A NEW WORLD: METAVERSE

Abstract

As the digital world is developing rapidly, all the areas and companies started enter into the virtual world thus narrowing the frontier between the physical world and virtual world using Metaverse. Many virtual environments have been already developed where people can play games, can do shopping and can also buy/sell properties. This all can happen because of AI and Cryptocurrency in metaverse. This chapter first introduces about the metaverse, the evolution of metaverse and seven layers of metaverse. After this Virtual reality, Augmented Resality and Mixed Reality has focused. This chapter explains the technologies we use in metaverse and how this metaverse will change the technique how we work. Finally this chapter concludes with the future scope and technologies in metaverse. The Metaverse involves many technologies like video conference, games such as Minecraft or Roblox, cryptocurrency, email, VR experience, interaction in social media and live stream ability. In this digital era, these various components originate a run-time and interconnected digital ownership by combining those components.[1] From way back, the metaverse was not popular. But with the digital development of Internet, the distance between physical and virtual world are being narrowing.

Keywords: Metaverse, AR, VR, virtual world, mixed reality

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I. INTRODUCTION

Can you be at two places at the same time? Now you can just because of metaverse. The metaverse became a trendy and prominent after the name of Facebook has changed to Meta by its CEO “Mark Zuckerberg”. Many big organizations have begin to think and evolve in the world of metaverse just like Microsoft who has developed a gaming environment “Activision Blizzard” to encourage gaming into the metaverse. In general, Metaverse is a world which is virtual and defines a world which is not an easy task to understand. In this virtual world you all can roam around, can play games, can do shopping etc. means you can do everything you do in real world. In the year 1992, Neal Stephenson has introduced the word Metaverse in his Novel “Snow Crash” which means a virtual world which let you to connect with each other by using a digital devices. These digital devices can be Virtual reality, Augmented Reality and electronic devices like phones, laptops, etc. These digital devices or gadgets helps us to connect with each other and narrow the distance it has between the virtual and the physical world. For stability point of view we use technology in metaverse i.e. Blockchain. The Blockchain is a technology which helps to reduce the risks, provides security, prevents fraud in the world of metaverse.

Here’s what the CEO “Mark Zuckerberg” has said about it that Facebook name has been changed so that he can take everyone into the world of Metaverse because this world is more ahead of Facebook world. He has made a big plan that in metaverse he will not only make people travel into the virtual world but also spread his business by involving cryptocurrencies and NFTs. He will also take utmost care of privacy. In metaverse, people will get advantage on one end and people will also make money on other end.

Presently, a metaverse real estate company whose name is Metaverse Group purchased a piece of land in virtual world i.e. Metaverse for $2.43 million which is among the biggest amount in virtual real estate world. [2] Another piece of land has been purchased by a famous rapper “Snoop Dogg” in the metaverse named Sandbox metaverse for $450,000.[2] The rapper wants to give his audience an immersive experience of the virtual world using digital gadgets by organizing the events like music festivals and concerts virtually.

Metaverse has become so famous that it now delights online game makers, social networds and various technology companies. Metaverse is gaining popularity gradually, various technologies has helped in the development in the metaverse and to make it more like our real world. The focus of this paper is on the concept of metaverse, its evolution, its seven layers, AI, VR, AR and the areas where it will be used.

II. EVOLUTION OF METAVERSE

In 1983, the Internet born. In 1993, the first web-browser, Mesh, was arrived and the term 'Metaverse' was came a year earlier in 1992, from Neal Stephenson's novel “Snow Crash”. In the same year, 1993, Cynthia Dwork and Moni Naor has represented Proof-of-Work, a concept which requires energy spent for authentication of cryptocurrencies. In 1998, the advent of B-money brought forth a revolutionary system in which all transactions were publicly broadcasted, albeit with anonymity preserved. Afterwords an expert of product lifcycle management “Dr. Grieves” has presented the digital twins concept in 2002. This

innovative idea allowed for designing, testing, manufacturing, and supporting products in a virtual realm, marking a significant leap in technology's capabilities.

Table- 1 Evolution of Metaverse

Year	Highlights
1983	Birth of Internet
1993	MESH
1992	Metaverse name coined in snow crash
1993	"Proof of Work" Invented
1998	B – Money
2002	Birth of Digital Twins
2003	Second Life
2006	Roblox
2009	Bitcoin
2009	Blockchain
2011	"Ready Player One"
2012	NFT
2014	Oculus headset
2015	Ethereum
2015	Decentraland
2016	Pokemon GO
2016	The DAO
2017	Fortnite
2018	Axie
2021	Microsoft Mesh
2022	Birth of the Metaverse

In 2003, the virtual realm of Second Life was unveiled, offering an immersive 3D environment that facilitated extensive social networking and information interaction. Secnd life gives us a beforehand instance of a world of metaverse type.

