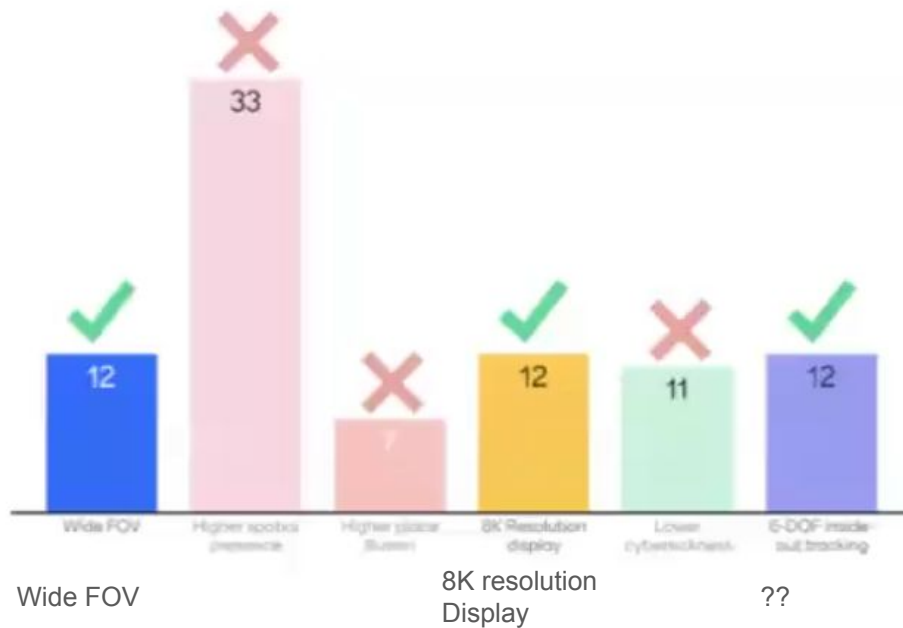
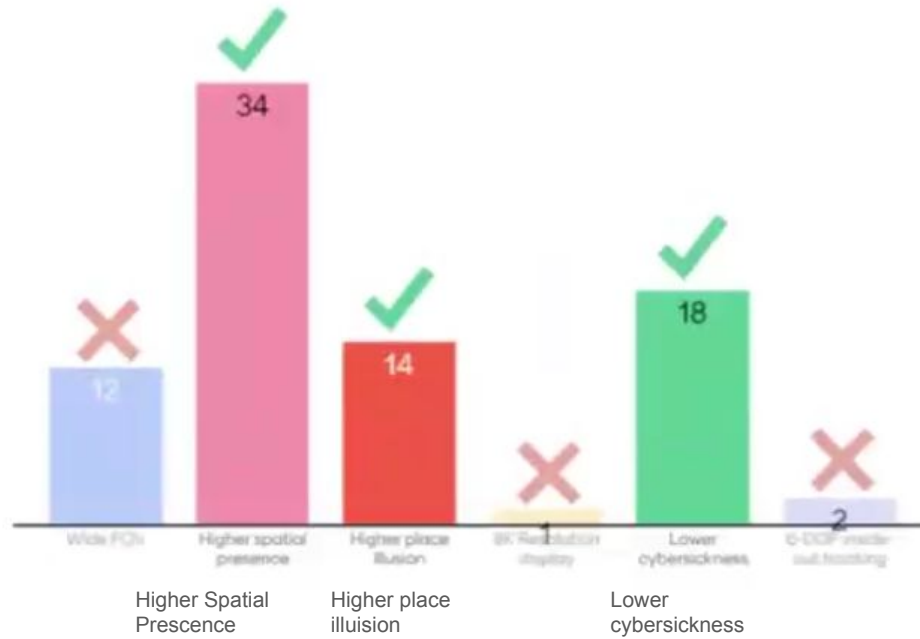


Lesson 2

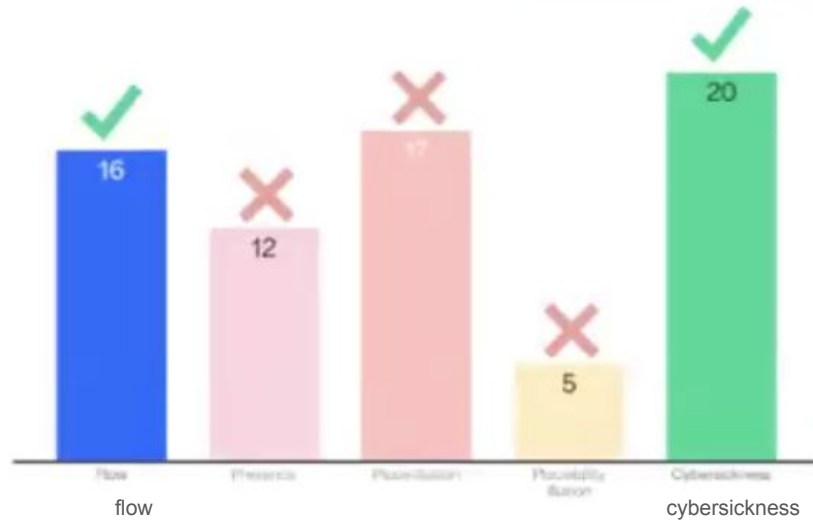
Which of the following describes immersion from a systems perspective?



