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AI/Virtual Reality Technology For Indoor Navigation and Accurate Levels

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Abstract: *The application of artificial intelligence and virtual reality technologies for precise occupancy level monitoring and interior navigation is covered in this paper. The use of these technologies enhance interior navigation and offer more precise data on occupancy levels, improving indoor space management. It is also investigated how these technologies could change a variety of sectors, including retail, healthcare, and education. Based on the research presented in this paper, indoor navigation and occupancy monitoring might be revolutionized by the application of artificial intelligence (AI) and virtual reality technologies, boosting both space utilisation and user experience.*

To reliably discover occupancy levels, AI may be used to construct algorithms that analyse data from sensors like as cameras, Wi-Fi access points, and beacons. This data may be utilised to optimize building space use, increase safety, and improve user experience. AI algorithms may also be utilised for interior navigation, allowing users to navigate buildings and discover specific rooms or things

Keywords: Occupancy level monitoring, space management, user experience

I. INTRODUCTION

With the use of artificial intelligence (AI) and virtual reality (VR) technologies, several industries, including healthcare, education, travel, and other sectors, are being swiftly transformed. Virtual reality (VR) and artificial intelligence (AI) will provide great immersive, interactive experiences that will benefit to the users in a variety of ways, including better customer experience and elevated productivity. Experiences that are far more impactful and innovative are provided by the VR and AI. Artificial intelligence (AI)-enabled virtual reality (VR) offers recommendations based on the user's preferences. VR and AI in healthcare can be used for therapy and rehabilitation to improve patient health because of its immersive experiences. In general, the use of AI and VR technologies has the potential to transform society. As a result, the body of literature related to cancer prediction/prognosis and machine learning is relatively limited.

II. PROBLEM STATEMENT

The problem statement of "AI/Virtual Reality technology for interior navigation and precise occupancy levels" pertains to the problems faced in traversing indoor locations and effectively tracking occupancy levels. Indoor navigation may be challenging, especially in complicated or unfamiliar structures, which can make users frustrated and ineffective.

These issues can be solved by precise 3D maps of interior places that allow people to easily travel around them being provided by AI and VR technologies. Moreover, real-time occupancy tracking is possible with AI-powered sensors and cameras, giving precise data for crowd management, safety monitoring, and capacity planning. VR technology may also be used to imitate indoor places, giving consumers the opportunity to get a feel for the layout and style before even setting foot inside.

III. LITERATURE SURVEY

“A Comparative Study of Indoor Navigation Techniques using Augmented Reality" by A. Di Pietro, F. Gambi and F. Lamonaca (2017) :

This research compares three augmented reality interior navigation techniques: map-based, vision-based, and landmark-based. During a user research, the authors assessed the accuracy, usability, and user satisfaction of each

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approach. They discovered that vision-based navigation was the most accurate, but landmark-based navigation was the most user-friendly.

"Indoor Positioning and Navigation Using Bluetooth Low Energy Beacons" by A. Lloret and M. Garcia (2019) :

This study offers an indoor locating and navigation system based on Bluetooth Low Energy (BLE) beacons. The scientists conducted trials to evaluate the accuracy of the system, and discovered that it was able to achieve an average inaccuracy of less than two metres. They also examine the system's possible uses, such as directing visitors in museums or assisting customers in vast malls.

"Occupancy Detection and Estimation for Smart Building Applications: A Review" by A. Taneja and N. Kumar (2020):

The purpose of this study is to offer an overview of few occupancy detection and estimate approaches for smart building applications. The authors address the benefits and drawbacks of several types of sensors, including infrared, ultrasonic, and image-based sensors. They also discuss machine learning strategies for calculating occupancy levels based on sensor data.

"Virtual Reality-Based Indoor Navigation for Blind People" by M. P. Oakes and J. K. Meehan (2018) :

This paper describes an interior navigation system for the blind person using virtual reality. The system's design which uses a sensory interface to give the user input is discussed by the writers. In order to evaluate the system's performance, they also conducted user research, which is revealed that it was capable of providing precise directions for users to their destination.

IV. PROPOSED SYSTEM

Holographic technology is capable of being utilized to make 3D maps of interior environments that people can interact with in real-time for indoor navigation. Walkthroughs of the holographic map allow users to better understand the layout and travel instructions.

