Augmented Reality (AR) and Virtual Reality (VR)

Falahuddeen P T
RollNo: 16

Department of Computer Applications
MES College of Engineering
Kuttippuram

March 4, 2024

Table of Contents

1. Introduction
2. What is LAM?
3. How it is used?
4. AR - How does it work?
5. Applications
6. AR - Implementation Framework
7. AR - Advantages of AR
8. AR - Disadvantages of AR
9. AR - Issues in Augmented Reality
10. VR - What is VR?
11. VR - How it is used?
12. VR - How does it work?
13. VR - Technology
14. VR - Challenges and Limitations
15. VR - Future Directions and Opportunities
16. Augmented Reality vs. Virtual Reality
17. Experiencing Augmented Reality

Introduction

- The field of artificial intelligence (AI) is constantly evolving, and one of the latest groundbreaking forces to emerge is the Large Action Model (LAM). Developed by the visionary minds at the Rabbit Research Team, LAM stands as a beacon, seamlessly blending neuro-symbolic programming with cutting-edge technologies. Let's delve into what LAMs are and how they redefine AI.

What is LAM?

Large Action Models (LAMs) represent a cutting-edge paradigm in artificial intelligence. These models directly understand and replicate human actions within computer applications. Unlike traditional language models, LAMs focus on the structure of interfaces, enabling accurate automation, efficient web navigation, and seamless interaction with software. By combining neuro-symbolic programming and learning-by-demonstration, LAMs redefine how computers interpret and execute user intentions, ushering in a new era of human-computer interactions.

How it is used?

Large Action Models (LAMs) are advanced AI systems designed to understand and carry out complex tasks based on user requests. They directly model the structure of applications and the actions performed on them, enhancing accuracy and interpretability. LAMs find applications in automating repetitive tasks in user interfaces, powering virtual assistants, chatbots, and streamlining business processes. Their unique blend of neuro-symbolic programming and learning-by-demonstration sets them apart, revolutionizing human-computer interactions by executing user intentions with precision and responsibility .

How does it work?

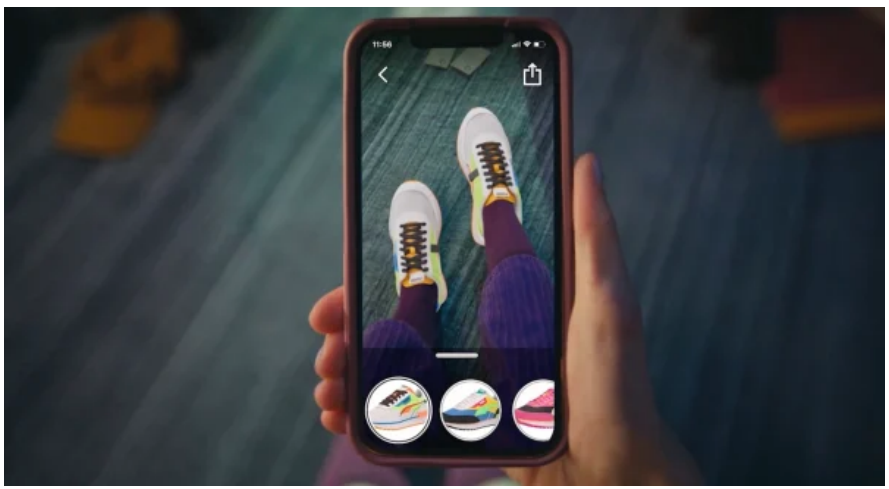
Large Action Models (LAMs) represent a cutting-edge paradigm in artificial intelligence. These models directly understand and replicate human actions within computer applications. Unlike just providing information or instructions, LAMs actively perform tasks like navigating websites, filling out forms, or even handling online shopping. Imagine having an AI system that not only comprehends your requests but also executes them seamlessly!

The birth of LAMs signifies a pivotal moment in the development of human-computer interactions. Coined by the visionary minds at the Rabbit Research Team, LAMs emerge as beacons, seamlessly blending neuro-symbolic programming with cutting-edge technologies to forge a new era of understanding and executing human actions on computer applications.

