IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Opportunities, Problems and Solutions for the Next Generation IoT

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ABSTRACT

Smart and Internet of Things (IoT) technologies are developing and being used at a rapid pace, opening up new avenues for technical breakthroughs in a variety of areas of life. IoT technologies' primary objective is to streamline various industry processes in order to guarantee increased productivity of systems (technology or particular procedures), and lastly to raise the standard of living. Sustainability has emerged as a major concern for the public as a result of the dynamic development of IoT technologies, which are providing a variety of beneficial effects. However, this rapid development needs to be closely watched and assessed from an environmental perspective in order to minimize the likelihood of negative effects and guarantee the wise use of finite global resources. In the former sense, extensive research is required to thoroughly examine the benefits and drawbacks of IoT technologies. There was also discussion of some IoT technology application areas. reflects the advancement achieved. The editorial that follows covered four major current topics, namely the most recent developments in the following fields: The applications of IoT technology include: (i) sustainable energy and environment; (ii) smart cities enabled by IoT; (iii) ambient assisted living systems and e-health; and (iv) low-carbon and transportation-related products. The primary findings of the review introductory article enhanced comprehension of the state of technological advancement in IoT application domains and the ecological consequences associated with the growing utilization of IoT items. It is anticipated that every gadget will have an Internet connection by 2025, which will lead to an increase in the total number of devices having Internet connections. By 2030, 500 billion gadgets will be connected to the Internet of Things (IoT), according to Cisco. In addition, Telefonica predicts that by 2030, 90% of cars will be connected to the Internet of Things, and that by that time, each individual will own an average of 15 connected devices. Nonetheless, a 2015 assessment predicted that by 2020, there will be over 250 million linked cars on the road worldwide—a 67% increase. Many industrial opportunities provided by the Internet of Things enable industries to develop innovative models and tactics to bring their ideas to reality. These industrial prospects also bring together research studies, engineering skills, the sciences, and the humanities under one roof, providing researchers and specialists in multidisciplinary study domains with innovative and fruitful examination options. IoT is also making the world a smarter place where everything is easily and rapidly available. Figure 1 illustrates a few clever uses. Generally speaking, based on the IoT technologies' state of growth, industries will deal with ventures through fast speculation.

Keywords: Internet of Things(IoT), Sensors, Smart cities, embedded system, sustainable energy, devices.

1.Introduction

The Internet of Things (IoT) is a network of physical objects—"things"—embedded with sensors, software, and other technologies to connect and exchange data with other devices and systems via the internet. These gadgets might be anything from simple domestic items to highly advanced industrial instruments.

In the past several years, the Internet of Things has become clear as one of the major technologies of the twenty-first century. The capacity to link everyday objects—like baby monitors, cars, thermostats, and kitchen appliances—to the internet via embedded devices has made seamless communication between people, processes, and things possible. Low-cost computers, the cloud, big data, analytics, and mobile technologies have made it possible for physical things to communicate and gather data with little assistance from humans. In today's hyperconnected world, digital technologies have the capacity to capture, observe, and alter every interaction between items that are connected.

As a result, scholars from academia and industry have been drawn to this Special Issue to explore the potential for IoT-based user scenarios of the future generation, analyse their impact on the resolution of the problems and difficulties covered above, and provide workable solutions. Numerous scholars have made contributions to various fields of study concerning next-generation IoT-based applications and user scenarios, such as the following:

- Next Generation IoT based Smart healthcare.
- Next Generation IoT based Smart cities.
- Next Generation IoT based Smart agriculture.
- Next Generation IoT based Smart analytics.
- Next Generation IoT based Industrial IoT.
- Next Generation IoT based Multimedia.
- Next Generation IoT based Spectrum sharing techniques.

Figure 1. IoT based applications.

2.IoT based Applications:

2.1 Next Generation IoT based Industrial IoT.

The rapidly evolving technology known as the Internet of Things (IoT) has permeated every industry. For companies of all sizes, the network of linked devices offers a host of benefits and prospects. IoT becomes a necessity in the manufacturing sector. Industrial IoT applications make handling large, hazardous machinery, manufacturing intricate aircraft, and maintaining track of millions of components much simpler. In a large-scale industry, inventory management is not only laborious and time-consuming, but it also increases the risk of accidents. These days, businesses all over the world invest in the Industrial Internet of Things (IIoT) to improve worker safety, boost productivity, and obtain insightful business data.

Manufacturing: Companies can boost the operational effectiveness of their manufacturing processes by automating them.

Oil and gas: By proactively recognizing dangers, businesses lower risks and increase efficiency. Energy: Businesses use IIoT to reduce expenses, improve plant and worker safety, and boost dependability.

Agriculture: In order to increase productivity, agricultural companies work to implement smart farming practices by gathering data and deriving insightful conclusions.

Construction: Businesses use technology to gather information about construction projects, expedite project completion, and centralize site monitoring.

Automotive: Businesses can build smarter, safer cars with the help of IIoT solutions.

Healthcare: Hospitals and clinics use technology to reduce human error, automate procedures, and collect patient health data in real-time.

