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Challenges of an Internet of Things-Based Health Monitoring System

D. Arun Shunmugam[1*],M. Deshiya Narayan[2], Dr. K.Ruba Soundar[3], G. Vijayarani[4]

[1]Assistant Professor, Department of Computer Science and Engineering, P.S.R. Engineering College, Sivakasi, Tamil Nadu, India
[2]PG Research Scholar, Department of Computer Science and Engineering, P.S.R. Engineering College, Sivakasi, Tamil Nadu, India
[3]Professor and Head, Department of Computer Science and Engineering, P.S.R. Engineering College, Sivakasi, Tamil Nadu, India
[4]Assistant Professor, Department of Computer Science and Engineering, SCAD College of Engineering and Technology, Cheranmadevi, Tamil Nadu, India

*[1]arunshunmugam@psr.edu.in,[1]arunsang1680@gmail.com,[2]deshiyakumar1105@gmail.com,[3]rubasoundar@psr.edu.in, [4]vijayarani@scadengineering.ac.in

ABSTRACT

The Internet of Things (IoT) is a cutting edge and quickly advancing innovation wherein everything (brilliant items and keen gadgets) is connected to the web for effective correspondence between them. The web of things is an impetus for medical care and assumes a basic part in an assortment of medical services following applications. By gathering internal heat level, circulatory strain, and sugar levels, organized sensors gadgets, regardless of whether worn on the body or installed in living conditions; permit the assortment of rich information to decide a patient's physical and psychological well-being condition. The troublesome errand in the Internet of things is conveying the gathered information to the specialist, settling on right choices dependent on the information gathered, and advising the patient. The creator of this paper centers around an investigation of IoT-based medical care frameworks, just as promising circumstances and difficulties for IoT-based patient wellbeing checking frameworks.

Keywords
Body Area Network; Healthcare; Internet of Things; Wireless Sensor Network; Nearest Field Communication; Radio Frequency Identification; Vehicle-to-Vehicle Communication; Machine-to-Machine Communication.

Introduction

Life in a time where every real material can be connected to another for data sharing. Naturally, many of our products and publications will exchange information due to better remote innovations such as 6LoWPAN, Wi-Fi, ZigBee, and Bluetooth. The internet of things (IoT) is the organization, by a neighborhood or remote sensor organizations, of items or articles connected. There are two terms on the Internet: the first is the Internet and the second is Things. The second is the Internet. The Internet is an overarching organization linked to established norms. Every physical object related to accessibility is referred to as "something.".

IoT uses a variety of advances like RFID labels, sensors, actuators, and mobile phones, among others, and distributed help in computing. We can interface anything, obtain any aid and provide important information on any item via the Internet of Things[1].

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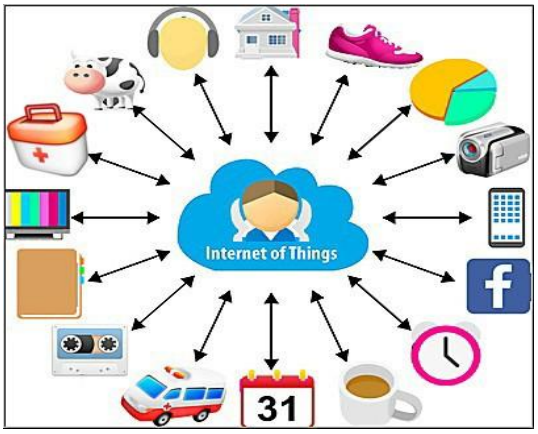

Figure 1. Internet Of Things (IoT)

IoT's Economic Impact

Many new technologies have speeded up the development of IoT, such as micro-electromechanical systems (MEMS), wireless sensor technologies, and the internet. We have sales sensor equipment at a competitive price. Industry analysts say that by 2020 around 25 trillion IoT devices will be deployed, and by 2025 the market for IoT will be roughly $2.1 trillion [2]. The internet of the healthcare industry will approach $117 billion by 2020, according to marketresearch.com [3.]. The research named "Web of things: Mapping the hype beyond promise" was published in June 2015 by the McKinsey Global Institute, in which the IoT industry is projected to rise to $11.1 trillion per year by 2025 [4]. Up to 26 billion IoT devices will be connected to the internet by 2020, according to Gartner. The IoT applications industry is expected to produce up to 180 billion Euros worldwide[6], according to Intechno Consulting.