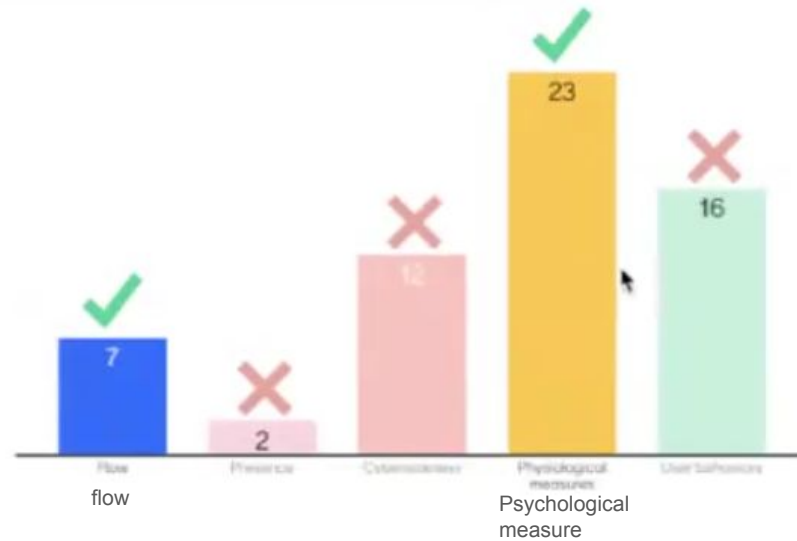
Which of the following describes immersion from an experiential perspective?



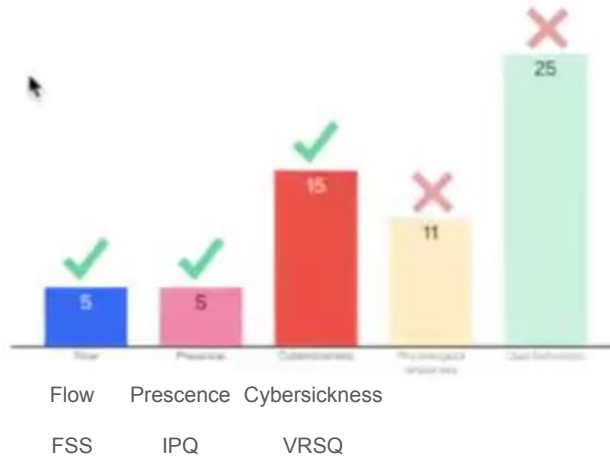
What experiential constructs were analysed in the user study in the paper on "Exploring Gameplay Experiences on the Oculus Rift"?



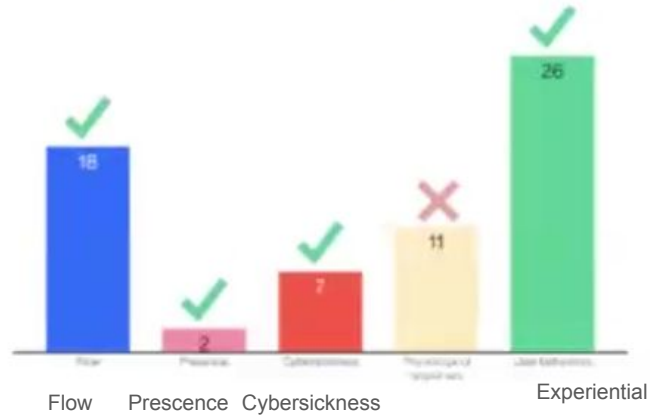
What quantitative data was analysed in the user study in the paper on "Exploring Gameplay Experiences on the Oculus Rift"?



What quantitative data was analysed in the user study in the paper on "Understanding User Experiences Across VR Walking-in-place Locomotion Methods"?



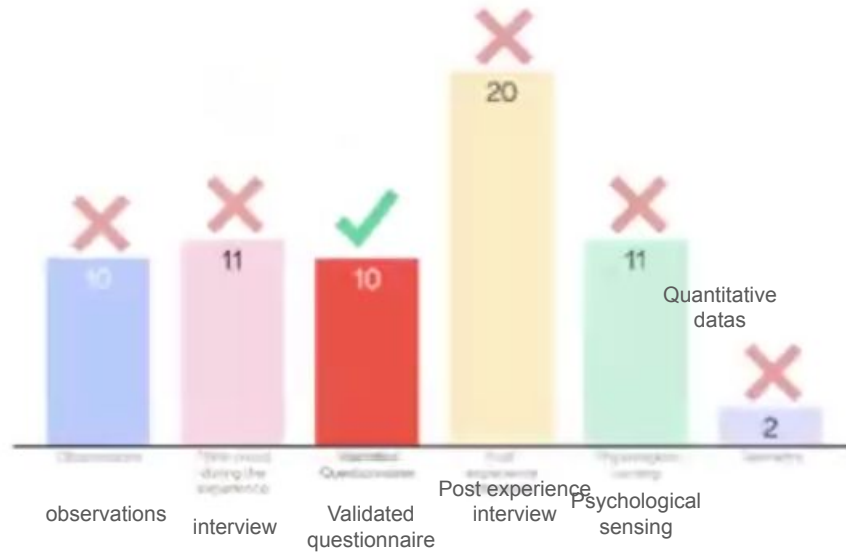
What qualitative data was analysed in the user study in the paper on "Understanding User Experiences Across VR Walking-in-place Locomotion Methods"?



