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A Critical Review of Internet of Things

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Abstract

Internet of Things (IoT) is one of the most significant technologies being used today (IoT). It is a rapidly expanding technology that is significant in many fields. IoT has been critically examined in the current study from the beginning of technology to the present. The study's findings suggest that the Internet of Things (IoT) has numerous applications in a variety of fields, including the growth of urban communities, the organization of necessary resources and frameworks, adaptability, transportation, and partnerships. Different sensors are used by this technology to function. IoT is growing every day as a result of the development of various sensors for sensing various situations. IoT development has revealed that an increasing amount of organized data is being analyzed, safeguarded, and communicated under various circumstances.

Keywords: Internet of Things (IoT), Sensors, Smart Systems, Communication.

INTRODUCTION

The “Internet of Things” is referred to by the acronym IoT. It alludes to the whole network of physically connected devices. Technology makes it possible for various gadgets to communicate with each other, the cloud, and other physical devices. The ability to connect billions of things together is made possible by the development of computer chips and high internet bandwidth. Sensors are utilized in everyday IoT-enabled appliances like vehicles, vacuum cleaners, and other machines to collect data and respond to users very smartly online. The IoT connects commonly used objects to the internet. To make everyday items smarter, computer engineers have been adding sensors and processors to them since the 1990s. Because the chips were initially large in size, progress in making things intelligent was slow.Eventually, low power computer chips known as RFID were utilized to track pricey machinery. As computing systems shrunk in size, chips similarly shrunk in size, speeded up, and got smarter over time, the price of goods has also decreased significantly. With this development, anyone may give MCUs with even less RAM than 1MB connectivity with Alexa speech services capabilities. With the help of IoT devices, an entire industry, including our homes, businesses, and offices, has become intelligent. These intelligent IoT-based gadgets can send and receive data autonomously. The Internet of Things is the term used to refer to the collection of all these invisible computing devices and the related technology **(Potu et al., 2016).**

Many studies offer diverse perspectives about how the Internet of Things may be applied in various fields. But, how a person applies these concepts for advancement strategies depends on them. IoT is

one of the best concepts that may be used to automate many locations. To utilize this idea for improving numerous facets of life, other disciplines must collaborate with IoT. IoT was employed by numerous academics in a variety of fields, including smart cities. Some significant studies conducted in this area have been evaluated.

REVIEW OF LITERATURE

Menon et al. (2013)worked on integrating IoT into Singapore's bus transportation system. The purpose of this investigation was to determine the viability of implementing the Internet of Things in Singapore's transportation system. It was discovered that while Singapore is renowned for its progressive movements, there is still room for improvement in terms of the development's application to transportation. Customers must be able to grasp and evaluate specific transportation alternatives persuasively, and here is where IoT architecture might be useful.

Qiang et al. (2013)examined the IoT's applications and security concerns with it. They discovered that there are numerous applications for IoT security as well as numerous challenges that want solutions, such as security for RFID labels, distant connections, organized transmissions, security insurance, and data preparation security. This study is based on an analysis of the ebb and flow of system security innovation. Additionally, it offers a distinct method of communication with experts in specific IoT applications and designs by looking into and reducing IoT security in many ways.

Bhide (2014)provided incredibly accurate condition monitoring by various sensors for examining crucial information to change the level of comfort in houses by streamlining energy use. He used estimation to find and fix any problems with the devices as a result. He is using information mining with the Naive Bayes Classifier for it. It will inform the owner in addition to sending an email or SMS to the needed specialist for management. This has a hugely positive impact on the cutting-edge home IoT systems.

Kaur & Singh (2014)performed a survey work on IoT application. Regarding information and communication technologies and societal transformation, the Internet of Things continues to uphold its fundamental role. The most relevant examples include distinguishing proof and following innovations, wired and remote sensor and actuator systems, improved correspondence standards, and information transmission for sharp goods. As one can definitely imagine, any sincere commitment to the development of the Internet of Things should primarily result from synergistic learning exercises conducted in a variety of academic subjects, such as media communications, informatics, hardware, and sociology. This study is tailored to the people who must approach this perplexing control and contribute to its improvement in such an uncertain circumstance.

Shahet al. (2015)worked on improving the density and flow control of the Indian road system's traffic monitoring system. Administration of movement is a persistent problem today due to the increase and size of vehicles. The existing framework for activity regulation operates in the context of a planning element, which entails an analogous timetable. Every crossroads can handle an opening. Due to the irregular influx of automobiles, this is wasteful. The need for a framework with flexibility arises as a result. According to the qualifications for each course, courses should have the option of receiving additional scheduling openings. They suggested a flexible architecture for

preventing traffic jams that would allow each course to have a planned opening depending on the intensity of the activity.

Lee& Chong (2015)performed a study to understand the relationship between seeming entomb animation and the impact of ads, a dual-factor model was developed to describe the future adoption of smart internet of things services and its ramifications. For this purpose, a commercial that shows IoT breakthroughs is used. Individuals who are the objects of this investigation are given an introduction to the Internet of Things and its related business advances. After viewing an IoT advancements connected ad, a review is then conducted. They contrast the clients who have lower seen entomb liveliness with the clients who have higher seen intuition and close the clients who have higher seen intuition display the positive notice states of mind.