Areas of IoT application

Innovation that enables the internet of things to generate at an expedited speed is Nearest Field Communication (NFC), Radio Frequency Identification (RFID), Machine-to-Machine Communication (M2M), and Vehicle-to-Vehicle Communication (V2V). By 2020, around 50 billion IoT Gadgets will normally be linked to the web. It will impact people's lives, work patterns, entertainment alternatives, and much more [7]. There is a wide range of uses on the Internet of Things (IoT). These applications are continually expanding in size and scope.

Some IoT executions take place, including the following:

1. Environmental monitoring
2. Car industry
3. Innovative retail
4. Intelligent agriculture
5. Intelligent industry
6. Energy management
7. Healthcare monitoring;
8. Smart cities and
9. home automation

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Figure 2. IoT Application Areas

Healthcare Monitoring and the Internet

Medical care is one of the companies in which IoT innovation is thriving. The IoT industry in medical care will amount to $117 billion by 2020, according to Forbes magazine [3]. According to a P&S Market Research report, the Internet of Things sector will increase by 37.6 percent sometime between 2015 and 2020, at an annual building development rate (CAGR). The necessity for medical support services may probably be reduced via IoT. IoT wearable gadgets capture patient wellness data, such as pulse, internal heat level, etc (clinical sensors). This data is transmitted for further actions from the right medical clinic or guardian.

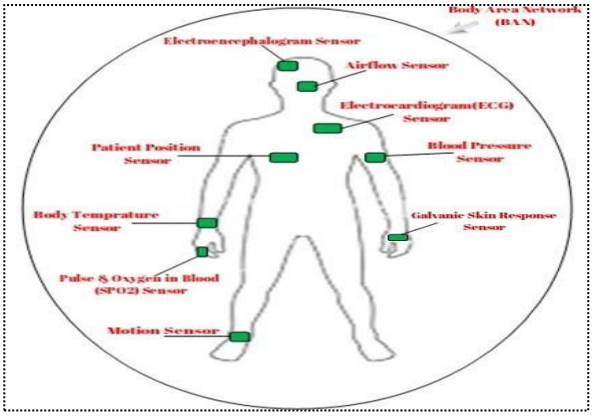

Figure 3. Body Area Networks

Medical Sensors and Wearables are Used by IoT-based Healthcare Monitoring

Due to increased remote networks, clinical sensing, and information test methods, diseases may be followed at a distance via wearable gadgets. Wearable sensors and devices, including cellphones, earbuds, and wristwatches may be incorporated into a range of accessories, including garments, bracelets, eyelids, socks, padding, and slips.

Two kinds of clinical sensors are available: contact sensors on-body and non-contact sensors on fringes. Furthermore, body contact sensors are segregated into two groups:

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- Medicinal sensors, unwinding (comfort alleviation), and crisis (ECG, EMG, EEG), (sweat, glucose, spit), compound (swing, glucose, spit), visual (oximetry, tissue), and crisis (ECG, EMG, EEG); (defibrillator).
- The fringe is defined by three types of noncontact sensors:
- Movement calculation (active work, quantity of carbohydrates), and posture to display well-being (GPS, indoor limitation)
- Emotions (injury, tension, melancholy), social management of emotions (admission of calories, dietary habits)
- Discourse (language progress) and pictures (daze technology) rehabilitation [8].
- The associated medical treatment applications may include wearable frameworks and clinical sensors [9].
- A crucial indicator of the hospital
- Motor and tactile misfortune assistance • In-home and versatile maturation • In-scale research and clinical research

IoT Applications Health Surveillance

IoT can apply a variety of therapeutic activities, including improvements in personal happiness, saving lives, and reducing expenditures of healthcare. The Healthcare business can strengthen its ability to reduce human error, work on the treatment cycle and achieve IoT-based advances to boost personal happiness for parents and patients. Specialists may use an IoT observation device to assist them to remember and predict a side effect before they begin to conclude.

