

Virtual & Augmented Reality:-

Q11 What are the types of Augmented Reality?

- Ans :-
- 1.) Projection-based Augmented Reality
 - 2.) Recognition-based Augmented Reality
 - 3.) Location based Augmented Reality
 - 4.) Outline Augmented Reality
 - 5.) Superimposition based Augmented Reality

Q12 What is Projection-based Augmented Reality?

Ans :- It is described as a video projection technique which can extend visual data by throwing images on the surface of the 3D objects.

Q13 What is Recognition-based Augmented Reality?

Ans :- It relies on identification of markers/user-defined images to function. AR requires a marker to activate an augmentation.

Q14 What is Location based AR?

Ans :- It doesn't require any markers to work. It primarily relies on GPS and digital compass to identify the phone's location and position with a high level of accuracy.

Q) What is outlined AR?

A) Special cameras are built for human eyes to perform outlining of the specified objects like boundaries and lines to help in certain situations. It uses object recognition for a better understanding of the current environment.

Q) What is Super-imposition based AR?

A) It provides an "alternative" view of the object concern, either by replacing the entire view with an augmented view of the object, or by replacing a portion of the object view with an augmented view.

Q) List some leading AR hardware in the Market.

1) VUZIX

2) META 2

3) ODG

4) MOVERIO BT - 300

5) Microsoft Holo Lens.

Q1 What is Augmented Reality?

Ans: Augmented Reality is a technology that superimposes a computer-generated image on a user's view of the real world, thus providing a composite view.

Q2 Draw the feedback loop between Human user and Computer System of a typical AR System

User

Virtual Content

SPATIAL MODEL

Real-world model

Registration
of virtual content → Situated visualization



Pose tracking ← user input and camera movement

Q3 What was the nickname of the world's first HMD?

Ans: The Sword of Damocles

Q4 When is the Augmented Reality term coined?

Ans: 1992

Q5 Who invented KARMA and when?

Ans: Feiner in 1993.

Q) Explain the brief history of AR.

- Ans History of AR
- 1) Ivan Sutherland built the first HMD in 1968 and named it "The Sword of Damocles".
 - 2) The term "Augmented Reality" was born in 1992.
 - 3) In 1993, Feiner introduced KARMA, a system that incorporated knowledge-based AR.
 - 4) In 1994, at the University of North Carolina, Compelling medical AR application was developed.
 - 5) In 1996, Schmalstieg developed first Collaborative AR system called Studerstube.
 - 6) From 1997 to 2001, the Japanese government and Canon Inc. jointly funded the Mixed Reality Systems Laboratory.
 - 7) In 1997, Feiner developed the first outdoor AR system, the Touring Machine.
 - 8) In 1998, Thomas published their work on the construction of an outdoor AR navigation system.

Q) What is AR toolkit?

Ans:-

AR toolkit is the first open-source Software Platform for AR.

It featured a 3D tracking library using black and white fiducials, which could easily be manufactured on a laser printer.

9.) In 2003, wagner and Schmalstieg presented the first handheld AR System running autonomously on a "personal digital assistant".

10.) In 2008, for the first truly usable natural feature tracking System for Smartphone was introduced.

Q) Where is AR useful in Contemporary world?

Ans:-

- 1.) Industry and Construction
- 2.) Maintenance and training
- 3.) Medical
- 4.) Personal Information Display
- 5.) Navigation
- 6.) Television
- 7.) E-Commerce & Marketing
- 8.) Games

Qn What is Augmented Reality? (in notes)

Ans.

A combination of

1) A real scene viewed by a user

and processed by a computer

2) A virtual scene generated by a computer
that augments the scene with additional
information.

Qn Differentiate Between AR vs VR. (in notes)

Ans.