Applications

Main classes of applications:

1. Automated User Interfaces
2. Virtual Assistants and Chatbots
3. Process Automation
4. Web Navigation and Interaction
5. Accessibility Features



Implementation Framework

- Hardware

  Sensors/tracking: Digital cameras and other optical sensors, accelerometers, GPS, gyroscopes, solid-state compasses, RFID, and wireless sensors. **Input devices from users:** Microphones, touch screens, gesture devices, stylus, pointers, and gloves or other body wear.

- Software

  ARKit - Best for detailed and realistic AR experiences on Apple devices. **ARCore** - Best for AR development across Android ecosystem. **Unity** - Best for powerful game development and interactive real-time 3D content.

Advantages of AR

- Can increase knowledge and information
- Enhanced Tourism Experience
- Games that provide an even more "real" experience
- Enhanced Marketing and Advertising
- Medical Visualization

Disadvantages of AR

- Hardware Limitations
- Software Challenges
- Physical Health
- Social Isolation
- Environmental Concerns

Issues in Augmented Reality

- Performance Issues

  Real time processing of images can be a challenge and often can slow down augmented reality systems.

- Interaction Issues

  Users within a mixed environment because of augmented reality have difficulties interacting with the environment as normal.

- Alignment Issues

  People working in an augmented reality are more sensitive to alignment errors. Proper calibration and alignment with the reference frame of the world is crucial.

What is VR?

Virtual reality is a simulated 3D environment that enables users to explore and interact with a virtual surrounding in a way that approximates reality, as it is perceived through the users' senses. The environment is created with computer hardware and software, although users might also need to wear devices such as helmets or goggles to interact with the environment.

How it is used?

VR technology has improved to become an basic part of various industries and everyday experiences. Nowadays, VR is utilized across various fields such as **gaming, education, healthcare, architecture,** and **training simulations**. In gaming, VR offers immersive experiences where players can interact with virtual environments and characters, enhancing realism and engagement. In education, VR provides students with interactive lessons, allowing them to explore historical landmarks or practice skills in a safe virtual environment. Healthcare professionals employ VR for medical training, surgical simulations, and therapy sessions, enabling hands-on practice and improving patient outcomes. Architects and designers utilize VR to visualize and refine building designs, providing clients with immersive walkthroughs of their future spaces. As VR technology continues to advance, its applications are expanding, offering innovative solutions across various sectors and transforming the way we work, learn, and entertain ourselves.

How does it work?

Virtual reality (VR) technology works by immersing users in a simulated environment that can be similar to or completely different from the real world. When a user puts on a VR headset, they are effectively transported to a digital environment where they can look around, move, and interact as if they were actually there. The combination of high-quality visuals, accurate tracking, and immersive audio creates a sense of presence that can be incredibly realistic and engaging.

Technology

- Head-Mounted Display (HMD) : in VR HMD is a wearable device that covers the user's eyes and provides a visual interface to virtual environments. It typically consists of small screens for each eye, lenses to focus the images, and sensors for tracking head movements. HMDs immerse users in virtual reality by displaying stereoscopic images that simulate depth and perspective, enhancing the sense of presence and immersion in the virtual world.

Technology

- Input Devices : VR systems often incorporate specialized input devices such as hand controllers or gloves to allow users to interact with virtual objects or navigate within the simulated environment. These devices can provide tactile feedback to enhance immersion.

Technology

- Computer Hardware : VR experiences require powerful computing hardware to render high-quality graphics in real-time. This includes graphics processing units (GPUs), central processing units (CPUs), and sufficient memory to handle the demands of VR applications.

Technology

- Tracking Systems : To accurately track the user's movements within the virtual environment, VR systems utilize various tracking technologies, such as infrared sensors, cameras, or laser tracking systems. These technologies enable precise positional tracking, enhancing the sense of presence in VR.

Technology

- Software Development Kits (SDKs) : Developers use SDKs provided by VR platform manufacturers to create immersive VR experiences. These SDKs include tools, libraries, and APIs that enable developers to integrate VR functionality into their applications and games. Some of them are given below :
  1. Unity3D
  2. Unreal Engine
  3. SteamVR
  4. OpenVR
  5. Google VR SDK

Challenges and Limitations

- **Motion Sickness and Simulator Sickness :** Causes of motion sickness in VR can include latency, low frame rates, and mismatched motion cues.
- **Hardware Limitations :** High-quality VR experiences demand powerful hardware, including high-resolution displays, fast processors, and advanced graphics cards. However, these components can be costly and may not be accessible to all users.
- **Content Creation Challenges :** Creating best VR content requires specialized skills and tools, including 3D modeling, animation, and programming expertise.

