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INDIA'S 3G, 4G, 5G, AND NEXT GENERATION WIRELESS COMMUNICATIONS EVOLUTION

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ABSTRACT

Artificial intelligence and cloud computing the fifth-generation mobile network (5G), which serves as the primary enabler of Industry 4.0, has made it possible to achieve digital transformation and smart manufacturing. B5G, on the other hand, is seen as a turning point that would radically change present worldwide trends in wireless communication practices as well as in the lives of masses of people. Convergence between the physical and digital worlds is something that B5G envisions for the future. The purpose of this research is to investigate the world beyond 5G, with the transition to 6G taking the lead as the most advanced wireless communication technology of the future. However, despite the fact that there have been a number of advancements, the fantasy of a time without latency, internet speeds that have never been seen before, and contact with alien beings has not yet become a reality. This article examines the primary obstacles and difficulties that the transition from 5G to 6G has the potential to encounter in order to realize these more lofty goals. The purpose of this article is to provide a vision for sixth-generation wireless wireless networks, which will facilitate technological infrastructures, challenges, and research that will lead to the eventual realization of the "technology for humanity" aim and improved service to disadvantaged individuals.

Keywords: cloud computing ,wireless communication, digital transformation

INTRODUCTION

Since the beginning of time, people have fantasized of being able to engage in conversation with one another whenever and wherever they want. For a long time, monarchs, nation-states, military forces, and corporate cartels have been searching for more and better means to collect timely information of strategic or economic worth from all over the world. It is not uncommon for travelers to be ready to pay higher rates in order to speak with their loved ones and friends back at home.

The topic of wireless communication is one of the most rapidly expanding subfields within the constantly evolving communication sector. The usage of mobile phones has reached around one billion people all over the globe, due to the significant exponential expansion that cellular phones have seen. There is no doubt that mobile phones have evolved into one of the most essential components of our everyday lives and an essential instrument for doing business all over the globe. However, ultrasound and infrared light are also utilized on occasion in wireless communication. Wireless communication refers to communication that takes place via the radio. Communication that is not broadcast is what is meant by the word "wireless," and it often occurs between persons who frequently utilize portable or mobile devices. In this section, we shall discuss the history of wireless communication before moving on to the developments.

History Of Wireless Communication

In the most of the discussion is devoted to the present state of wireless communication, with some projection about its potential in the future. A quick look into the past, on the other hand, will be helpful in gaining an understanding of the current condition of affairs. There have been advancements made in the systems that are used now compared to their predecessors, some of which are still working today. In a similar vein, we might anticipate that future systems will develop from the ones that are now in place. One may trace the origins of wireless communication all the way back to the 1880s. Morse's invention of telegraphy in 1837 and Bell's invention of the telephone in 1876 were quickly followed by Hertz's first tests with radio in 1887. The technology that Hertz developed was little more than a laboratory curiosity, but Marconi was the one who successfully communicated over the English Channel in the year 1899 and across the Atlantic Ocean in the year 1901. Initially, the first wireless transmission was a short letter that was delivered between the United Kingdom and Canada. These results led to the widespread usage of the radio for communication between ships and shores using Morse code once it was developed.

The first wireless systems were only appropriate for radiotelegraphy and used spark-gap transmitters, which were rudimentary instruments that were often quite strong. speech transmission became feasible with De Forest's invention of the triode vacuum tube in 1906. This discovery made it possible to modulate a continuous wave signal and made speech transmission possible. There is a disagreement on the precise identity of the first person to do anything, but it is quite probable that Reginald Fessenden was the first person to broadcast voice and music to the public in the latter half of 1906. It was impossible to place early radio transmitters in automobiles because they were too cumbersome. In the beginning, the sole component of mobile radio systems for police agencies was a receiver that was installed in the vehicle itself. A system that was established in Detroit in 1928 was the first one that was judged to be practical. It was in the middle of the 1930s that the first two-way police radios were introduced, with the equipment taking up the majority of the trunk space. Before the late 1930s, amplitude modulation (AM) was the dominant mode of transmission; however, frequency modulation (FM) started to take its place.

Wireless Technology

Since its origin, wireless technology has seen significant advancements and has become an indispensable component of our everyday life. The development of wireless communication has undergone a dramatic transformation, beginning with the first generation (1G) of wireless communication and continuing all the way up to the fifth generation (5G) device. The progression of wireless communication from 1G to 5G will be covered in depth in this tutorial, which will offer an overview of the whole process. There has been a significant acceleration in the development of wireless technology from 1G to 5G. This most recent generation of 5G technology has the potential to completely transform the manner in which we communicate and engage with the world around us. The globe will become more linked as a result of its low latency, high speed, and enhanced dependability, which will make it possible for new applications and services to be developed.