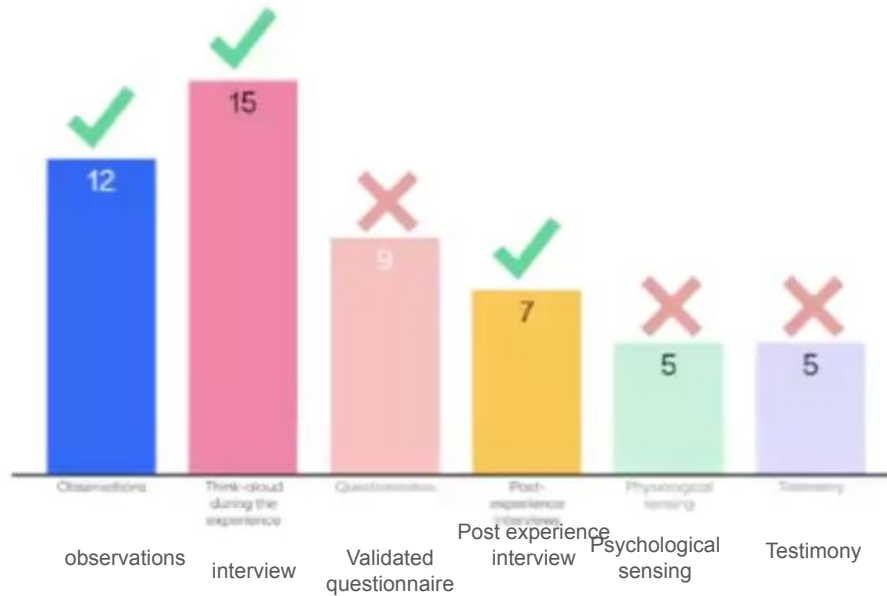
What type of data allows us to answer this research question in the most direct and convincing fashion?



What type of data allows us to answer this research question in the most direct and convincing fashion?



What is the best type of data to answer this research question?



Which of the following is NOT a symptom of cybersickness?



The calculations in the Simulator Sickness Questionnaire

None = 0

Slight = 1

Moderate = 2

Severe = 3

Symptoms	Weights for Symptoms		Disorientation
	Nausea	Oculomotor	
General discomfort	1	1	
Fatigue		1	
Headache		1	
Eye strain		1	
Difficulty focusing		1	1
Increased salivation	1		
Sweating	1		
Nausea	1		1
Difficulty concentrating	1	1	
Fullness of head			1
Blurred vision		1	1
Dizzy (eyes open)			1
Dizzy (eyes closed)			1
Vertigo			1
Stomach awareness	1		
Burping	1		
Total*	[1]	[2]	[3]