Afterwards, a platform for game which can be defined as "proto-Metaverse with a path to the Metaverse" in 2006 by Roblox. It has set down the platform for the elements of metaverse like avatars in gaming environment, digital economy to sell and purchase something and delightful experiences.

In the same year, 2009, two groundbreaking events occurred. Firstly, the first cryptocurrency has been emerged by using Bitcoin which changes our view for the financial transactions and money. Secondly, Blockchain's first code has been invented by Nakamoto, who has defined a decentralized system for cash which was came in operation without the need for a central authority for maintaining ledger, and to open doors for more peer-to-peer possibilities.

"Ready Player One" novel written by Ernest Cline hit the shelves in 2011, proving to be a profound inspiration for the development of "real" virtual reality (VR). Cline's work left a lasting impact on the minds of creators at Oculus VR and other companies, motivating them

to delve into the world of virtual reality. The year 2012 saw the emergence of Non-Fungible Tokens (NFTs) from the concept of a "colored coin" initially issued on the Bitcoin blockchain. NFTs would go on to revolutionize the way digital assets are owned and traded.

A VR headset Oculus has been acquired by Facebook in 2014 which has been used so far in the gaming environment. Facebook, later renamed Meta, promised that this acquisition would revolutionize digital social interaction and much more. Ethereum, a groundbreaking blockchain platform designed to enable cryptocurrency transactions and the creation of decentralized applications, made its debut in 2015. Around the same time, Decentraland, a metaverse with a native economic network, was released, offering people the ability to participate in a self-contained economy where they could rent land, place billboards, and create social gathering spaces.

The year 2016 brought two transformative developments. First, Pokemon GO captivated millions of people by blending the digital and physical worlds, bringing augmented reality (AR) into the mainstream. Secondly, with a crowdfunding campaign, a peer-to-peer version of Airbnb “DAO” has made $150 million worth of Ethereum. In 2017, the release of Fortnite marked a significant step forward in gaming. The interconnected title of Epic game introduced a method to combine one game with another for immersive gaming experience. 2018 introduced Axie Infinity, a blockchain-based war game developed by Sky Mavis. The game stood out for its complex player-owned economies and reward systems.

Finally, in 2021, Microsoft Mesh became a reality, offering a mixed reality platform that enabled teams from different locations to meet and collaborate through shared augmented reality (AR) experiences, setting a new precedent for collaboration in the digital age. And in 2022 and nowadays, Metaverse became more popular and advanced to come into existence.

III. SEVEN LAYERS OF THE METAVERSE

1. **Experience:** Metaverse is taking inputs and after generating result it will storing the output so that new experience can be generated. Through metaverse immersive encounters for generating immense excitement for substantial investment is generated.Like generating data knowledge through different games ,shopping experiences for people.

2. **Discovery:** In Metaverse the discovery stage gives you the result for different experiences, their ups and downs, regular flow of data. The discovery phase is more suitable in business. It will do the work like enhancing advertisement experiences, real time presence, finding facilities for different task.

3. **Creator Economy:** In this phase, metaverse will generate 3D images with virtual space that will be just like a clone of the original one. It is done through AR, VR and many more technologies.

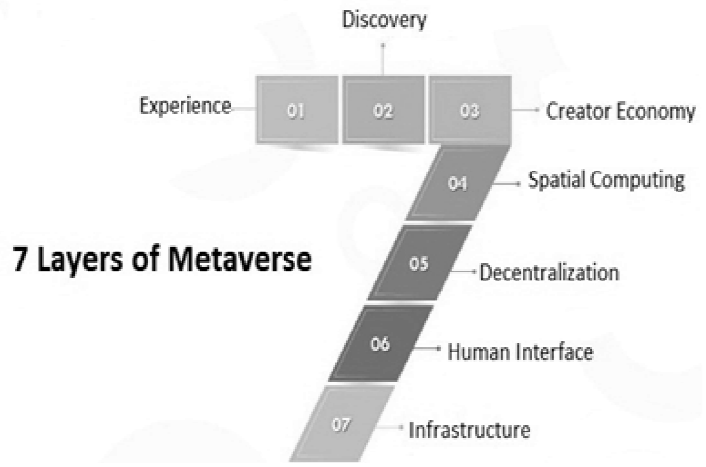

Figure 1: Layers of Metaverse

4. **Spatial Computing:** Spatial Computing is related to minor problems of our daily life. For example, before taking a haircut we can see which type of haircut will going to suit us. It uses the AR, VR & MR technology to bring metaverse in our day to day work like you are sitting in your living room but you will be able to interact with other different characters while playing a game.

5. **Decentralization:** Sometimes it is difficult to check user's authentication when the data is centralized as controlling authority need to check user activity for security purpose. In metaverse, it uses blockchain technology for privacy and security. Blockchain is used here to provide user experience that will fulfill censorship and check interoperability.

