Application Domains of the Internet of Things (IoT)

MITTAKANTI VINOD KUMAR[1], D LOHITHA [2], DHARAVATH VINODA[3]

1,2 & 3, Associate Professor, ECE department, Brilliant Institute of Engineering & Technology, Hyderabad, TS.

ABSTRACT

As the Internet of Things (IoT) continues to evolve, it emerges as a transformative force in the ongoing advancement of the Internet. It is essential to explore the diverse domains where IoT can be applied and to understand the related scopes of these applications. From smart cities to healthcare, agriculture, logistics, retail, and even intelligent living environments, IoT is expected to permeate nearly every aspect of daily life. While significant advancements have been made in existing IoT enabling technologies in recent years, several areas still require attention and development. Given that the IoT concept is based on a variety of heterogeneous technologies, there remains much to investigate. The pervasive nature of IoT, which impacts nearly all facets of our lives, positions it as a vital research topic across multiple related fields, including information technology and computer science. This paper explores various application domains and their specific characteristics.

Keywords: Domains, Heterogenous, Explorations, Research

I. INTRODUCTION

The Internet of Things (IoT) refers to the network of physical objects—known as "things"—that are embedded with sensors, software, and various technologies to connect and exchange data with other devices and systems over the internet. These devices range from everyday household items to sophisticated industrial machinery. As of now, there are over 7 billion connected IoT devices, and experts predict this number will rise to 10 billion by 2020 and reach 22 billion by 2025. IoT is increasingly becoming a significant part of our daily lives, manifesting in various forms around us. Overall, IoT represents a breakthrough that integrates a wide array of smart systems, structures, and intelligent devices and sensors (see Fig. 1). Moreover, it harnesses the potential of quantum and nanotechnology in terms of storage, sensing, and processing speeds that were previously unattainable. Extensive research studies, documented in scientific articles and reports across web platforms and publications, illustrate the potential effectiveness and relevance of IoT innovations. It can serve as a foundational step toward developing novel and creative strategies while addressing important considerations regarding security, privacy, and interoperability.

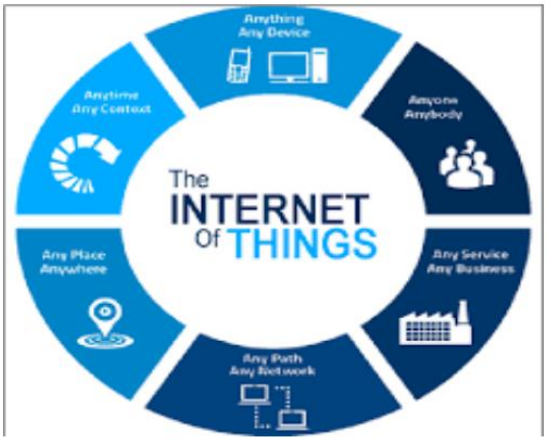

Fig 1: IOT

As the internet continues to evolve, it has transformed from a simple network of computers into a vast network of various devices, with the Internet of Things (IoT) representing a network of interconnected "smart" devices—essentially an ecosystem of systems, as illustrated in Fig. 1. Today, devices such as smartphones, vehicles, industrial systems, cameras, toys, buildings, home appliances, and countless others can share information seamlessly over the Internet. Regardless of their size and functionality, these devices enable a range of intelligent features, including upgrades, tracking, positioning, control, real-time monitoring, and process management. In recent years, we have witnessed a significant proliferation of internet-enabled devices. While the most notable impact has occurred in the consumer electronics sector—especially with the revolution in smartphones and the growing interest in wearable technology (such as smartwatches and headsets)—the role of these devices in connecting people reflects a broader movement toward integrating the digital and physical worlds. This paper will discuss the need and significance of IoT in Section II, explore various application domains in Section III, and provide a brief summary and conclusion in Section IV.

II. WHY DO WE NEED IOT?

Web of Things (IoT) makes our reality as conceivable as associated together. These days we nearly have web foundation any place and we can utilize it at whatever point. Implanted figuring gadgets would be presented to web impact. Normal cases for installed processing gadgets are MP3 players, MRI, traffic signals, microwaves, clothes washers and dishwashers, GPS even heart observing inserts or biochip and so forth.

IoT attempts to lay out cutting edge availability (with the guide of web) among these referenced gadget or frameworks or administrations to gradually makes robotization in all areas. Picture that all thing are associated with assemble and all data would be communicated to one another over norm and different convention space and applications. Therefore, we need IOT due to following reasons

1. INTERACTION- Internet of things devices connects you with on and off switch function to the internet that makes able to serve in a much better way to the people.