Score

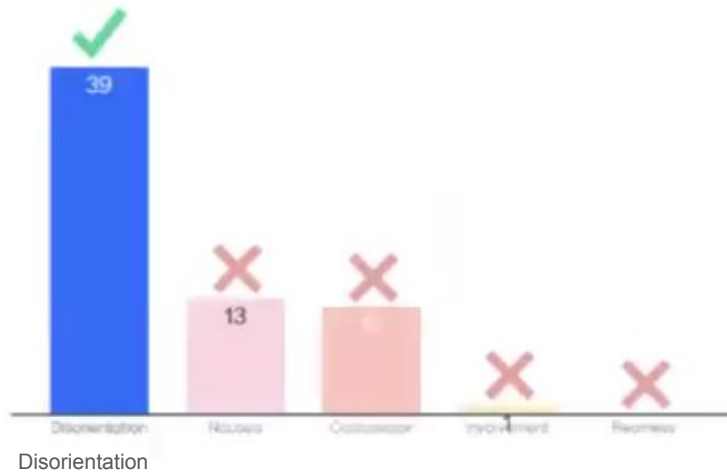
Nausea = [1] \times 9.54

Oculomotor = [2] \times 7.58

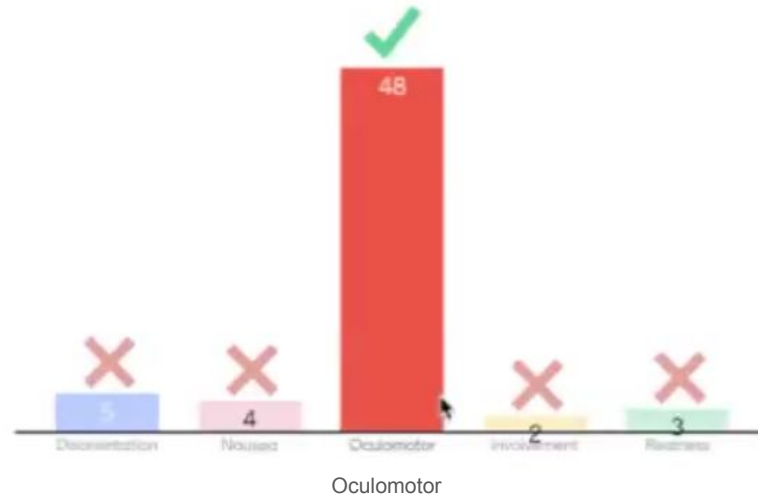
Disorientation = [3] \times 13.92

Total Score = ([1] + [2] + [3]) \times 3.74

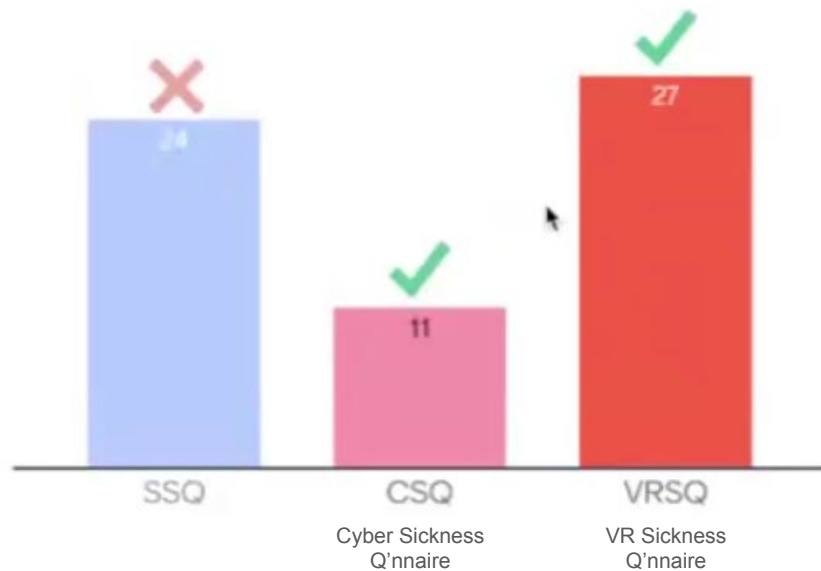
"This one feels dizzyier than the previous one." - What dimension of cybersickness is this?



"I find it very straining on my eyes to look at stuff in the scene after a short while" - What dimension of cybersickness is this?



Which cybersickness questionnaire is best when I need to use the results to inform v2.0 development of my VR?



Which cybersickness questionnaire should I use when I need to compare my results with a pool of prior research studies from others?



For Screens

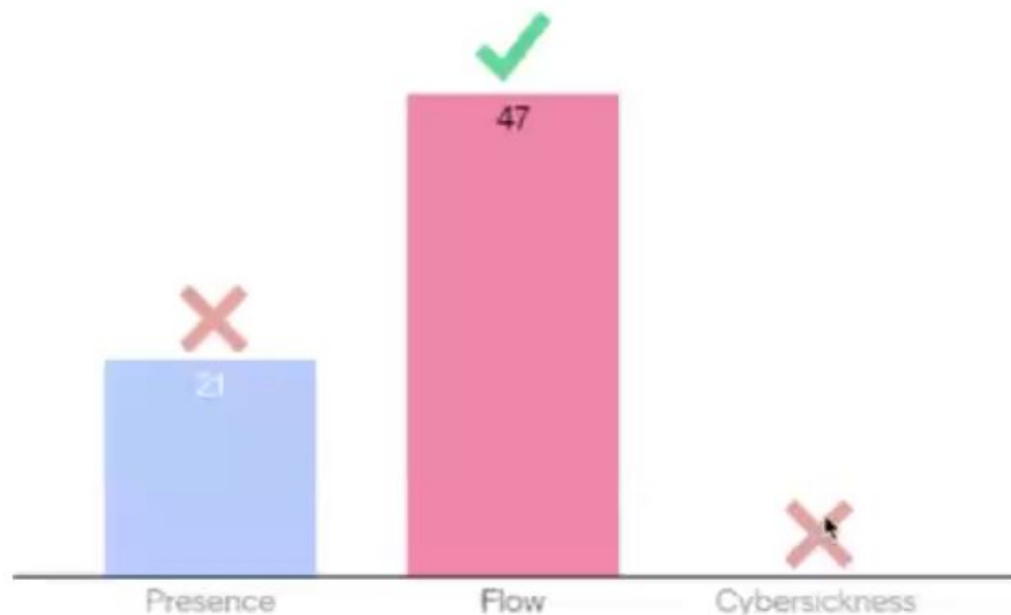
**FlowShort Scale with item allocation
proposed by Engeser (2012)**