6. **Human Interface:** This phase talks about different hardware devices so that user can get best experience about what actually a metaverse is. We are gradually connecting with different devices through different technologies. This increases connectivity between human and devices which will give immersive living experience in the metaverse.

7. **Infrastructure:** This phase uses different technology structure so that we can create a metaverse which will be fully functional. The metaverse is powered by 5 key technologies-

    - Computing power & Network [3]
    - Artificial Intelligence [3]
    - Video gaming technology [3]
    - Display technology [3]
    - Blockchain technology [3]

IV. NFTs (NON-FUNGIBILE TOKEN)

NFT i.e. Non-Fungibile Token is very important in Metaverse. With Regards to blockchain and virtual environments Metaverse and NFT (Non-Fungibile Token) are very important and useful technique. The Ownership of a particular product or portion of the

content I represented in blockchain technology and so these are digital assets of NFTs. Every NFT is different so you are not allowed to change it with any other NFT. The work like Virtual Real Estate, digital art , Collectibles, Audio and many different assets are gained attention from NFTs, so that user are allow to use their work and authenticity for their work. By Combining Metaverse with NFTs user can get more scope for their work for like different Creators and Investors. NFTs are doing major Role in the fields of Metaverse for Virtual asset and many more different products in Virtual Universe. For example:

1. Virtual Real Estate
2. Digital Art and Collectibles
3. Virtual Identities
4. Virtual Goods and Items
5. Virtual Events and Experiences

V. CRYPTOCURRENCIES

Let's just get knowledge about cryptocurrency, so it is basically important fundamental Role in Metaverse, As it is doing work in the area of digital Economy. With Respect to Virtual Area of Metaverse, Cryptocurrencies or tokens are in each platform, the primary purpose is exchanging of currency.Users can use these virtual currencies to buy virtual goods, assets, properties, and services.In addition to it there is DeFi (Decentralized Finance) Protocol used to combine with Metaverse to provide the financial services like Giving, Borrowing, Observing and yield farming.Cryptocurrencies also facilitate cross-Metaverse transactions, allowing users to transfer assets and virtual currencies seamlessly between different virtual worlds. Metaverse' cryptocurrency is also contributed by NFTs (Non-Fungible Tokens), so that all the virtual assets which are sold, traded or bought can get Ownership in Cryptocurrency. So Users like Investor or Creators can monetize their talent and creation in Metaverse's virtual Economy System, User can make profit by selling their virtual art and different content. In some projects, decentralized governance models enable stakeholders to vote on important decisions using cryptocurrency as voting power. Furthermore, Cryptocurrencies foster interoperability between the Metaverse and the real world, enabling users to exchange their virtual currencies for fiat money or other Cryptocurrencies, thus realizing value from their virtual activities. The integration of Cryptocurrencies enriches the user experience, encourages entrepreneurship, and fuels innovation within this ever-evolving digital universe.

VI. BLOCKCHAIN

Blockchain is basically digital ledger like in Accountancy which keeps every record of transaction like we are keeping in our day to day life, so that it can check monitoring on different Assets and these all are directly connected to Businesses via Cryptography Methods.

By leveraging these cryptographic techniques, blockchain offers real-time, collaborative, and transparent data accessible exclusively to authorized network participants. The information stored in the blockchain is immutable, meaning it cannot be altered or tampered with, ensuring its integrity and security. This decentralized and tamper-resistant nature of blockchain technology instills trust and facilitates efficient and reliable information exchange among the network's members. [4].

Within the metaverse, vast amounts of data, such as videos and various digital content are collected through VR devices, transmitted across networks, and stored in data centres without adequate security and privacy protection measures. This makes them susceptible to potential cyberattacks, posing a significant risk to sensitive information. With respect to Security in Metaverse the best solution is blockchain technology. Blockchain is giving us the best result for security and privacy concern.

Blockchain's unique features, such as decentralization, immutability, and cryptographic security, offer a robust framework for safeguarding data and ensuring the confidentiality and integrity of information in the virtual realm.

So finally using leveraging Blockchain, the Metaverse can get security and trusted area, to stopping cyber attacks so that full safety of user's data or Authentication can be get in this immersive digital environment.[5]

VII. EXTENDED, VIRTUAL, AUGMENTED AND MIXED REALITY

Extended Reality or Cross Reality (XR) is a broad category that encompasses various immersive technologies. These technologies create electronic and digital environments where data is represented and projected to users. XR involves Augmented Reality (AR), Virtual Reality (VR), and Mixed Reality (MR), which let you experience virtual world with the real world in several other ways.[6] Virtual Reality (VR) is a different and overall environment which is artificial digitally created. While using VR, people feel an immersive experience, which let you feel as if people are in real world rather than in the virtual world. They can interact and navigate within this virtual space much like they would in the real physical world [7].