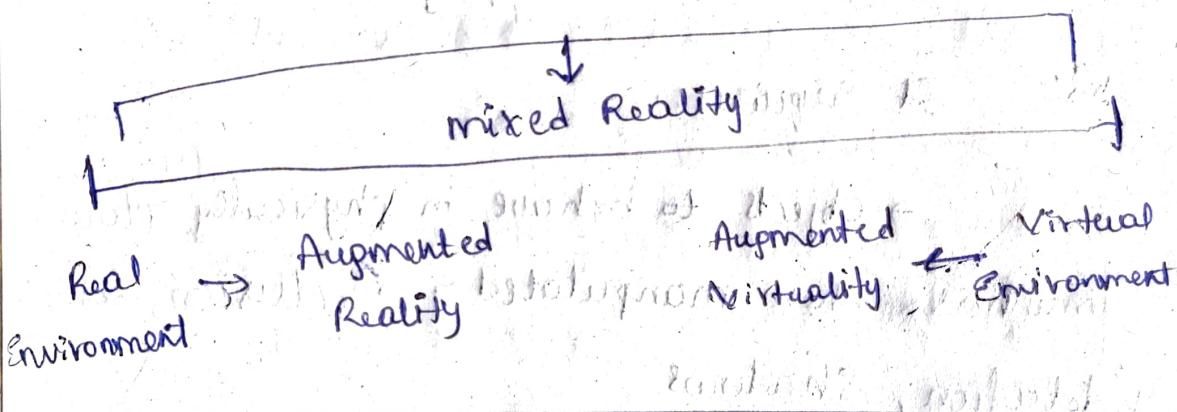
Augmented Reality

Virtual Reality

- | | |
|--|--|
| <ul style="list-style-type: none">• Systems augment the real world scenes.• User maintains a sense of presence in real world.• Needs a mechanism to combine virtual and real world.• Hard to register real and virtual. | <ul style="list-style-type: none">• To fully immersive environment.• Senses are under control of system.• Need a mechanism to feed virtual world to user.• Hard to make VR world interesting. |
|--|--|

Q1 Define Milgram's Reality Virtuality Continuum.

Ans.: Milgram coined the term "Augmented reality" to identify systems which are mostly synthetic with some real world imagery added such as texture mapping video onto virtual objects.



Q1 Describe the process of Combining the Real and Virtual Worlds.

Ans.: In order to combine them, we need

- * Precise models
- * Locations & optical properties of the viewer (or camera) and the display.
- * Calibration of all devices
- * To combine all local coordinate systems centred on the devices and the objects in the scene in a global coordinate system.

* Register models of all 3D objects of

interest with their counterparts in the scene

* Track the objects over time when the user moves and interacts with the scene

Q6 what is Realistic Merging?

Ans: It requires:

→ Objects to behave in physically plausible

manner when manipulated (Occlusion, Collision detection, shadows)

Q6 Mention some research activities.

Ans: Develop methods to register the two distinct sets (real, virtual) of images and keep them registered in real-time.

* Develop new display technologies for merging the two images.

Q7 List the potential performance issues?

Ans: * Update rate for generating the augmented image

* Accuracy of the registration of the real and virtual image.

Q) what can be some failures in Registration

A) Failures in Registration due to:

- Noise

- Position and pose of Camera with respect to the real Scene.

- Image distortions

- Time delays.

All use some display technologies?

A) Monitor based

- Laptops

- Cellphones

- Projectors

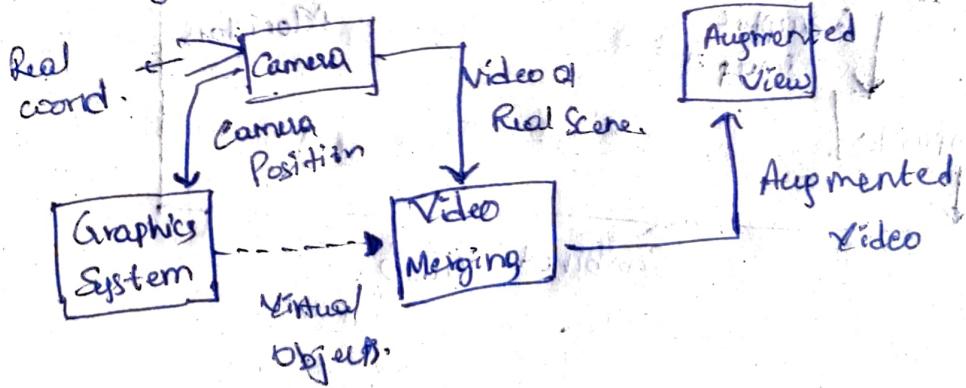
Head Mounted Displays

- Video See-through

- Optical See-through

Q) What are Monitor based AR and mention some use cases?