**Flow Short Scale with item allocation
compatible with the Greek context**

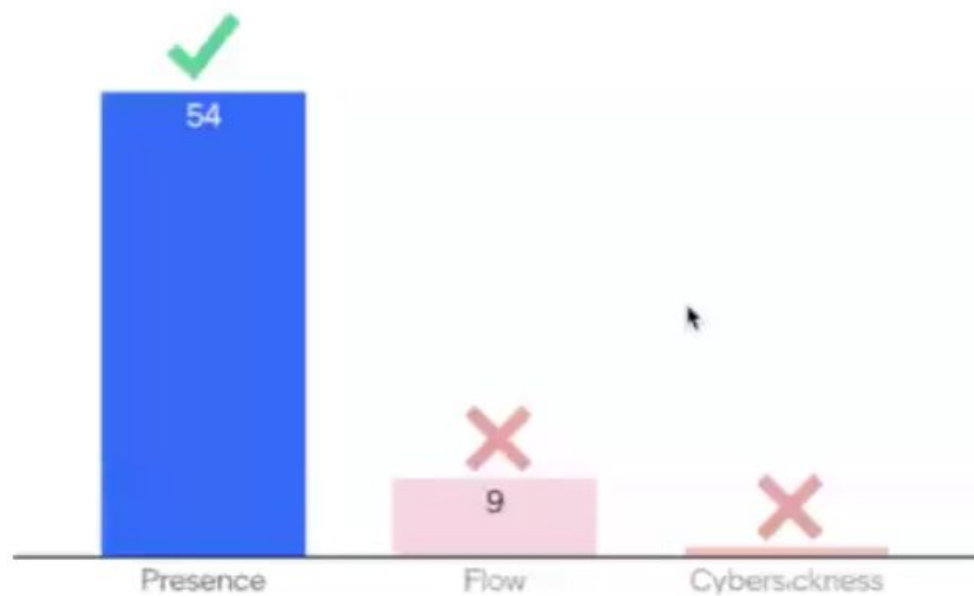
- | | |
|--|---|
| 1. I feel just the right amount of challenge (ABA) | 1. I feel just the right amount of challenge (FP) |
| 2. My thoughts/activities run fluidly and smoothly (FP) | 2. My thoughts/activities run fluidly and smoothly (ABA) |
| 3. I do not notice time passing (ABA) | 3. I do not notice time passing (ABA) |
| 4. I have no difficulty concentrating (FP) | 4. I have no difficulty concentrating (ABA) |
| 5. My mind is completely clear (FP) | 5. My mind is completely clear (ABA) |
| 6. I am totally absorbed in what I am doing (ABA) | 6. I am totally absorbed in what I am doing (ABA) |
| 7. The right thoughts/movements occur of their own accord (FP) | 7. The right thoughts/movements occur of their own accord (ABA) |
| 8. I know what I have to do each step of the way (FP) | 8. I know what I have to do each step of the way (FP) |
| 9. I feel that I have everything under control (FP) | 9. I feel that I have everything under control (FP) |
| 10. I am completely lost in thought (ABA) | 10. I am completely lost in thought (ABA) |

The factor of each item is included in parenthesis, ABA = Absorption by activity factor, FP = Fluency of performance factor.

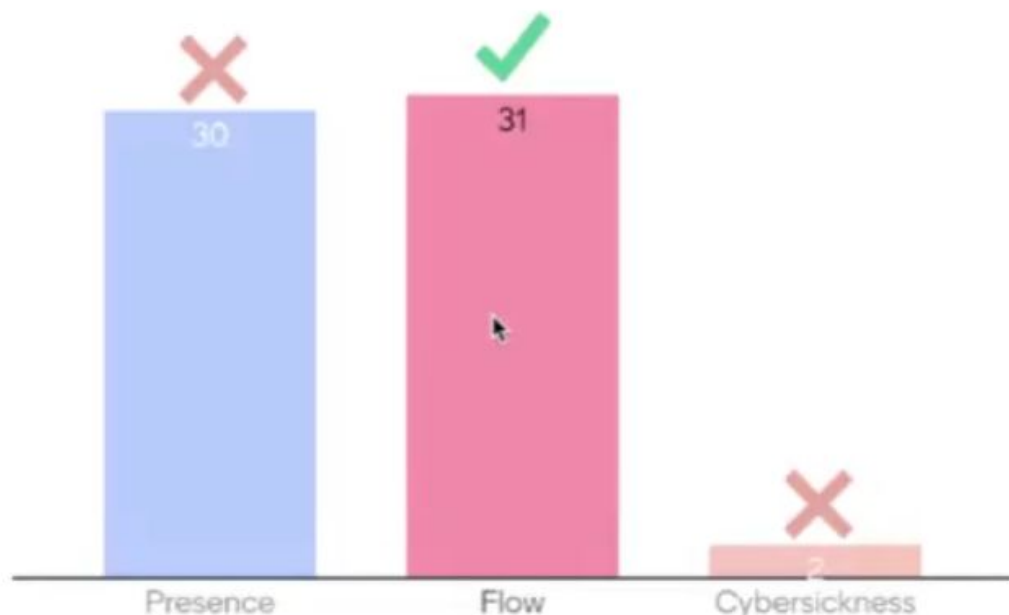
What is the type of experience being described here?