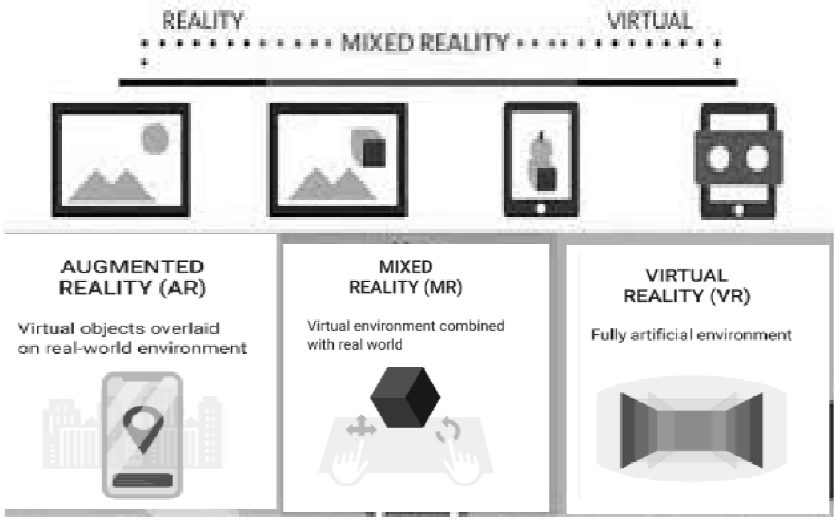

Figure 2: AR vs. VR vs. MR

Using specialized multisensory equipment like immersion helmets, VR headsets, and omnidirectional treadmills, the VR experience is taken to the next level. These devices enhance various senses such as vision, sound, touch, and movement, allowing users to feel

fully immersed in the virtual environment. As a result, users can interact naturally with the object which are virtual in nature than can make our experience more real and engaging [8,9]. Augmented Reality (AR) takes a unique approach to physical spaces. AR combines the digital elements and virtual inputs together to make virtual world more like a real world. This enhances the physical space by overlaying digital information, graphics, or objects onto what we see in the real world, enriching our perception and interaction with our surroundings [10]. AR seamlessly combines the physical world with the virtual realm, blending them together in a spatially merged experience. It overlays digital content onto the real environment, creating a harmonious fusion where the boundaries between what is real and what is virtual become fluid and interconnected. [11].

As a result, what users perceive is a layer of digital elements projected spatially onto their surroundings, facilitated by various devices such as smartphones, tablets, glasses, contact lenses, or other transparent surfaces. This seamless integration of the virtual with the physical environment enhances the user experience, enabling them to interact with and access valuable digital information while remaining connected to the real world [12]. Additionally, AR can be integrated into VR headsets with pass-through mode capability, which allows the headsets to display real-world input captured by their built-in camera sensors. This feature enables users to see and interact with the physical environment around them while still being immersed in the virtual world, creating a more versatile and dynamic mixed reality experience.

Mixed Reality (MR) is a multifaceted and evolving concept that has undergone changes in its definition over time. These changes have been influenced by the prevailing technological advancements and the prevailing interpretations and stories that shape our understanding of this technology. As MR continues to develop and be shaped by various influences, its definition and significance are subject to ongoing refinement and adaptation [13].

Just like Virtual Reality (VR), Mixed Reality (MR) necessitates the use of specialized glasses or headsets. However, for the context of this article, we adopt a broad understanding of MR, encompassing any combination of Augmented Reality (AR) and Virtual Reality (VR), along

VIII. CONCLUSION AND FUTURE ENHANCEMENT

The concept of the Metaverse is relatively new, and for many individuals, it remains a somewhat unfamiliar and technical notion. As a result, grasping the true essence of the Metaverse can be challenging, leading to differing interpretations and sparking numerous debates among people trying to comprehend its full scope and implications.

In this chapter, we discuss deep into the Metaverse, offering a comprehensive exploration that encompasses its concept, historical background, development process, and future prospects. While the Metaverse may not fully match the imaginative worlds depicted in science fiction, it holds immense potential as a groundbreaking computing platform and a versatile medium for content creation. As communication, cloud computing, artificial intelligence, blockchain, and other technologies continue to advance, the lines between the physical and virtual realms will gradually blur. This convergence will lead to the integration

of various aspects of daily life, including entertainment, education, work, and trade, into the fabric of the Metaverse system. Eventually, this integration will culminate in the creation of a vast and multifaceted digital world, promising boundless opportunities and generating trillions of dollars in value.

The future of the Metaverse holds immense promise with advancements in VR and AR, improved interoperability, blockchain integration, AI-driven interactions, enriched social experiences, and a thriving digital economy. It will impact education, healthcare, content creation, and user-generated content while prioritizing data security and privacy. The Metaverse is set to become an integral part of our lives, reshaping how we interact and work in a vast digital universe.

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