Future Directions and Opportunities

- **Advancements in VR Hardware :** Continued advancements in hardware technology are expected to drive the evolution of VR devices, making them lighter, more comfortable, and more affordable.
- **Integration of Artificial Intelligence (AI) :** AI technologies play a significant role in enhancing VR experiences, enabling more realistic simulations, intelligent NPCs (non-player characters), and personalized content.
- **Augmented Reality (AR) and Mixed Reality (MR) :** MR experiences, which combine elements of both VR and AR, will enable users to interact with virtual objects and characters in real-world environments, opening up new possibilities for gaming, education, and enterprise applications.

Augmented Reality vs. Virtual Reality

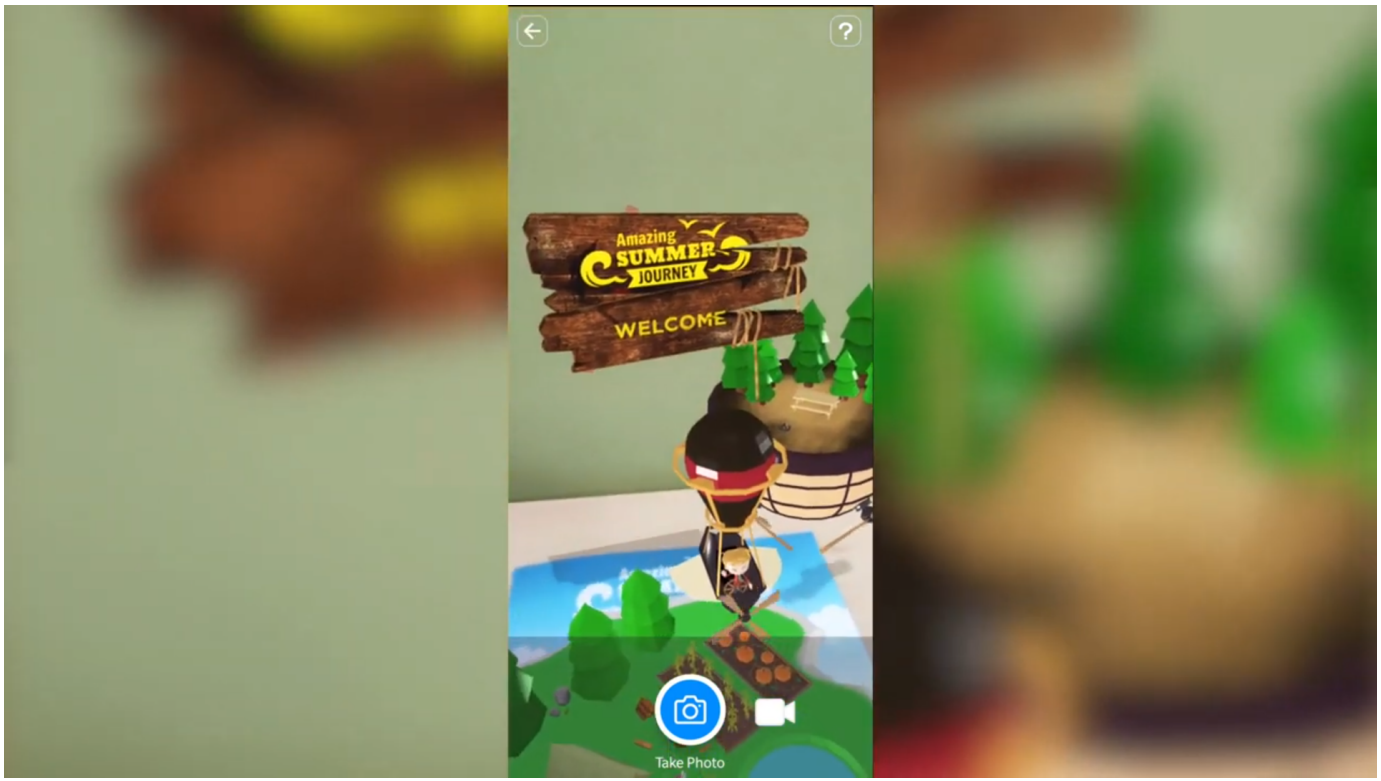
Augmented Reality

- System augments the real world scene
- User maintains a sense of presence in real world
- Needs a mechanism to combine virtual and real worlds
- Hard to register real and virtual