The technology behind wireless communication has been present for more than a century, but it wasn't until the 1970s that we started to see mobile networks being implemented on a mass scale. The initial versions of mobile networks, sometimes referred to as 1G, were analogue networks that enabled fundamental voice communication. 2G digital networks quickly followed, bringing with them faster data transfer rates and improved call quality. It was possible to create the contemporary internet that we are familiar with today thanks to the development of 3G and 4G networks, which saw even higher speeds and improved coverage. Currently, the most cutting-edge and innovative

kind of wireless technology is known as 5G. It offers speeds that are very quick and a capacity that is enormous. There has been a long and interesting journey in the growth of wireless technology, and it is just getting better from point to point.

A wireless communication system's component

The simplest wireless system is comprised of three components: a transmitter, a receiver, and a channel, which is often a radio link. These three components will be discussed more below. Because we are unable to use the radio directly with low frequency, it is necessary to use modulation in order to superimpose the information content onto a carrier signal that has a higher frequency at the transmitter. This is done in order to ensure that the information is sent effectively. By using a distinct carrier frequency for each of the signals at the same time, modulation makes it feasible for several signals to utilize the same radio channel. This is made possible by the fact that modulation takes place simultaneously. The process of inverse modulation, which is often referred to as demodulation, is carried out at the receiver in order to recover the information that was first sent.

Evolution of Wireless Technology

Since the middle of the 1970s, when the first cellular networks, also known as 1G, started to develop, wireless technology has accomplished a great deal of progress. With the passage of time, each successive generation of cellular networks has been characterized by a wide range of noteworthy advancements. The internet has become more accessible and the connection has been quicker with each new technological advancement, beginning with the first analogue 1G networks and continuing all the way up to the present 5G networks.

It is now able to send text messages and multimedia communications, stream music and video, and access the internet at rates that are becoming faster and faster thanks to the development of wireless technology. This is a significant advancement from the previous method of making voice-only conversations. Because of this progression, wireless technology has become an indispensable component of our everyday life. As time goes on, we may anticipate encountering even more advancements in wireless technology, which will continue to bring about changes in the manner in which we communicate and engage with one another online.

OBJECTIVE

1. In order to educate oneself on the development of wireless mobile networks
2. To investigate the pace of expansion of the Internet in India

Method

There is a fast growth in the demand for internet access all across the globe. India has seen an unstoppable surge in internet use over the course of the last five years, from 2013 to 2017. In order to increase the number of people using the internet in India, 4G technology plays a significant role, particularly with regard to dependency JIO. Roads, communication, and the presence of illiterate people are the three primary factors that determine the progress of any nation. The Internet is a significant factor in the advancement of literacy rates in any nation around the globe. If we look at the graph of internet use in our nation (India), we can see that. During the last two to three years, the pace of growth of internet and smart phone users has been quickly increasing. The implementation of a 5G communication infrastructure in India was necessary in order to sustain the current expansion of the internet. This study examines the many communication technologies that are now used in the communication system as well as those that are anticipated to be

implemented in the year 2020. The 5G communication system, which is scheduled to begin operations in the year 2020, is the next step in the growth of the communication sector.

Result and discussion

These tiny sensing element nodes, which are responsible for the detection, processing, and transmission of components, capitalize on the concept of sensing element networks by supporting the collaborative effort of a large number of nodes. A detector array is made up of a large number of detector nodes that are densely implanted either at regular intervals or in close proximity to the development. There should be no alterations or planning done to the location of the detector nodes anywhere. The random preparation of inaccessible parcels or disaster aid activities is made possible as a result of this.

Comparison of Various Techniques

Table 2 provides an overview of the many qualities that differentiate 3G, 4G, 5G, and 6G technologies from one another. The lowest data rate of 3G is between 400 kbps and 30 Mbps, whereas the highest data rate of 6G is 70 Gigabits per second. This demonstrates the difference between the two technologies.