Holographic interior navigation might be implemented by placing holograms at each corner. This method allows for the creation and placement of 3D holographic replicas of the indoor environment, such as a building or a shopping center, at each corner of the existing environment. Following that, users may put on augmented reality (AR) headsets or smart glasses to view the holographic representations superimposed on the actual world. Using holograms at each corner has the benefit of giving users a constant reference point that they may use to find their way around the actual room.

Once users have navigated around the indoor environment utilizing holographic representations, they may put on VR goggles to get to their destination. Users can wear VR headsets to physically go to their preferred place once they have become comfortable with the indoor environment through the holographic representations.

V. SYSTEM ARCHITECTURE

The technique of deploying AI/Virtual Reality technology for interior navigation and precise occupancy levels is shown in the block diagram below:

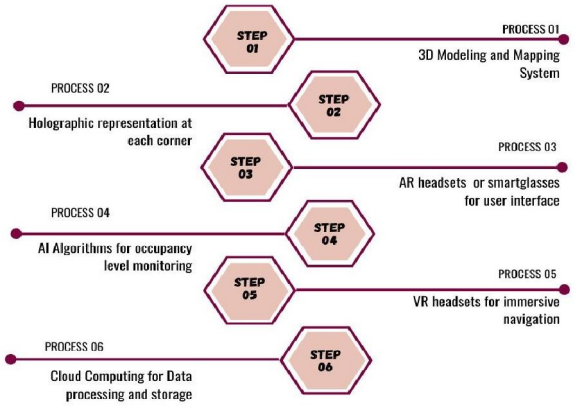

Fig 1. Block diagram of AI/ Virtual Reality technology for interior navigation and precise technology

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- Indoor environment 3D modeling and mapping: Using 3D modelling and mapping tools, an exact depiction of the inside environment must be created.Data from the physical environment is often collected throughout the 3D modelling and mapping process using sensors like cameras, LIDAR (laser imaging, detection, and ranging), or other specialized sensors. A 3D model of the environment is then produced to utilizing the data after it has been processed using specialist software.
- Holographic representations at each corner: Users can have a fixed reference point for navigating the interior environment by positioning holographic representations at each corner. The holograms can provide crucial details like maps, sites of interest, or even the current occupancies in a certain location. The final 3D map will be then used to produce digital representations of the surroundings that can be shown as holographic images in a virtual reality (VR) system.

Depending on the requirement of the system, the holographic representations may take the shape of virtual signs, arrows, or other visual signals. In order to give users a clear and understandable directions, these representation are positioned strategically at important spots around the interior environment such as corners or junctions.

The usage of holographic representations can significantly improve the user experience of the indoor navigation system by offering a more user-specific and intuitive way finding experience. By lowering the possibility of mistakes or misunderstanding during navigation it can also increase the accuracy and efficiency of the system.

- AR headsets or smart glasses for user interface: Users can view these holographic representations superimposed on the real world when they are using AR headsets or smart glasses. They can traverse the indoor world in an intuitive and immersive manner due to seamless integration of the virtual and actual environments. Also, the headsets can offer extra details like directions or points of interest.
- AI algorithms for accurate occupancy level monitoring: Using AI algorithms to monitor and track the occupancy levels of various places inside the interior environment is the third phase in the AI/Virtual Reality technology for indoor navigation and precise occupancy levels with hologram solution.

The accuracy of the AI algorithms can be increased by training them using historical data and then tuning them. For instance, machine learning algorithms taught using information on past occupancy levels to accurately anticipate future occupancy levels. It is feasible to give consumers up-to-date information on the current occupancy level of various places within the interior environment by properly tracking occupancy levels in real-time.

- VR headsets for immersive indoor navigation experience: Arrows are another technique that can be employed to map the area and lead people in addition to the holographic representations at each corner. The VR headset makes it simple to view these arrows which may be positioned on the ground or on walls.

Users may travel across the environment more quickly and effectively by following the arrows clear directional cues. To convey extra information, such as the position of a certain destination or the amount of occupancy in a particular region, the arrows can be color-coded or labelled.

Users may experience extremely precise and simple navigation by integrating holographic representations, occupancy level monitoring, and directional arrows.