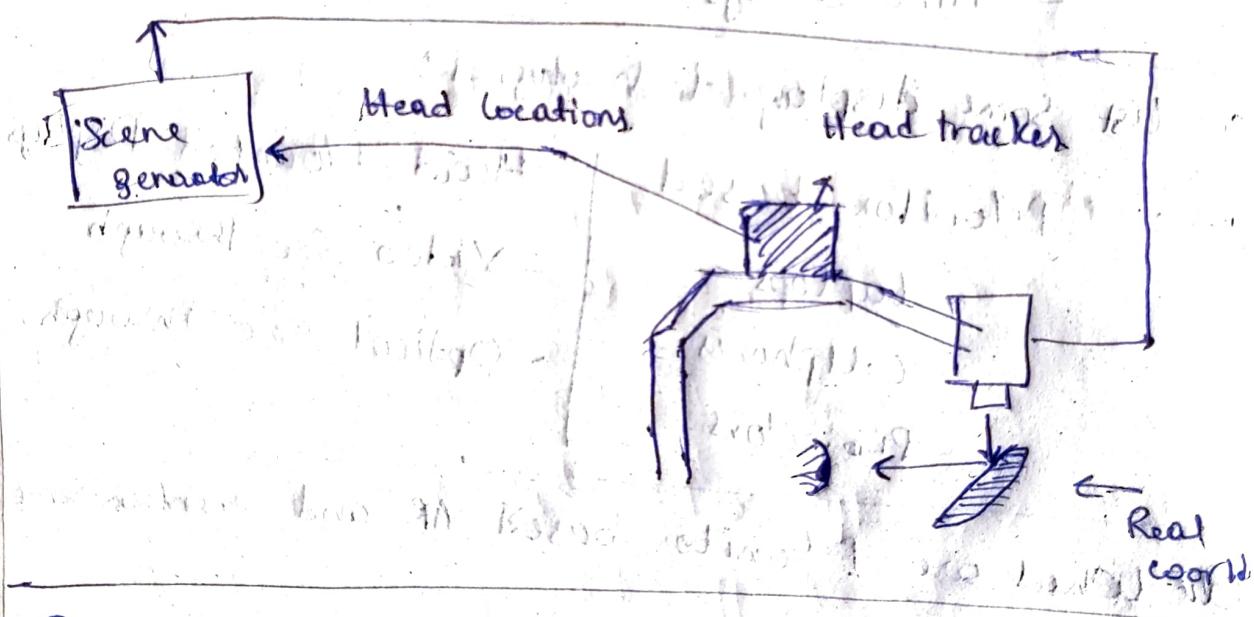
A) The simplest available display tech. By treating the (laptop) PDA / cellphone as a window through which you can see AR world.



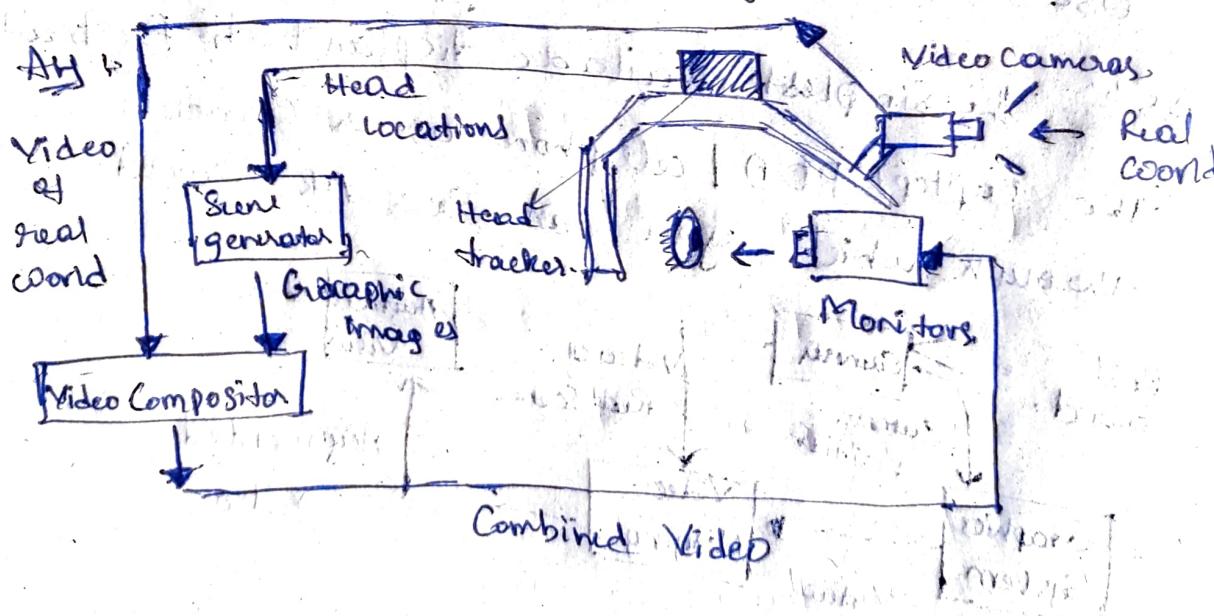
Use Cases

- Yellow line in football broadcasts
- Glowing hockey puck
- Baseball cards
- Ad campaigns

Q: What are Optical See-through HMD's?