2. LIFESTYLE- Sensors connected objects are equipped for trading the information significantly and accordingly with the help of the web, they can convey to settle on productive choices.

3. INDUSTRIAL DECISIONS-The web of things gadgets likewise investigates it in a solid setting and our business additionally extends extraordinarily. So there are numerous enterprises that are taking on the IOT arrangement innovation thinking about the future interest and to work on the current framework too.

4. NEED SATISFACTION- With the assistance of compelling information examination, you can productively collaborate with others progressively. Additionally, area, timing, and looking through type can likewise be followed by the organization to be familiar with the genuine need of the clients.

5. SAFETY-With the tech gadgets empowered with IOT can be aware of the forest fires and different disasters with the fine-grained exactness constantly.

III. IOT APPLICATIONS DOMAINS

Expected uses of the Internet of Things are various as well as very assorted as they pervade into for all intents and purposes all parts of day to day existence of people, organizations, and society. As indicated by [3], the uses of IoT cover wide regions counting producing or the modern area, wellbeing area, agribusiness, brilliant urban communities, security and crises among numerous others. The main domains of IOT uses are

1. SMART ARCHITECTURE- As indicated by [5], the IoT assumes a urgent part in working on the adroitness of urban communities and improving general foundation. IoT is changing the customary common design of the general public into innovative construction with the idea of shrewd city, savvy home and brilliant vehicles and transport. Fast upgrades are being finished with the assistance of supporting innovations, for example, AI, regular language handling to comprehend the need and utilization of innovation at home [6]. Different advancements, for example, cloud server innovation, remote sensor networks that should be utilized with IoT servers to give an effective brilliant city. Another significant issue is to ponder natural part of shrewd city. In this manner, energy proficient advances and Green advances ought to likewise be considered for the plan and arranging of brilliant city framework. Further, savvy gadgets which are being fused into recently sent off vehicles can recognize gridlocks out and about and in this way can propose an ideal backup course of action to the driver. This can assist with letting down the blockage in the city.[4] In addition, IoT permits establishment of savvy and climate versatile road lighting and discovery endlessly squander compartments by keeping tabs of rubbish assortment plans. Keen expressways can give cautioning messages and significant data, for example, admittance to redirections contingent upon the climatic circumstances or unforeseen events like gridlocks and mishaps. Also as [7] said, IoT is likewise extremely successful in keeping up with the vehicle's wellbeing. Self driving vehicles can possibly speak with other self driving vehicles by the method for wise sensors. This would make the traffic stream smoother than human-driven vehicles who used to drive in an unpredictable way. This system will take more time to be carried out from one side of the planet to the other. Till the time, IoT gadgets can help by detecting gridlock ahead and can make fitting moves.

2. HEALTHCARE INDUSTRY- IOT assumes an essential part in medical services. It tends to be utilized in numerous ways like following the quantity of patients in an emergency clinic, distinguishing the right persistent for the right medication and observing a patient's ailments from a remote spot which is known as Telemedicine [8]. This incorporates giving

treatment, analysis and treatment. Also, verification and distinguishing proof decrease occurrences that might be hurtful to patients, record upkeep and less instances of crisscrossing newborn children. Also, programmed information assortment and transmission is indispensable in process mechanization, decrease of structure handling courses of events, computerized technique inspecting as well as clinical stock administration. Sensor gadgets permit capacities fixated on patients, especially, in diagnosing conditions and benefiting continuous data about patients' wellbeing markers [5].

3. AGRICULTURE- The world's developing populace is assessed to arrive at surmised 10 billion by 2050.Agriculture assumes a significant part in our lives. To take care of such a gigantic populace, we want to propel the current farming methodologies. Along these lines, there is a need to join farming with innovation so the creation can be worked on in a productive manner. According to [9], the IoT has the capacity to strengthen and enhance the agriculture sector through examining soil moisture and in the case of vineyards, monitoring the trunk diameter. IoT would allow to control and preserve the quantity of vitamins found in agricultural products, and regulate microclimate conditions in order to make the most of the production of vegetables and fruits and their quality. Furthermore, studying weather conditions allows forecasting of ice information, drought, wind changes, rain or snow, thus controlling temperature and humidity levels to prevent fungus as well as other microbial contaminants. GREENHOUSE innovation is one of the potential methodologies toward this path. It gives a method for controlling the natural boundaries to work on the creation. Be that as it may, manual control of this innovation is less compelling, need manual endeavors and cost, and results in energy misfortune and less creation. With the progression of IoT, shrewd gadgets and sensors makes it simpler to control the environment inside the chamber and screen the interaction which brings about energy saving and further developed creation. The use of IOT with GreenHouse effect can be seen in figure 2.