Table 1 Comparisons of different generation communication 1G to 5G

Technology feature	1G	3G	4G	5G
Start/Deployment	1970–80	2004–2010	Now	Soon (Probably 2020)
Data Bandwidth	2 kbps	2 Mbps	1 Gbps	Higher than 1 Gbps
Multiplexing	FDMA	CDMA	CDMA	CDMA
Switching	Switching	Packet	All packet	All packet
Core N/W	PSTN	Packet N/W	Internet	Internet

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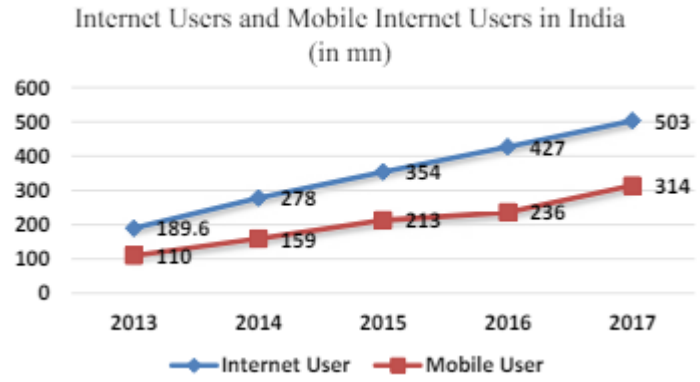

Fig. 1 Internet growth rate in India

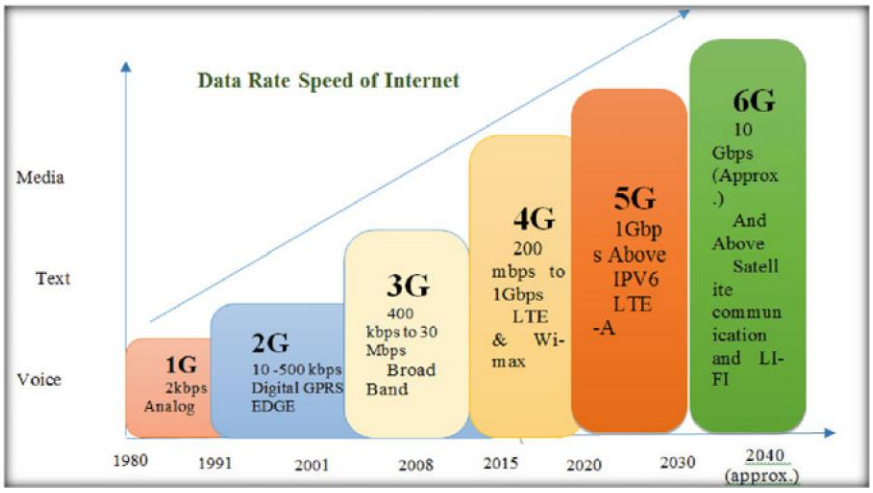

Fig. 2 Wireless mobile networks generation

Table 2 Compression between various technologies

Generation	3G	4G	5G	6G
Started at	2001	2008	Will start 2020	Will Start 2022
Technology	Broad Band IP Tech	LTE, Wi-max	IPv4	IPv6 satellite-based internet
Data rates	400 kbps to 30 Mbps	200 mbps to 1 Gbps	Higher than 1Gbps	70Gbps
Main network	Packet GSM, TDMA	Internet	Internet	Satellite-based connectivity
Sub generation	3.5G, 3.75G	4G only	5G till now	Currently not available

Over the course of the last ten years, several researchers have been working on these three generations, which include 3G, 4G, and 5G.The fourth generation (4G) mobile communication system is described by certain research Ersan telecom operators as a new world that is superior to the third generation (3G) system. It is capable of providing a wide variety of applications that are unthinkable and high-performance multimedia materials. Additionally, there are certain services that are more affordable than 3G services, such as 4G wireless instant connections.

Within the context of this comparative study analysis, the various generations of communication networks are discussed. The focus of this study analysis is mostly on three distinct generations: 3G-4G, 5G, and the future of 6G-7G. Throughout the last ten years, a variety of researchers have been working on this three generation. The comparative examination of many generations is presented in this article. The fact that both 6G and 7G are considered to be the future of communication technology is the reason why this article covers the various perspectives of researchers and compares them. Beginning with the system and design layers and working all the way down to the physical layer, 5G may need some rethinking. With the deployment of three communication satellites, India was able to achieve accomplishments in the field of satellite-based internet services. In India, the deployment of 5G connectivity has been completed successfully, resulting in a speed of 10 Mbps per second.

CONCLUSION

The influence of advancements in wireless technology that are working in a variety of domains was the primary emphasis of this study throughout its whole. The use of wireless communication technologies, including as cellular radio, mobile phones, Internet of Things devices, wireless modems, Wi-Fi, local area networks (LANs), and multipoint distribution systems (LMDS), for the purpose of wirelessly delivering television internet service is seeing a fast expansion. Wireless Communication Technology is able to provide customers with the fundamental and fundamentally important electronic information they want. In the last several decades, the field of telecommunications has seen significant development. Its expansion is anticipated to exceed one trillion gadgets that are connected to the internet.

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