2.2 5G Technology

A speedier communication medium will be made available by 5G; speeds of several gigabits per second are anticipated. Your devices can so work together more effectively and complete tasks more quickly. Moreover, it will offer an ultra-low latency network (VZ reports that early 5G deployment demonstrated a latency of 30 ms), which will facilitate the usage of IoT devices for delicate operations like surgery. Lastly, you can connect more devices to 5G without experiencing quality loss due of its enormous bandwidth.

A 5G IoT network allows users to park their cars without physically driving to a location. In the same way you can call it directly.

The Internet of Things network allows farmers to remotely control equipment and keep an eye on live stock and crops.

Low latency surgical instruments enable doctors to operate from a distance.

Your enjoyment may also be enhanced by the minimal latency. For instance, you may play AAA games without needing to install them.

While they are away on vacation, homeowners may keep an eye on and manage their homes. You can track your robot vacuum cleaner, for instance, while lounging on the beach.

2.3 Fog Computing

Anyone working in the IT industry or aspiring to work in it should be aware of the fog computing trend. It can be used in a wide range of situations, including factories, hospitals, and other healthcare facilities. A type of distributed computing known as fog computing moves data storage and processing closer to the network edge, which is where a lot of Internet of Things devices are situated. Fog computing does this by decreasing the need for the cloud to handle these resource-intensive operations, which enhances performance and lowers latency. By moving processing and data storage closer to the edge, mist computing expands on cloud fog computing. Mist computing servers, which are low-power servers that can be set up in huge quantities, are frequently used in this process.

2.4 Next Generation IoT based Smart healthcare.

Hospital and other health center healthcare monitoring systems have grown significantly, and portable healthcare monitoring systems with new technologies are now a major worry for many nations across the world. The transition from in-person consultations to telemedicine in healthcare is made easier by the introduction of Internet of Things (IoT) technologies. This study presents an IoT-based smart healthcare system that can track a patient's current room conditions and basic health indicators in real-time. This system uses five sensors—the room temperature sensor, body temperature sensor, CO sensor, and CO2 sensor—to collect data from the hospital environment. For every scenario, the devised scheme's error percentage falls between a predetermined limit (< 5%). Medical personnel receives information about the patients' conditions through a gateway, which allows them to process and assess the patients' current state. Evidenced by the system's efficacy, the produced prototype is highly suited for healthcare monitoring.

2.5 Next Generation IoT based Smart cities.

Internet of Things (IoT) sensors are used in smart cities to gather data and automate processes like trash management, energy consumption, and transportation. By doing this, smart cities lower expenses, raise living standards, and enhance the effectiveness of municipal services. Dgtl Infra delves deeply into the many IoT technologies that serve as the essential building blocks of smart cities and the creative applications that arise from them. IoT technologies are being used more and more by smart cities to gather data and create insights that will help them manage resources, assets, and services more effectively. In addition, the convergence of growing Internet of Things applications with faster data rates and more capacity capabilities from wireline and cellular networks is driving this change. A smart city uses cutting-edge technology, such as an extensive network of sensors and networked devices, to collect data in real-time and enhance the effectiveness of public services while conserving funds and resources.

2.6 Next Generation IoT based Smart agriculture.

Information and communication technology employed in machinery, equipment, and sensors in network-based high-tech farm supervision cycles is the focus of the emerging field of "smart farming." It is expected that new technologies, cloud computing, and the Internet of Things (IoT) will spur development and introduce robotics and AI into farming. Such revolutionary departures pose a number of difficulties and are disturbing established agricultural practices. This paper examines the instruments and apparatus utilized in wireless sensor applications in Internet of Things agriculture, as well as the expected difficulties encountered in integrating technology with traditional farming practices. Additionally, growers can benefit from this technological knowledge from the time of sowing to harvest; applications in packing and transportation are also being researched.

Precision agriculture leverages the Internet of Things (IoT) by employing robots, drones, sensors, and computer imagery together with analytical tools to monitor and gain insights from the farms. Physical equipment is placed on farms to monitor and record data, which is subsequently analyzed to obtain insightful information.

2.7 Next Generation IoT based Smart analytics.

The enormous volume of data generated by the Internet of Things is made sense of through IoT analytics. Numerous sensors and gadgets provide this data; a single piece of equipment may have dozens of sensors, all of which are continuously generating data. In order to process data from IoT-connected devices and generate insights, identify trends, or forecast outcomes that businesses can utilize to inform their decision-making, IoT analytics is essential. Organizations can use a variety of advanced analytics tools to interpret the data from the Internet of Things. The amount of data being generated, the intricacy of the insights offered, and the kinds of activities motivated by those insights all influence the best course of action. Businesses may get a better understanding of the present state of their devices as well as their future requirements by integrating IoT predictive analytics with a predictive maintenance model. The optimal time to service equipment can be determined by predictive maintenance, which can also foresee and stop potential problems before they happen. Service results are changing as a result of predictive maintenance; unexpected downtime can be reduced by up to 30%, service can be completed up to 83% faster, and site visits can be reduced by up to 75%.