Q: What are Video See-through HMD's?



Q. What are the advantages of Video see-through HMD?

- A. • flexibility in composition Strategies.
• Real and Virtual view delays can be matched.

Q. What are the advantages of optical See-through HMD?

- A. • Simplicity, Resolution, No eye offset

Q. What are the advantages of Monitor Displays?

- A. • Consumer-level equipment
• Most practical
• A lot of current research aim here.
• Other current active area is a flip-down optical display.

Q. What is Vuforia?

- A. Vuforia is a platform for Mobile Computer Vision released by Qualcomm in 2010, acquired by PTC in 2015. The main features include Recognition like image, text and object recognition and tracking like Image, marker, scene, object.

It offers Device, SDK, tools & Services and

Support forums.

Q) What are the features that are included in Vuforia?

Ans: 1.) Vision Capabilities: -
ability to recognise Images, Objects, text, Markers, Environments

2.) Scalable Recognition Engine:

It offers multiple Database Platforms. Cloud databases and Device Database

3.) Powerful Creative Palette:

It includes Video playback, Virtual Buttons, Background Effects, Occlusion Management

4.) Supports popular tools:

like Xcode, Eclipse, Unity

Q) What are Vuforia Developer Tools?

Ans: 1.) Vuforia Target Manager: -
Create and manage target databases for use on device or cloud.

- Supported in all major web browsers
- IE, Chrome, Firefox, Safari.

• Vuforia Capture APP:

- Scan objects such as toys to create object targets

• Supported devices:

- LG G3

- Samsung Galaxy S5.

Q: What are Vuforia Cloud Services?

A: Vuforia Cloud Recognition Service.

- Allows use of cloud-based target database with upto 1 million images.

• Vuforia Web Services

- Enables management of cloud-based targets, databases using RESTful APIs.
- Integrates with Existing CRIS Systems
- Java & PHP Samples provided

Q. Explain the Unity Asset Structure?

Ans :-

- Editor : Contains the Scripts required to interact with the data in Editor.
- Plugins : Contains JAVA Libraries that integrate the Vuforia AR SDK with the Unity Android or Unity iOS App.
- Vuforia : Contains the Prefabs and Scripts required to bring AR to your application.
- Streaming Assets (LAR) : Contains the Device Database Configuration XML and DAT files from the Online Target Manager.

Q. What are the uses of Evaluation techniques?

- Ans :-
- Evaluation tests usability and functionality of System. It majorly occurs in laboratory field and/or in collaboration with users.
 - It evaluates both design and Implementation.
 - Should be Considered at all stages in the design life cycle.

Q11 What are the goals for evaluation?

- Ans: 1) Assess extent of system functionality
2) Assess effect of interface on user
3) Identify specific problems.

Q12 List the three Evaluating Designs?

- Ans: 1) Cognitive Walkthrough
2) Heuristic Evaluation
3) Review-based evaluation.

Q13 What is Cognitive Walkthrough?

- Ans: → It is proposed by Polson.
→ It evaluates design on how well it supports user in learning task.
→ Usually performed by expert in cognitive psychology.
→ expert "walks through" design to identify potential problems using psychological principles.

- Principles
- forms used to guide analysis.
 - * For each task walkthrough Consider:
 - what impact will interaction have on user

- what cognitive processes are required)
- what learning problems may occur
- * Analysis focuses on goals and knowledge
does the design lead the user to generate the correct goals?

Q: What is Heuristic Evaluation?

- Ans: * It is proposed by Nielsen and Molich.
- * The usability criteria (heuristics) are identified.
 - * Design examined by experts to see if there are violated.
 - * Example heuristics
 - System behavior is predictable
 - System behavior is consistent
 - feedback is provided
 - * Heuristic evaluation & debugs' design.

Q: What is Review-based Evaluation?

- Ans: * Results from the literature used to support or refute parts of design.
- * Care needed to ensure results are transferable to new design.

- Model based evaluation
- Cognitive models used to filter design options.
- Design rationales can also provide useful evaluation information.