Virtual Reality

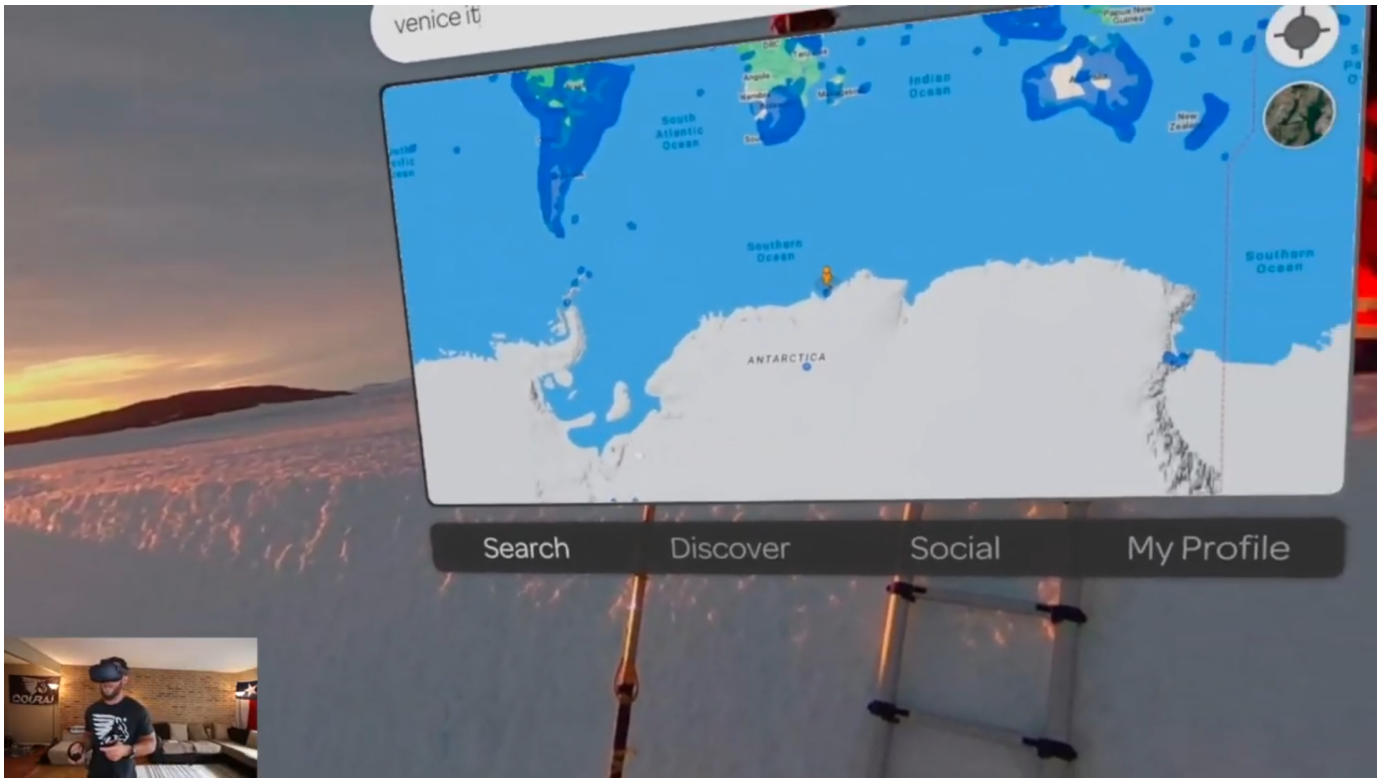
- Totally immersive environment
- Senses are under control of system
- Need a mechanism to feed virtual world to user
- Hard to make VR world interesting

Experience Augmented Reality on Mobile Web browser



Click Here to Watch the Full Video On YouTube

Experience Virtual Reality on Tourism



Click Here to Watch the Full Video On YouTube

END

THANK YOU