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OVERVIEW OF IOT (INTERNET OF THINGS)

Mr. Rishi Sikka*

*SOEIT, Sanskriti University,
Mathura, Uttar Pradesh, INDIA
Email id: rishisikka.ec@sanskriti.edu.in

ABSTRACT

The Internet of Things (IoT) is a ground-breaking communication paradigm that is critical in remote monitoring and control activities. This paper provides an overview of Internet of Things (IoT)-based remote monitoring and control systems that have the potential to address societal issues in the areas of healthcare, environment, home automation, transportation, military, agriculture, solid waste management, smart metering, surveillance, consumer asset tracking, smart grid, vehicular communication system, and pilgrim monitoring.The Internet of Things (IoT) is a hot subject with significant technological, social, and economic implications. Consumer items, durable goods, automobiles and trucks, industrial and utility components, sensors, and other common things are being coupled with Internet connection and sophisticated data analysis capabilities to change the way we work, live, and play. The effect of IoT on the Internet and economy has been estimated to be as high as 100 billion linked IoT devices and a worldwide economic impact of more than $11 trillion by 2025, according to some estimates.

KEYWORDS: *Agriculture, Internet of Things, Interaction , Sensor , Security.*

1. INTRODUCTION

What would the world as without the Internet? It’s impossible to conceive a situation like this that we've never seen before. The Internet is becoming more essential for everyone in both personal and professional life nowadays[1]. Smart phones, sensors, mobile computers, and a variety of other smart items are examples of things we interact with on a daily basis. These and other IoT-related technologies have a big impact on emerging ICT and business systems. It was first referred to as the "Internet of Computers," then as the "Internet of People," and, more recently, as the "Internet of Things," due to fast advancements in ICT. Different gadgets and smart things are integrated in the IoT in order to extend the Internet and make it more accessible

and individually identifiable. The connection has been improved from "anytime, anywhere" for "anyone" to "anytime, anyplace" for "anything"[2]. In terms of ICT breakthroughs and economic advances, a lot of attention has moved to IoT-related technologies, which are generally regarded as one of the most essential infrastructures for their promotion and one of the most promising future plans. The primary goal is to make it possible for the physical world and cyberspace to interact and integrate.

Internet of Things (IoT) is seen as a cornerstone of the future Internet, with gadgets, smart items, systems, and services being able to operate intelligently and communicate in sophisticated ways. Indeed, it is a new revolution in communication technology that will give a unique identity to everything from tires to hairbrushes so that they may be addressed, linked to other objects, and share information[3].The Internet of Things has yet to be defined preciselyor uniformly. Internet of Things (IoT) is a network that links ordinary physical things with identifiable addresses to offer intelligent services, based on conventional information carriers such as the Internet, telephone network, and so on. The author of proposed a semantically correct definition of IoT as "a global network of linked items uniquely accessible, based on standard communication protocols," since its origin phrase is made up of two words: "Internet" and "Things." The true value of IoT, on the other hand, lies in its ability to connect a diverse range of heterogeneous devices, such as everyday existing objects, embedded intelligent sensors, context-aware computations, traditional computing networks, and smart objects, all of which differ in terms of design, systems, protocols, intelligence, applications, vendors, and sizes[4]. Through applications and management systems located in data centers or network clouds, these organizations are able to interact and integrate with one another to gather,produce,process**,** and share data. This aids in the coordinated execution of complicated processes and intelligent activities, as well as the autonomous making of choices.The fundamental premise of the Internet of Things (IoT) is to link smart devices – or things – to the Internet in a transparent manner[5]. As a result, data is exchanged across all devices, and users' information is sent in a more secure manner.