Das& Tuna(2015)worked on machine-to-machine communications for smart homes and discovered that machine-to-machine improvements can be characterized as those that allow both wired and remote frameworks to communicate with other devices of the same capability. M2M offers a few benefits to business and industry because it may be used for a wide range of monitoring and controlling applications. It is expected that M2M developments along with PDAs will become notably essential components in modern homes. In a similar vein, this inquiry introduces an example M2M technology usage. In the demonstrated application, the clever aeration and cooling system modifies itself based on temperature data provided by sensors.Although the exhibited application is merely a simple example of how M2M can be used, it has the power to impact all areas, improving our daily lives.

Nandyala&Kim(2016)worked on an IoT-based real-time u-healthcare monitoring for smart homes and hospitals has been worked on, and engineering for IoT-based u-medicinal services has been presented. observing under the guidance and beneficial conditions of the Cloud to Fog (C2F) registering system, which communicates more by providing closer to the edge (end focuses) at clever homes and hospitals.

Kaur (2016)worked on IoT security and privacy issues and presented an architectural diagram, application zone diagram, security and protection challenges in the IoT. IoT can be visualized as a seven-layered design. The layers can be divided into four groups: Business Value, Big Data, Cloud Computing, and Fog Computing.

Guptaet al. (2016) worked on the need for smart water systems in India and raised money for the World Water Development (UN) study that predicts a serious water deficit for half the population. Countries in Asia and Africa including Cambodia, Bangladesh, China, and India that are still developing will likely see increased water shortages. It was expected that 70% of the population will flee India's cities by 2050. It is challenging to maintain and provide resources like water and power to such a large population due to shrinking water stores, limited precipitation, and other factors. Information and communication technology (ICT) sensors can be used to monitor and set reserve water assets for future use.Sensors provide continuous pressure-driven information checking with automated control and disrupting if an occurrence of events, such as water spillages and so on, should occur. Examining facts will assist in carrying out important actions. Intelligent water management reduces non-sustainable water losses and reduces water use in the horticultural industry.

Deshpande&Deshpande(2017) focused on monitoring and managing industrial environmental parameters using IoT and suggested the idea that industry has to safeguard all relevant data, insights, and information related to the various current procedures, engines, machines, and devices used in industry premises. This is true for restricted access, increased effectiveness, and excellent outcomes from the manufacture of mechanical products. This calls for the checking and regulation of modern natural parameters. Innovation is growing swiftly thanks to IoT. The Internet of Things (IoT) is a network of physical objects or objects that have been outfitted with machinery, software, sensors, and organizational frameworks. This network enables these objects to gather and exchange data.In this article, a structure that will screen and manage cutting-edge parameters is being developed using the IoT concept of remote devices, Android, and sensors. It is the best and generally priceless. It has thus proven to have fantastic societal prospects.

Ghuteet al. (2017)worked on an Internet of Things (IoT)-based smart garbage monitoring and air pollution management system, and they described it as a really innovative framework that will keep cities clean. This system inspects the trash cans and provides information on the quantity of trash accumulated in the trash cans via a website page. The system does this by using ultrasonic sensors placed over the containers to identify the garbage level and compare it to the depth of the waste canisters. With the use of gas sensors, this system also detects dangerous gases that are visible all around. However, a webpage is created to show the status to the customer checking it. The site page lists the quantity of damaging gases present and illustrates the amount of garbage amassed. The trash level and level of harmful gases are displayed on the LCD panel. When the level of trash gathered crosses as far as it can go, the framework activates the signal. Therefore, this structure keeps the city clean by providing information on the trash levels of the containers and providing a graphical representation of the containers using a website page.

Debauche et al. (2018)working on web-based IoT bee health monitoring for researchers and beekeepers. They suggested a brand-new data storage architecture that is specifically intended for use in scientific research. The lambda architecture is capable of ingesting a wide range of data at high frequency, including photos, videos, punctual data, time series data, etc. The ability of this architecture to normalize, share, and interchange data among teams of researchers is one of its key new characteristics. Additionally, the growing availability of IoT protocols makes it possible to transport a large variety of data from numerous sources at a relatively low cost.The adoption of strong, interference-resistant protocols enables the deployment of monitoring systems in a variety of challenging contexts, including urban areas, particularly in urban beekeeping.

Alexopoulos et al. (2018) worked on the architecture and creation of a framework for industrial IoT to realize services in systems for industrial product service. This framework offers architecture for creating an Internet of Things framework for implementing services in many businesses. A comprehensive prototype was created that successfully demonstrates data gathering, analysis, and reporting. Additionally, it offers a range of services to meet the needs of diverse roles. The systematic information gathering, aggregation, analysis, and streamlining of user information are the main advantages of this approach. Users are informed of the output in the form of various graphs and figures. Additionally, this framework may be used in a variety of settings and gives users extended usage.