For example, when an old patient falls or has doubtful behavior in an emergency unit, in health-related crises, the checking framework might be a caution (ICU).:

- Observation of health
- Personal wellness recognition
- Chronic disease recognition
- Safety Recognition
- Real-Time Location Tracking
- Home Rehabilitation
- Recognition of medicines.

Monitoring of Health

Clinical screens and wearable gadgets can record essential finishing documents for use in the welfare and individual exercise schedules. Pulses, blood glucose, weight, ECG, pulse, internal heat levels can be controlled by sensors in children and older children [11].

Monitoring of Personal Fitness

This type of sensor application is for persons needing to maintain their well-being. Sensors can also be used to monitor individual well-being and progress. Many rules to evaluate an individual's well-being and practice schedule can be followed and recorded. There is complete use of weight sensors and screen movement sensors such as flying time counters, steps counters, pace counters as well as calorie counters.

Monitoring of Chronic Diseases

Continuing diseases such as disease, diabetes, asthma, coronary disease, rest and joint diseases pain A lot of people influence. Such a disease calls for further consideration. Explicit dietary and treatment systems for the disease were required. To identify signs and antagonistic changes to the illness of the patient, brief clinical consideration can be made use of physiologic sensors such as ECG (electrocardiogram), EMG (electromyography), and EEG (electroencephalogram), combined with moving screen sensors, like step counters, pace counters, and calorie counters,

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Monitoring of Security

A range of sensors and portable devices are available to help older and children improve their medical care. For patient well-being observation, sensors for fall identification, location of an epileptic seizure, and indication for a coronary episode can be used. These sensors have a button to give guardians or relatives warning messages.

Management of Drugs

Specialists' rebellion with medication is a typical human feature. As a result of monetary misfortune, it could jeopardize the patient's wellbeing. An astute IoT bundling framework for drug boxes may be used for drugs. For drug boards. This cycle of bundling that depends on delaminated materials and is restricted by remote communications is used with controlled fixing [12].

Renovation of the Home

The use of the Internet of Things in medical care may improve recovery. To establish a locally established recuperation framework for older people, it can be used to detect progress dependent on the Internet of Things, combined with virtual reality conditions and increased critical frameworks. Far meetings with IoT-based technologies are also conceivable[13].

Tracking of Real-time Location

Things web (IoT) Patients and the hardware used in medicinal products can be screened. Providers of medical services can use RFID labels to screen the area constantly, the doctor allocated, and the therapy progress. The use of IoT can be effectively controlled by marking sensors and detecting defibrillators, ECG machines, spirometry, or Nebulizers among other clinical gadgets[14].

Technology for IoT-based Health Monitoring

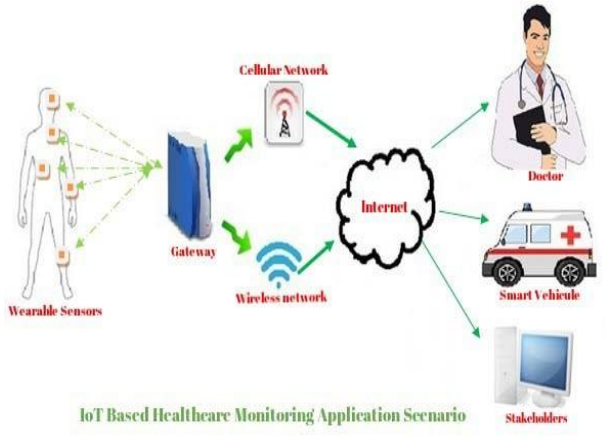

Figure 4. IoT Based Healthcare Monitoring Application Scenario

IoT is another innovation that connects to the Internet all things (living and non-living) for the sharing of information and controllers. By combining heterogeneous innovations, IoT executions are made conceivable. In the field of IoT, RFID innovation, sensor networks, wireless technology, and embedded systems in health care have been fully utilized [14]. The sensor collects real information about the well-being which is sent from the middleware. The crossing can simultaneously require several innovations and sensors. This information is researched and collected before it is sent to the web, where the related health care specialists and investors use it for decentralization.