2.8 Next Generation IoT based Multimedia.

The interfaces, protocols, and related multimedia-related information representations that enable advanced services and applications based on human to device and device to device interaction in real and virtual settings are collectively referred to as the Multimedia Internet of Things (IoT). Data that is sensed, processed, and/or sent to a human or another device is referred to as information.

- Possible subjects consist of, but are not restricted to, the following:
- Service and system architectures of multimedia-based IoT
- Interfaces, protocols, and associated multimedia-related information representations in IoT
- Fast and complexity-awareness algorithms for real-time multimedia computing in IoT
- Low complexity audio/video encoding in mm-IoT
- Controlling quality over complexity for each individual Media Thing
- Real-time, ultra-high quality media compression and storing scheme in IoT
- The design of hardware structure for low-power, real-time, multimedia-centric IoT service
- Synchronization technique for video and audio for IoT services
- Security scheme of video/audio signals for protecting personal information in mm-IoT
- Structure of camera network management
- Distributed system for smart applications in IoT
- Architectural performance evaluation of system
- Multimedia crowd flow analysis in mm-IoT
- Big data analysis technique on mm-IoT

2.9 Next Generation IoT based Spectrum sharing techniques.

The vast Internet-of-things (IoT) industry, or applications involving the widespread deployment of Internet-enabled devices, is reshaping a number of industries, including agriculture, retail, logistics, and cities. However, because of the special traffic patterns of enormous IoT and the high device density, widespread adoption of such applications is entwined with connectivity issues. This dissertation's primary goal is to provide spectrum sharing technologies that will allow for widespread Internet of Things connectivity across both licensed and unlicensed bands. In order to do this, we explain how intra- and inter-network sharing interact, i.e., how a high density of inexpensive IoT devices should share spectrum among themselves while still getting along well with other wireless networks.

First, we introduce a framework for modeling and analyzing ultra-narrowband (UNB) communications, in which Internet of Things (IoT) devices use extremely narrowband signals to randomly access the unlicensed spectrum. The approach makes it possible to analyze large-scale networks in a tractable manner, highlighting key constraints and suggesting improvements that would allow UNB networks to accommodate a greater density of low-rate IoT devices. Next, we introduce an access mechanism that allows higher-rate applications over unlicensed bands that have restrictions on sensing. In order to achieve this, we reexamine spectrum sensing for the massive Internet of Things and suggest a sensing-based system in which base stations equipped with narrowband receivers locally share and process sensing reports in order to scan a wideband spectrum, efficiently reusing resources across space and identifying them at a fine spectral resolution. Next, we look at cellular connectivity for applications that require stringent quality-of-service assurances. Here, we create a shared spectrum access protocol and use drones as Internet of Things data aggregators. The suggested methodology minimizes disturbance for current cellular users while optimizing the energy-efficiency of IoT devices. Finally, in order to improve the coverage and rate of users and IoT devices, we study and optimize the densification of tiny cells.

3.Conclusion

Recent years have seen an intense digitalization that has opened up new technical possibilities that have already started to progressively alter the major economic sectors and societies at large. Digitalization has opened up new avenues for advancement and more effective use of scarce resources, systems, and processes in a variety of economic sectors. Information technology, or smart technologies supported by the Internet of Things, is the primary force behind the effective digitization of numerous industries. In the earlier meaning, one of the main industries where "energy digitalization" has already begun to take off quickly in a number of energy-related fields is the energy sector. The energy industry is currently among the IoT technology deployment sectors with the fastest pace of advance. The solutions being developed are targeted at smart houses, i.e., sophisticated automation of household energy systems, creation of intelligent and flexible micro-grids, or improvements in effective demand-side power system management. In-depth research has also been done on the idea of a circular economy, which can promote intelligent waste management and assist in bridging one of society's major problems. IoT technologies have recently been explored in many ways for environmental protection, mainly for air quality monitoring, which has a lot of potential in that regard. Every quickly developing technology has unique potential downsides that should be thoroughly considered and dealt with. With billions of IoT devices and significant potential population consequences, there are particular issues that must be resolved. These issues were identified through the review process that was undertaken here. Ensuring a balanced and sustainable development of IoT technology is the primary objective.

References

1.M. Aazam, and et.al.(2018), "*Deploying fog computing in industrial internet of things and industry*" IEEE Transactions on Industrial Informatics.

2.Abdouet and et.al., (2019), "*Proceedings of the International Conference on Microelectronics*.", ICM, Volume 2019-December, December 2019

3.Al-Ali et al., (2017),"A smart home energy management system using IoT and big data analytics approach."IEEE Trans. Consum. Electron., 63

*4.*Al-Masri et al., (2018),"*A serverless IoT architecture for smart waste management systems"*2018 IEEE International Conference on Industrial Internet (ICII) (2018)

5.Alletto et al., (2015), "An indoor location-aware system for an IoT-based smart museum" IEEE Internet of Things Journal, 3 (2) (2015), pp. 244-253