Mourtzis et al. (2019)observed in their study that IoT is able to transform industries into much more complex systems containing CPS, sensors, machines, and actuators which can communicate and exchange data among them to provide a flexible and fully aware system. This was determined through work on mapping vulnerabilities in the industrial internet of things landscape. However, the ability of data to transfer from controlling actuators to machines is boosted with a rise in wireless connectivity. The increased IoT ecosystem also offers ways to abuse a network, which creates a number of threats. In that paper, vulnerabilities in the IoT landscape were discovered, and the possible effects on the machine and human resources of an industry were evaluated. This framework was applied in the shop floor to highlight the necessity of cyber security at every tier prior to offering a service to users because its equipment are typically created with a focus on cost and not as much on security.

Bouras et al. (2019)performed research on Internet of Things (IoT) as the synergy of communication, processing, and caching for smart sensing came to the conclusion that IoT applications are expanding and a significant number of devices are being added continuously to IoT enabled networks. Caching, combined with compute and communication, is required to fix the sensing issues. To reach promising benefits and improve sensing for a smart world in the future, more problems related to IoT sensing must be overcome. The convergence of connectivity, processing, and caching for IoT smart sensing was described by the authors in this research.They also listed other prerequisites that must be met in order to realize IoT-related smart systems. The confluence of CCC and smart sensing were both mentioned by the authors. It is required for several future IoT technologies, including 5G networks, cloud, fog, and edge computing.

Allah et al. (2020)working on a real-time IoT-based water quality management system to reduce or eliminate the expense of water quality tests outside of a lab and claimed that IoT can be used to monitor water quality parameters. IoT can be used to maintain parameters relating to water quality. These characteristics are cleverly maintained using IoT and checked at the input.

Zhu et al. (2020)conducted research on an IoT-based intelligent classroom management system for schools. In this study, they created a method for managing smart classrooms in schools that uses little electricity, is inexpensive, simple to use, and is likely to be well-liked. The storage model based on MySQL and NoSQL has been found to match the ideal system requirements. MySQL is simple to use and satisfies the needs of tiny data volume information. For the vast amounts of data the IoT generates, H-Base offers reliable storage and quick data. The user can swiftly read data while taking readings while using that system.

Aslam & Curry (2021) used deep learning and event-based middleware to conduct a survey on the methodologies, difficulties, and potential directions of object detection for the internet of multimedia things (IOMT). Authors examined IOMT's characteristics and difficulties when employing IoT's service-oriented architecture (SOA) for the processing of multimedia events. They examined event-based middleware options and their applicability to the IOMT, coming to the conclusion that middleware is crucial to the provision of general-purpose services and the resolution of heterogeneity across organized events. Additionally, they demonstrated how the limited user interface and lack of adaptability of the present multimedia event processing methodologies. The

authors used object detection to show the difficulties in using neural network-based algorithms to interpret multimedia events.

Tariqa et al. (2021) done a thorough review of the security requirements and challenges for smart IoT applications and discovered that the research and industry have concentrated on a number of security flaws such device vulnerabilities and attain transit related with IoT devices. Due to its limited nature, smart IoT applications have a number of security issues that must be taken into consideration while creating security measures. Important security issues related to IoT applications in smart agriculture, smart cities, and smart healthcare were also covered by the authors.

Hamdy et al. (2022)suggested a strategy for implementing IoT in Warehouse 4.0 using Node-RED. In this study, a system using Node-RED and MongoDB has been suggested for the deployment of the IoT method in managing warehouses. In the research paper, it is explained how IoT can be deployed in a warehouse to reap benefits and prevent issues with current management systems. In order to demonstrate the significant impact that IoT has on operations warehouse, particularly on forecasting accuracy, a dataset has been employed. This solution aids in increasing speed and efficiency, reducing labour requirements, and preventing counterfeiting and inventory shortages by enabling real-time visibility of everything in the warehouse.This study gave warehouses a practical road map for enhancing their operations with IoT.

Long. (2022) IoT technology has substantially enhanced the level of online monitoring of the power grid, according to studies done on status information monitoring of power equipment. In comparison to traditional monitoring techniques, online monitoring via IoT is more intelligent, real-time, unrestricted, and its analysis of power equipment is also more automated and intelligent. This can increase the efficiency and reliability of monitoring. Numerous sensors work together to construct the network layer and perception layer through data processing and communication.

CONCLUSION

The literature research has shown that the IoT is a rapidly developing technology with numerous applications in a variety of industries. It is built on sensors, and these sensors can be many different kinds and sense a wide range of ambient, natural, and artificial elements. In order to monitor numerous factors that can be utilised to monitor various characteristics, many researchers used sensors-based IoT technology. In addition to technology, data analysts are required to evaluate the information presented in order to effectively handle any issues and make changes. Many IoT-based systems are used in smart cities by the general public. According to the literature review, several researchers have utilised three or four sensors to keep track of the climate or weather. Therefore, it is crucial and required to upgrade the system by including more sensors.

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