IoT's health benefits

Costs of Low Hospital

The Web provides continuous patients with Thing-based medical treatment after 24 hours a day, seven days a week. It would certainly eliminate inappropriate medical visits as well as transport expenditures. Patients may get specialist

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calls at home over the Internet through video and should go to a medical facility only under dangerous conditions. The follow-up to IoT-based medical care will reduce the protection rates and enable patients to spend fewer days. Reduction of human error: In the area of IoT-based healthcare services, For instance, pulse and sugar levels, physical health information is acquired by sensors with changing precise accuracy and consequently decisions are taken using a huge information study. It contributes to reducing human errors.

Geographical Barriers to Dismantling

Because physicians and patients are universally connected via the Internet, any tolerant may seek clinical counsel anywhere on the earth.

Chronic Disorders Early Detection

It is possible to foresee and cure chronic issues in their first stages before they become hopeless by using large-scale testing and information collection methods using actual clinical sensor data [16].

Drug Management Improved

This is an enormous test for the wellness business to produce and monitor medicines. In addition, the Board of Directors for Medicines for producers, providers, and customers can use RFID (Radio recurrency identification) innovation in the drug production network. Their misfortunes will decrease since the drug managers are cheated, lost, and missed.

Medical Attention Immediately

In case of an event that a health crisis, such as the upward trend in a pulse or a collapse of a senior relative, IoT-based clinical devices may inform health service providers or relatives.

Better Treatment Results

Well-being surveillance day after day and evidence-based treatment solutions can aid to resolve diseases ideally. The effects of therapy will thus improve.

Problems and Difficulties

A few hurdles lie ahead for each new idea. The IoT-based medical services control has bottlenecks and obstacles in its setup. A few of them will come next:

Concerns about Security and Privacy

Private medical care data are gathered by medical treatment devices and programs which are accessible from and to the web every time. It can then draw programmers in the hope of receiving data on their own. Private well-being records should be used only the patient has been given permission. As the genuine penetration reports suggest from 2009 to mid-April 2013, robbery of a PC and a clinical gadget for medical treatment constitutes a significant 51% of safety hazards [15].

- Current healthcare insurance gadget
- Ensure secure correspondence management Maximum security for minimum asset measurement Ensuring simple information in the distributed computing environment

Patient welfare data are obtained in IoT-based medical care from various clinical sensors and wearable gadgets. Clinical devices should link to various devices and diverse customers for information. Several traders make products without sticking to consistent rules or recommendations for interfaces and conventions of gadget communications. The information collected by these devices cannot thus be accessed by various devices. Then questions of interoperability arise. Due to the lack of interoperability, loss of likely value, and the increasing framework addition, information from distinct IoT devices may safeguard every framework.

Issue of Device Design

In medical treatment, IoT gadgets are small sensors with little handling capacity, limited additional space, and reduced battery life. IoT devices are often web-based and portable. Wearable frameworks should be able to talk to

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one another. several groups that supply clinical subtleties to parental figures It's still a struggle to study IoT devices with power, additional space, the life of the battery, and adaptability that are genuinely ready to prepare.

Scalability

An improved clinical foundation would be provided in the next several days. The company would have many IoT gadgets to produce huge quantities of information on well-being. The measurement and preparation of information will develop quickly. Medical services will thereafter face a serious problem with information. For the framework storing and testing data from IoT gadgets, versatility is essential. The large-scale analysis of information and distributed storage should enhance treatment plans using information gathered from related IoT gadgets. When the amount of IoT gadgets develops, data creation and perception are increasingly troubling.

Confidence

Clinical devices provide enough and helpless information against digital attacks. Although information may give the idea that it is right, it may be well undermined or contaminated throughout transmission by infection malware. Programmers can use this information to damage individuals since guardians rely on information from these sensors for choices and treatment regimens. This damaged knowledge will thus lead to key choices. How can we trust a therapy that is subject to clinical sensor information? This is a key obstacle in the IoT-based welfare process.

Conclusion

Only in the early stages is the Internet of Things, but it can have an enormous impact on human health services and associated areas. Due to a speedy online network and advanced sensor innovation, individuals and diverse objects may be viewed. Many specialist strategies have been initiated by scientists to modify the medical services structure. This study further explores applications for medical services, innovative empowerment, current problems, and problems in the Internet of Things (IoT).