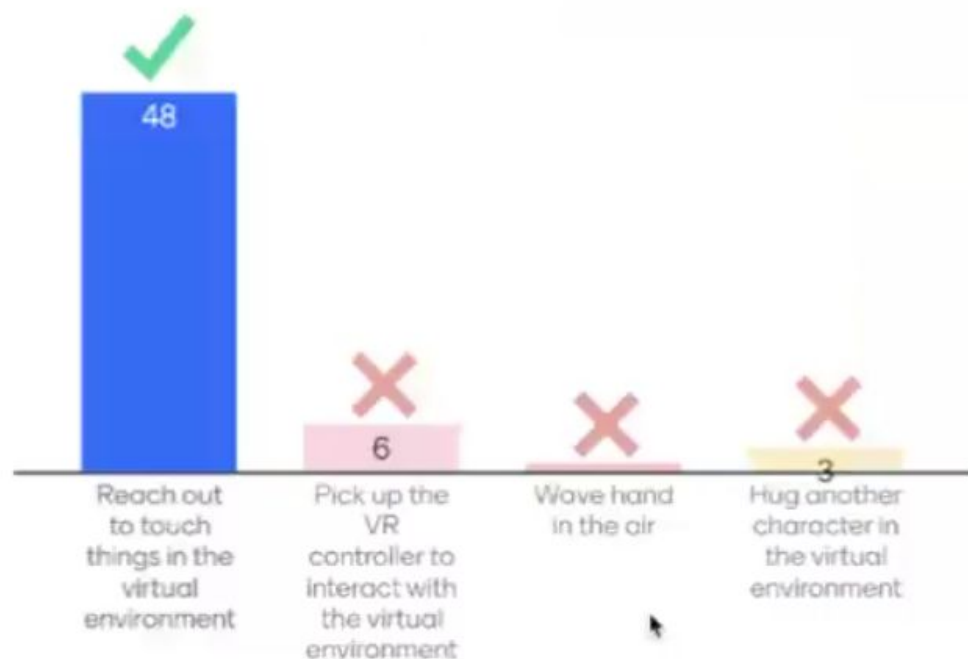
What is the type of experience being described here?



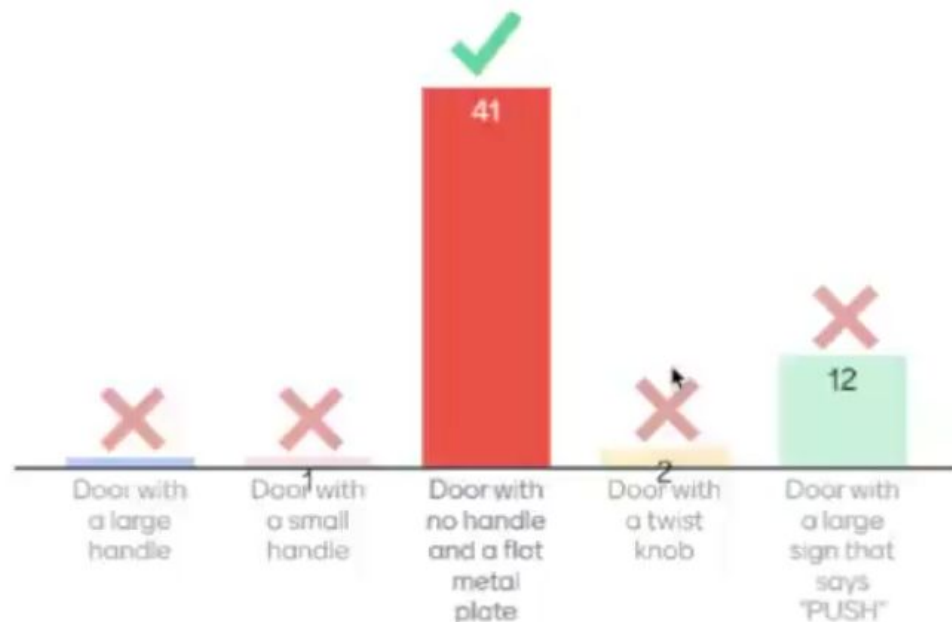
What is the type of experience being described here?



What is the main affordance on a haptic glove for an experienced VR user?

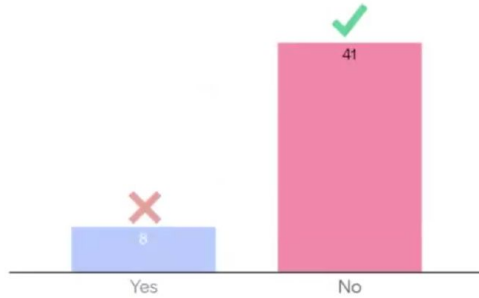


Which design provides the right affordance for a door that is meant to be pushed

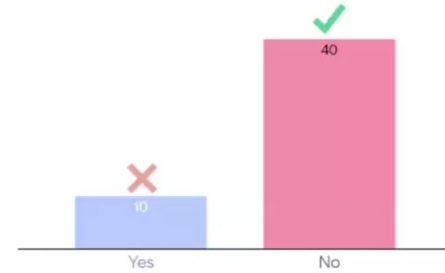


Lesson 4

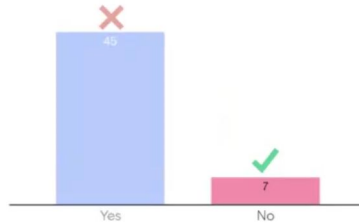
I need to use a WebXR-compliant framework for my Team Project