- Cloud computing for data processing and storage: The data gathered by the sensors and cameras, as well as the 3D maps and holograms, may all be stored and processed using cloud computing in the context of this system. It would be necessary to create a suitable cloud infrastructure, which would include servers, databases, and other software elements.

Depending on the needs of the system, data processing in the cloud might be done in real-time or in batches. When individuals walk about an interior area, real-time data processing may be utilized, for instance, to update occupancy levels and modify navigation routes. Batch processing may be utilized for more difficult tasks like assessing data patterns or pinpointing places where AI systems need to be improved.

In order for the system to properly connect with other systems and give correct data, it would also need to be linked with existing infrastructure such as building management systems or security systems.

The system need to be monitored and maintained once it was deployed and integrated to make sure it remained functional. Regular data analysis, software updates and device upkeep would be required for this.

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VI. ADVANTAGES

- Enhanced User Experiences: AI, virtual reality, and holograms work together to provide an immersive, interactive experience for users that makes interior navigation more fun and effective.
- Improved Spatial Understanding: Users are given a 3D picture of interior areas through the use of virtual reality and holograms, which helps them better comprehend and navigate the environment.
- Accurate Occupancy Levels: The AI algorithms used in the technology can correctly measure interior space occupancy levels in real-time, assisting in the upkeep of social distance norms and ensuring user safety.
- Efficient Wayfinding: Real-time guidance may be given to users by the technology, which will enable them to move within enclosed environments more quickly and effectively.
- Increased Safety: If interior places are too crowded, the technology can show warnings, ensuring that users follow social distance standards and lowering the danger of infection.

VII. CONCLUSION

Holographic technology, which allows for extremely immersive and interactive experiences is a promising field of research for indoor navigation and occupancy level monitoring.

Holographic technology has the potential to be utilized to build virtual maps or 3D representations of interior locations that can be superimposed over the actual world to offer users with an easy and engaging method to navigate. Holograms might potentially be utilized to display realtime occupancy numbers in different regions of a building giving significant data for building management and maximizing space efficiency.

Further study is needed to examine the possibilities of holographic technology for indoor navigation and occupancy level monitoring, as well as to create realistic and scalable systems that can be applied in real world situations.

REFERENCES

[1]. Ahmed Alkhayat, et al. "Indoor Navigation for Visually Impaired People Using Augmented Reality and Machine Learning." IEEE Access, vol. 8, pp. 13964-13975, 2020.

[2]. Shoaib Ehsan, et al. "Indoor Navigation Using Augmented Reality: A Survey." IEEE Access, vol. 8, pp. 35817-35832, 2020.

[3]. Mehdi Rezapour, et al. "Real-Time Indoor Occupancy Estimation Using Wireless Sensor Networks and Machine Learning Techniques." IEEE Access, vol. 7, pp. 150161-150175, 2019.

[4]. "Occupancy Detection and Estimation for Smart Building Applications: A Review" by A. Taneja and N. Kumar (2020)

[5]. "Indoor Navigation System for Visually Impaired using Augmented Reality" by S. A. Yengera and M. A. Siddiqui (2019)

[6]. "How Airports are Using Virtual Reality to Improve Passenger Experience" by Forbes (2018)

[7]. "Virtual Reality and Its Applications in Tourism and Hospitality: A Review" by S. Das and P. Vyas (2021)

[8]. M. Baranski and P. Strumillo, "Smart system for indoor navigation using artificial intelligence methods," 2017 IEEE 14th International Conference on Networking, Sensing and Control (ICNSC), Calabria, Italy, 2017, pp. 494-499.

[9]. S. Zareapoor and A. Zareapoor, "Indoor Occupancy Detection System Using Machine Learning Techniques," 2018 4th International Conference on Computer and Knowledge Engineering (ICCKE), Ferdowsi University of Mashhad, Iran, 2018, pp. 1-6.

[10]. J. Chen, L. Fang, C. Li and Y. Zhang, "Research on occupancy detection technology based on machine learning algorithm," 2018 13th IEEE Conference on Industrial Electronics and Applications (ICIEA), Wuhan, China, 2018, pp. 1755-1759.

[11]. "Indoor Positioning and Navigation Using Bluetooth Low Energy Beacons" by A. Lloret and M. Garcia (2019)