According to Cisco Systems, the Internet of Things will have 50 billion connected devices by 2020, and many physical objects, such as computers and sensor actuators, will be distributed with unique addresses and the ability to securely transfer data ranging from common daily activities to restricted medical records. The Internet of Things (IoT) is a technology that "provides an integration method for all these physical items that include embedded technologies to be coherently linked and allows them to communicate, perceive, or interact with the physical environment, as well as among themselves"[6]. The Internet of Things (IoT) is a concept that encompasses "everyone, anything, anytime, anywhere, any service, and any network" [6]. Healthcare is one of the most appealing IoT application areas, as it allows for a variety of medical applications such as remote health monitoring, fitness programs, chronic illness management, and senior care."A self-configured dynamic global network infrastructure with standards and interoperable communication protocols where physical and virtual "things" have identities, physical attributes, and virtual personalities, and are seamlessly integrated into the information infrastructure," according to another definition of IoT. Indeed, the Internet of Things (IoT) is the result of a global network interconnecting smart objects via extended Internet technologies, as well as the set of supporting technologies required to realize such a vision (such as RFIDs, sensor/actuators, machine-to-machine communication devices, and so on), as well as

the suite of applications and services that leverage such technologies to open new business and market opportunities[4].

1.1 Advantages of IoT

- Enhanced Customer Interaction Current analytics include blind spots and severe accuracy problems, and engagement remains passive, as previously stated. This is totally transformed by the Internet of Things in order to create a deeper and more effective connection with audiences[7].
- Technological Optimization The same technologies and data that enhance the consumer experience also increase device usage and help to make more powerful technological advancements. The Internet of Things (IoT) opens up a world of vital functional and field data.
- IoT reduces waste and identifies opportunities for development. Current analytics offer just a surface level of insight, while IoT delivers real-time data that leads to more efficient resource management.
- Improved Data Gathering Modern data collection has limits and was designed to be used passively. IoT takes it out of those areas and puts it right where people want to go to study their surroundings. It provides a complete view of everything.
- AI IoT basically turns everything into a "smart" object, enhancing every area of life via the use of data gathering, artificial intelligence algorithms, and networks. This might be as easy as adding sensors to your refrigerator and cabinets to detect when milk and your favorite cereal are running short and placing an order with your chosen grocer.
- New enabling technologies for networking, particularly IoT networking, imply that networks are no longer only dependent on large providers. Networks may be built on a much smaller and less expensive scale and yet be functional. These tiny networks are created by IoT between its system devices.
- Without sensors, the Internet of Things loses its uniqueness. They function as defining instruments, transforming the Internet of Things from a passive network of devices to an active system capable of real-world integration.
- Passive Engagement accounts for the majority of today's interaction with connected technology. The Internet of Things (IoT) ushers in a new era of active content, product, and service interaction.
- Small Devices have gotten smaller, cheaper, and more powerful throughout time, as anticipated. To achieve accuracy, scalability, and flexibility, IoT relies on purpose-built tiny devices[8].

1.2 Disadvantages ofIoT:

- The Internet of Things (IoT) generates a networked ecosystem of continuously linked objects. Despite any security precautions, the technology provides minimal control. As a result, users are vulnerable to a variety of threats.

- Without the user's active involvement, the complexity of IoT offers significant personal data in extreme detail. Given their usage of numerous technologies and a wide range of new supporting technologies, some people perceive IoT systems to be difficult in terms of design, implementation, and maintenance[8].
- Many people worry about an IoT system's ability to seamlessly connect with other systems. They are concerned that they will be confronted with several systems that are either incompatible or locked.
- Regulations apply to IoT, just as they do to any other technology used in the corporate world. Because of its complexity, the problem of compliance seems to be very difficult, even if many people believe standard software compliance to be a struggle.