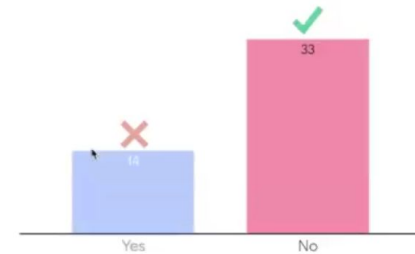
I should build my Team Project on top of the existing UniverseSITy codebase



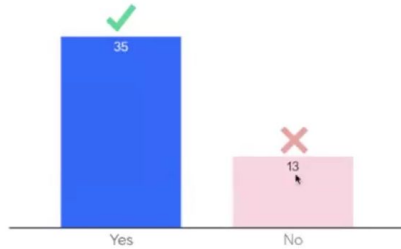
We will be assessed more favourably if we can demonstrate higher levels of immersion from our evaluation.



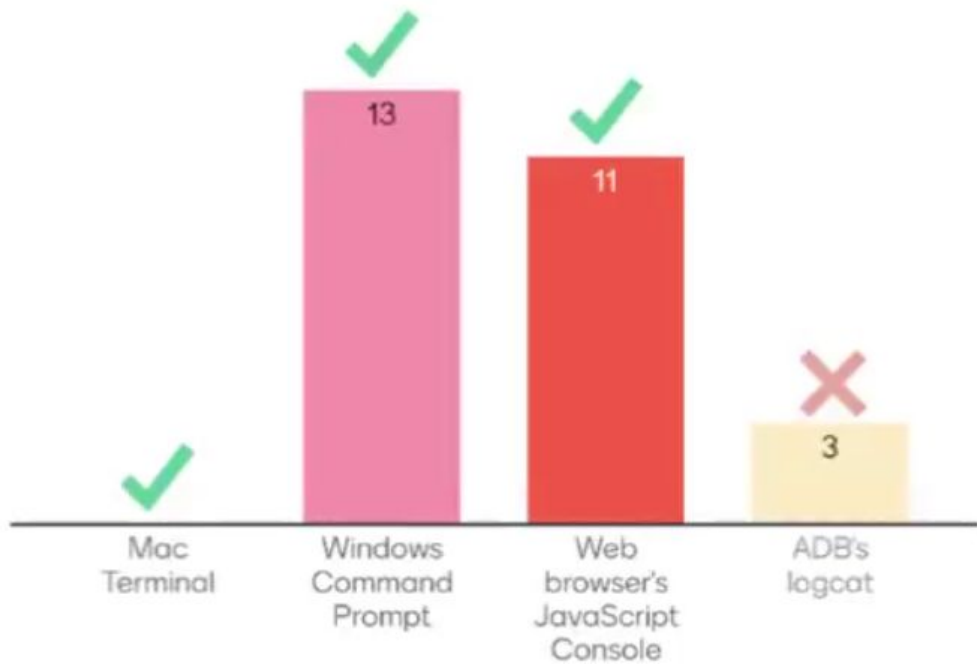
We will be assessed more favourably if our project aligns with UniverseSITy theme better (e.g. use real SIT campus 3D model)



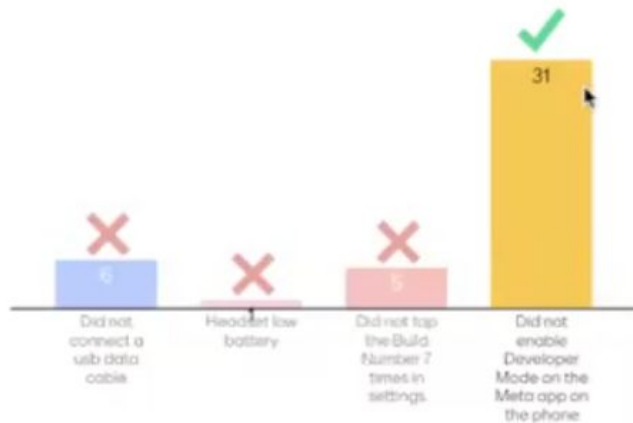
We will be assessed more favourably if we demonstrate implementation efforts that are clearly aligned with immersion goals.



When I run `console.log("debug")`, where should I see this "debug" message?

