security and follow standard security protocols. Otherwise the whole system can be compromised by connecting an unauthorized device. Other possible risks and dangers include the protection of the generated big data and the essential data that increase the power and benefits of the Internet

of Things, which makes it necessary to consider all security issues in the design layer of different systems.
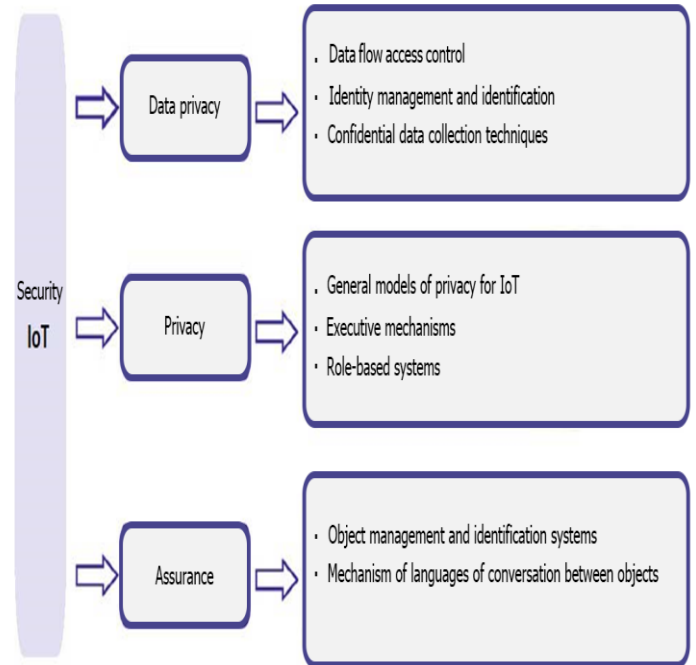

Fig.5

Security requirements

The following measures and requirements can be effective in maintaining security.

Data Encryption Requirements:

There are currently algorithms for encrypting and authenticating data on the Internet, which will also be essential on IoT devices. For example, data confidentiality in wireless networks is often secured using encryption; Therefore, in order to eliminate eavesdropping and maintain security in a network, it is necessary to create a security policy to perform actions such as decryption and authentication in an account (Abbasi et al., 2016).

For example, in a transition model with signature-encryption schemes that addresses IoT security requirements by searching for an object naming server, Root-ONS can authenticate the operating system of local ONS servers through a trusted authentication server (TAS). Certify and TAS a temporary certificate to

A valid ONS-L that can be used for search services multiple times by a certificate issued at the verified time. An ONS security search service, with anonymous authentication, provides only authorized and valid L-ONS credentials and prevents the illegal ONS from searching for information from objects (Z.-Q. Wu; et al, 2011).

IoT Outlook:

The evolution of the Internet and bandwidth and communication protocols is crucial to the development of IoT. The Internet is getting faster and cheaper every year, and in addition, more devices with built-in Wi-Fi function are being developed, and more advanced protocols such as NB-IoT are being developed for IoT with higher speeds and lower power consumption. As a result, objects will connect to the Internet faster and cheaper.

According to the WoT (Web of Things), there is data flow from person to person, from person to device, and from device to device. Device connections are increasingly ending up in Internet connections. Finally, the Internet of Things can be a means to further profit More convenience and better use of resources, energy conservation and environment in the not too distant future Nebka Company, using its expert teams and knowledge base, has succeeded in designing, developing, producing and commercializing IoT-based products and solutions in various fields. Is.
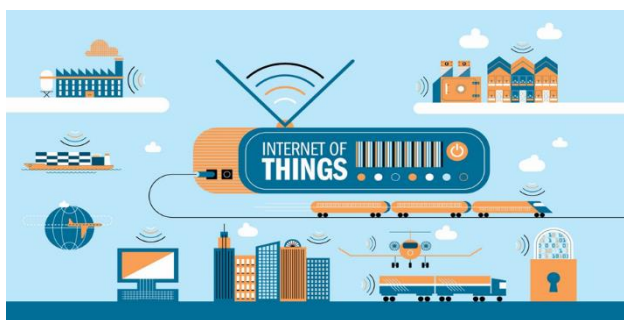

Fig.6

The Internet of Things is based on wireless radio waves, which allow different devices to communicate with each other over the Internet.

"For example, a city in Spain has installed 10,000 sensors, including sensors such as temperature sensors or motion sensors that they place on buses," Kronberg said, referring to IoT applications. With these sensors, the government captures all the information of the people, even China is active in this matter and tries to expand the

IoT debate so that it can have optimal management of its resources and people.

In the meantime, access to this type of technology can certainly lead to its own turnover and create profitability. According to IDC, the market value of IoT products and services will reach $ 7.3 trillion by 2017. The market was worth only $ 4.8 trillion in 2012.

Similarly, big names like Samsung, LG, Apple, Google, and Philips are currently working on connected devices, and countless small companies are doing research. According to research, 4.9 billion interconnected devices are expected to be used this year, and this number will reach 25 billion by 2020.

background research

The purpose of the Internet of Things is to connect objects to each other through the Internet. Objects mean everything that is around us and has the ability to communicate (Z. D. R. Gnimpieba; et al, 2015).

Vermson et al. (2011) also acknowledge that the purpose of the Internet of Things is to enable objects to connect at any time and place, with anything and anyone that uses any path or network ideally.

These objects work together to create new applications and services and achieve common goals, and are in fact development challenges to create an intelligent and large world. A world that is real, digital, and virtual, converging toward smarter environments, creating smarter areas of energy, transportation, health, cities, and more (O. Vermesan; et al, 2011) .

Conclusion

The emerging idea of the Internet of Things is rapidly growing throughout our modern lives, with the goal of improving the quality of life and communication between many smart devices; Technologies and applications. In this article, an overview of the concepts of the Internet of Things (IoT) and its applications in various industries was examined. This technology can also be used to make a variety of medical devices and make work easier for different patients and make living conditions easier for them. In general, the Internet of Things allows you to automatically control and control everything around us.

Seyed Yasin Mirmohseni , Samaneh Tolou Askari, maryam kalantariyan

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