1.3 Application of IoT:

- Houses with Smart Technology: Smart homes are one of the finest and most practical IoT applications because they take both convenience and home security to the next level. Though IoT may be used at many levels for smart homes, the finest is the one that combines intelligent utility systems with entertainment. Your energy meter with an IoT device that gives you insights into your daily water use, your set-top box that enables you to record shows from a distance, Automatic Illumination Systems, Advanced Locking Systems, and Connected Surveillance Systems are all examples of smart homes. As the Internet of Things progresses, we can expect most gadgets to become smarter, allowing for improved home security.
- City of the Future: Smart cities are intended to be made up of not only internet connection for individuals in a city, but also access for the city's gadgets. And we can gladly announce that we're on our way to making this goal a reality. Efforts are being made to integrate linked technology into infrastructure needs as well as certain critical issues such as traffic management, waste management, water distribution, and electricity management, among others. All of these things help to alleviate some of the problems that individuals encounter on a daily basis while also adding convenience.
- Autonomous Vehicles: There has been a lot of talk about self-driving vehicles. Google experimented with it, as did Tesla, and Uber even developed a self-driving vehicle that was subsequently shelved. Because we're dealing with human lives on the roadways, we need to make sure that the technology has all it needs to improve passenger and road safety.The vehicles utilize a variety of sensors and embedded technologies that are linked to the Cloud and the internet to continuously generate data and transmit it to the Cloud for Machine Learning-based decision-making. Though it will take a few more years for technology to mature fully and nations to change their laws and regulations, we are now seeing one of the greatest IoT applications[9].
- Internet of Things (IoT) Retail Stores: You should see the video of Amazon Go - the eCommerce giant's concept shop – right now if you haven't already. Perhaps the greatest use of technology for bridging the gap between an online shop and a physical store is this. By deducting money from your Amazon wallet, the retail shop enables you to go cashless. When you choose goods from the shelves, it also adds them to your cart in real time.If you change

your mind and choose another item, the old one is removed from your cart and replaced with the new one. The concept store's greatest feature is that there is no cashier to charge your purchases. You don't have to wait in line; just walk out after picking up your items from the shelves. If this technology proves to be successful in attracting more customers, it will undoubtedly become the standard in the future years.

- Agriculture : One of the industries that will gain the most from the Internet of Things is agriculture. With so many advancements being made in agricultural equipment, the future seems bright. Drip irrigation, crop patterns, water distribution, drones for farm surveillance, and other tools are being developed. These will enable farmers to produce a higher-yielding crop and better address their concerns
- Wearable technology: Even now, wearables are a popular subject in the market. These gadgets are used for a variety of reasons, including medical, health, and exercise. Jawbone, a wearables company, is the most well-funded of all the IoT companies.
- Smart Grids are number seven:A smart grid, for example, is a comprehensive system that employs a wide variety of Information Technology resources to allow current and new gridlines to minimize energy waste and costs. Electricity efficiency, reliability, and economics will all benefit from a future smart grid.
- Internet for Industry: The Industrial Internet of Things is made up of networked sensors, instruments, and other devices that are linked to industrial computer applications such as production, energy management, and so on. While the industrial internet is currently unpopular in contrast to IoT wearables and other applications, market research firms such as Gartner, Cisco, and others think it has the greatest overall potential.
- Telemedicine: Telehealth, often known as telemedicine, is still in its infancy. Nonetheless, it has a bright future ahead of it. IoT Telemedicine includes digital medical imaging communication, remote medical diagnosis and evaluations, video consultations with specialists, and so on.
- Intelligent Supply-Chain Management: Supply-chains have been around for a long. Solutions for monitoring products while they're on the move are an excellent example. They are certain to remain on the market for a long time, thanks to IoT technology.

1.4 Industry take advantages from IoT

- Manufacturing: Manufacturers may obtain a competitive edge by utilizing production-line monitoring to allow proactive equipment repair when sensors indicate imminent breakdown. Sensors can detect when manufacturing output is being harmed. Manufacturers can rapidly inspect equipment for accuracy or remove it from production until it is fixed with the assistance of sensor warnings. Companies can save operational costs, increase uptime, and enhance asset performance management as a result of this[4].
- Automobile: The adoption of IoT applications has the potential to provide substantial benefits to the automotive sector. Sensors can identify imminent equipment failure in cars currently on the road and notify the driver with facts and suggestions, in addition to the advantages of using IoT on manufacturing lines. Automotive manufacturers and suppliers

may learn more about how to keep vehicles operating and car owners informed thanks to aggregated data collected by IoT-based apps.