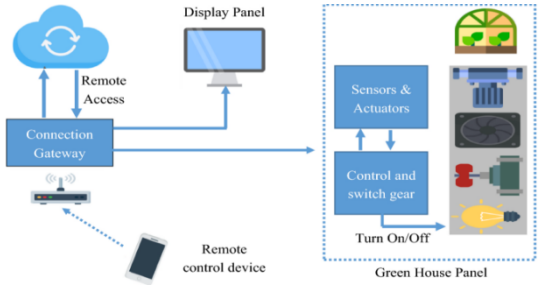

Fig 2

4. RETAIL- Executing the IoT in Supply Chain or retail Management has many advantages. Some incorporate; noticing capacity conditions all through the inventory network, item following to empower follow capacity purposes, installment handling relying upon the area or action period openly transport, amusement parks, exercise centers, and others. Inside the retail premises, IoT can be applied to different applications, for example, heading in the shop in view of a preselected list, quick installment processes like consequently looking at with the guide of biometrics, recognizing potential allergen items and controlling the revolution of items on racks and distribution centers to robotize restocking methodology [10].

IV. CONCLUSION

The Internet of Things (IoT) represents a new frontier in web applications, ushering in an era of smart technology where communication occurs between devices rather than solely between humans. IoT can be best described as a Complex Adaptive System (CAS) that will continue to evolve, necessitating innovative approaches in software development, systems engineering, project management, and various other disciplines to facilitate its growth and management in the years to come. IoT engineers and researchers are collaborating to enhance this technology on a large scale, aiming to maximize its benefit to society. Additionally, significant application areas of IoT are explored where developers and researchers are actively engaged. Consequently, IoT holds tremendous potential as a transformative force that is already making a profound impact on millions of lives globally. This significance has become more evident, as numerous countries worldwide are showing increasing interest in the IoT concept by allocating more funding aimed at promoting further research in this field.

V. REFERENCES

[1] Sfar AR, Zied C, Challal Y. A systematic and cognitive vision for IoT security: a case study of military live simulation and security challenges.

[2] Gatsis K, Pappas GJ. Wireless control for the IoT: power spectrum and security challenges. In: Proc. 2017 IEEE/ACM second international conference on internet-of-things design and implementation (IoTDI), Pittsburg, PA, USA, 18–21 April 2017.

[3] K. K. Patel, S. M. Patel, et al., “Internet of things IOT: definition, characteristics, architecture, enabling technologies, application future challenges,” International journal of engineering science and computing, vol. 6, no. 5, 2016.

[4] AbdelRahman H. Hussein. “Internet of Things (IOT): Research Challenges and Future Applications”, (IJACSA) International Journal of Advanced Computer Science and Applications, Vol. 10, No. 6, 2019.

[5] S. V. Zanjal and G. R. Talmale, “Medicine reminder and monitoring system for secure health using IOT,” Procedia Computer Science, vol. 78.

[6] Park E, Pobil AP, Kwon SJ. The role of internet of things (IoT) in smart cities: technology roadmaporiented approaches. Sustainability. 2018;10:1388.

[7] Sachin Kumar, Prayag Tiwari, Mikhail Zymbler “IOT is a revolutionary approach for future technology enhancement”.

[8] A. J. Jara, M. A. Zamora and A. F. G. Skarmeta.” An ambient assisted living system for telemedicine with detection of symptoms”. Third International Work-Conference on the Interplay between Natural and Artificial Computation.

[9] V. Sundareswaran and M. S. null, “Survey on Smart Agriculture Using IoT,” International Journal of Innovative Research in Engineering & Management (IJIREM), vol. 5.

[10] P. Tadejko, “Application of Internet of Things in logistics-current challenges,”” Ekonomiai Zarz{a¸}dzanie, vol. 7, 2015.

[11] R. Porkodi and V. Bhuvaneswari, “The Internet of Things (IoT) Applications and Communication Enabling Technology Standards: An Overview,” in 2014 International Conference on Intelligent Computing Applications, 2014.