References

[1] Eric Brown says, Who Needs the Internet of Things. Linux.com is a site devoted to Linux. Wednesday, September thirteenth, 2016.

[2] Ramakrishnan Iyer and Radharaman Mishra, Building Intelligent Internet of Things Applications with Microsoft Stream Insight, *IGATE Global Solution*, April 2014, pp 1-7.

[3] T. J. McCue, Web of Things in Healthcare: $117 Billion Opportunity by 2020, [Online]. http://www.forbes.com/locales/tjmccue/2015/04/02/117-billion-market-for-web of-things-in-medical care by-2020/#58d793712471

[4] James Manyika and Michael Chui, byThe Internet of Things: Mapping the Value Beyond the Hype, June 2015.

[5] James Manyika, Organizations that move quickly on the Internet of Things will flourish now regardless of whether the economy needs to stand by, https://www.linkedin.com/beat/organizations moving-quick web things-can-profit now-Manyika

[6] Cyril Cecchinel, Matthieu Jimenez, Sébastien Mosser, and Michel Riveill, An Architecture to Help Big Data Collection in the Internet of Things, *IEEE tenth World Congress* on Services 2014.

[7] D. Evans by, The Internet of Things,How Will the Internet Change in the Future? No. April 2011, *The Internet of Things: How the Next Evolution of the Internet Is Changing Everything.*

Annals of R.S.C.B., ISSN: 1583-6258, Vol. 24, Issue 2, 2021, Pages. 1270 - 1277
Received 24 October 2020; Accepted 15 December 2020.

[8] Kunal Mankodiya, Shivayogi Hiremath, Geng Yang Idea, Architectural Components, and Promises for Person-Centered Healthcare: Wearable Internet of Things, 2014, *ICST*

[9] Jeong Gil Ko, Chenyang Lu, and Mani B. Srivastava Wireless Sensor Networks for Healthcare. IEEE 2010 (IEEE)

[10] Xu Xingmei, Zhou Jing, and Wang He, Exploration on the Basic Characteristics, Key Technologies, Network Architecture, and Security Problems of the Internet of Things, *3rd International Conference on Computer Science and Network Technology*.

[11] Krishnan, B., Sai, S.S., Mohanthy, S.B.: Real time internet application with distributed flow environment for medical IoT. In: *International Conference on Green Computing and Internet of Things, Noida*, pp. 832–837 (2015)

[12] Azariadi, D., Tsoutsouras, V., Xydis, S., Soudris, D.: ECG signal analysis and arrhythmia detection on IoT wearable medical devices. In: *5th International Conference on Modern Circuits and Systems Technologies*, Thessaloniki, pp. 1–4 (2016) [

[13] Mohan, A.: Cyber security for personal medical devices Internet of Things. In: *IEEE International Conference on Distributed Computing in Sensor Systems*, Marina Del Rey, CA, pp. 372–374 (2014)

[14] Yeh, L.Y., Chiang, P.Y., Tsai, Y.L., Huang, J.L.: Cloud based fine-grained health information access control framework for lightweight IoT devices with dynamic auditing and attribute revocation. IEEE Trans. Cloud Comput. PP(99), 1–13 (2015) IoT-Based Health Monitoring System for Active and Assisted Living 19

[15] Porambage, P., Braeken, A., Gurtov, A., Ylianttila, M., Spinsante, S.: Secure end-to-end communication for constrained devices in IoT-enabled ambient assisted living systems. In: *IEEE 2nd World Forum on Internet of Things*, Milan, pp. 711–714 (2015)

[16] Laubhan, K., Trent, M., Root, B., Abdelgawad, A., Yelamarthi, K.: A wearable portable electronic travel aid for the blind. In: *IEEE International Conference on Electrical, Electronics, and Optimization Techniques (2016)*

[17] Yelamarthi, K., DeJong, B.P., Laubhan, K.: A kinect-based vibrotactile feedback system to assist the visually impaired. In: *IEEE Midwest Symposium on Circuits and Systems (2014)*