- Logistics and Transportation: A number of IoT applications assist transportation and logistics operations. Thanks to IoT sensor data, fleets of vehicles, trucks, ships, and trains carrying goods may be redirected depending on weather conditions, vehicle availability, and driver availability. Sensors for track-and-trace and temperature-control monitoring may be included within the inventory itself. Temperature-sensitive inventory is common in the food and beverage, floral, and pharmaceutical sectors, and IoT monitoring systems that provide warnings when temperatures increase or decrease to a level that threatens the product would be very beneficial[10].
- Retail: IoT apps help retailers manage inventory, enhance customer experience, increase supply chain efficiency, and save operating costs. Smart shelves with weight sensors, for example, may gather RFID-based data and transmit it to an IoT platform to automatically check inventory and provide warnings when goods are running short. Customers may get customized discounts and promotions through beacons, making for a more engaging experience.
- The Government Sector: In the public sector and other service-related settings, the advantages of IoT are equally extensive. Government-owned utilities, for example, may utilize IoT-based apps to inform their customers of large-scale outages as well as minor disruptions in water, electricity, or sewage service. IoT applications can gather data on the extent of an outage and deploy resources to assist utilities in recovering from outages more quickly.
- Healthcare: The healthcare sector benefits from IoT asset monitoring in a variety of ways. Doctors, nurses, and orderlies often need to know where patient-assistance items like wheelchairs are located. When wheelchairs at a hospital are fitted with IoT sensors, they can be monitored using an IoT asset-monitoring application, allowing anybody searching for one to easily locate the closest accessible wheelchair. Many hospital assets may be monitored in this manner to guarantee appropriate use and financial accounting for the physical assets in each department.

Across all industries, there is a need for general safety IoT may be utilized to enhance worker safety in addition to monitoring physical assets. Employees in hazardous settings, such as mines, oil and gas fields, chemical and power plants, need to be aware of the possibility of a hazardous incident affecting them. They may be informed of accidents or rescued as quickly as possible when they are linked to IoT sensor–based apps. Wearables that monitor human health and environmental factors also utilize IoT applications. These apps not only help individuals better understand their own health, but they also allow doctors to monitor patients remotely.

2. DISCUSSION

The Internet of Things (IoT) offers unparalleled possibilities for further innovations and investments in ICT as a fast-emerging, fast-growing technology. Open problems and difficulties, on the other hand, arise, emphasizing research trends and necessitating greater attention. Recent research articles, studies, and surveys cover a variety of topics related to the difficulties that IoT

developers confront. Because the Internet of Things is still in its early stages, problems such as large data management, analytics & mining, architectural standardization, scalability, privacy & security, clock synchronization, energy management, protocols, visualization, and QoS exist. Furthermore, as described in social IoT and nano-IoT are new developing aspects. Such problems are likely to be addressed in the near future, and greater collaboration is required. We emphasize the necessity of paying particular attention to the following two issues: I energy efficiency, which is a major consideration when developing IoT systems. As the number of connected devices grows, so does power consumption; as a result, energy-efficient methods are required for creating green IoT systems. (ii) Clock synchronization, which is becoming a key technology for distributed systems that are coherent. For data integrity, improved coordination, and job scheduling, scalable time synchronization is needed. Furthermore, an IoT device may time its sleep pattern using dynamic timing synchronization, allowing it to save more energy. We anticipate more involvement in order to mitigate the effect of such technological difficulties. As a result, creating a coherent and consistent IoT world in which a thing or a smart item is able to survive, interoperate, and adapt to any environment.

3. CONCLUSION

The Internet of Things (IoT) is a cyber-physical system that connects billions of disparate devices and smart things. Identification, embedded sensors, intelligent management, protocols, data storage/processing/analytics, and other technologies allow these things. In recent years, a broad variety of IoT applications have been accepted and implemented. This article presents an overview of the Internet of Things, including its vision, ideas, characteristics, and promising future.There are brief explanations of the major technologies, freshly created protocols, and the most popular IoT applications. For further efforts in the near future, the research directions/future problems are mentioned. We highlight the significance of power efficiency and temporal synchronization as future developments that, in our opinion, need greater attention and research. The most significant contribution of this article is that it pulls together the most important elements of the Internet of Things and their significance in a single document, presented in a simple and unverbose way.

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