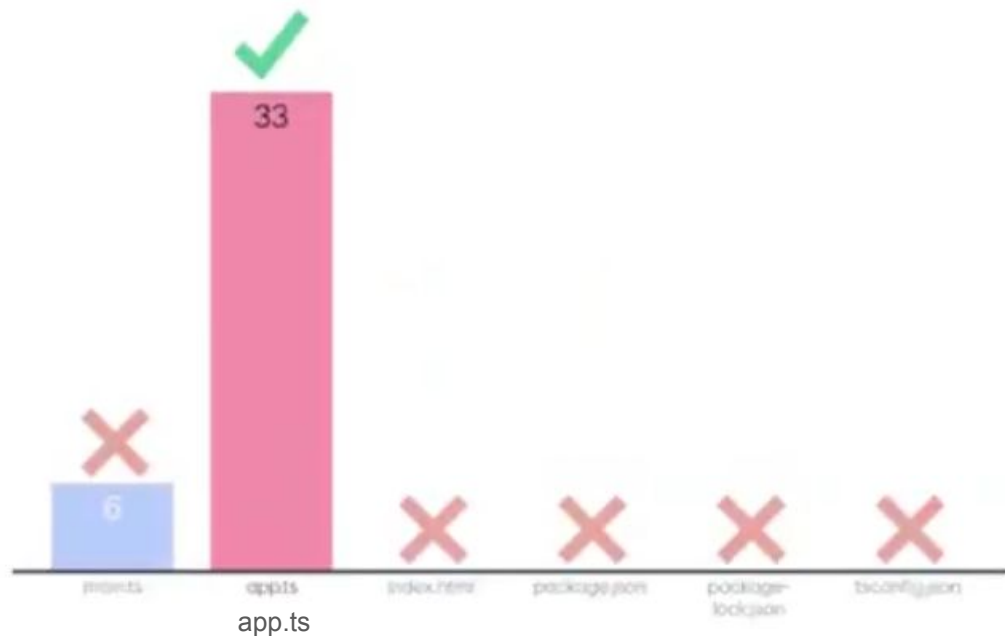


When connecting the Meta Quest, there is no prompt to enable connection and I can't see developer options in the settings. What is the likely issue?

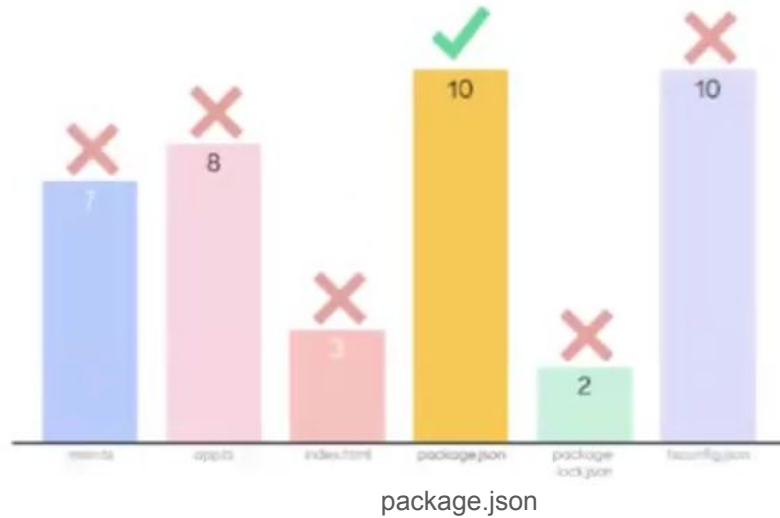


Did not enable Developer Mode on the Meta app on the phone

Where is createScene(...) normally defined?



You want to add a custom script as part of your BabylonJS project test workflow. Which file should you modify?



Which file should you add to your team's version control if you want the project dependencies to have the same exact versions across your team?



What does the following Babylon.js snippet accomplish?

1

```
const xr = await scene.createDefaultXRExperienceAsync({  
  uiOptions: {  
    sessionMode: "immersive-vr",  
  },  
});
```



5

0

Initializes
typical
components
for hybrid XR
(AR & VR)
experience.

Makes a non-
blocking
method call
to initialize
components.

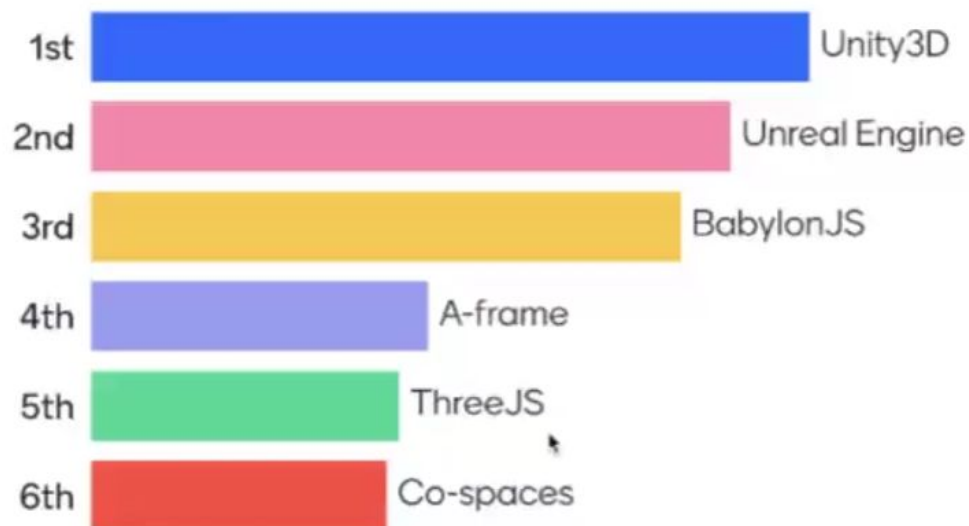
0

Creates a
default
BabylonJS
scene with a
sphere.

0

Waits for all
components
to complete
initialization
before
continuing

Rank from the best to worst tool in your perspective for creating immersive applications



For building your webxr pages, do you prefer...



Pure Javascript



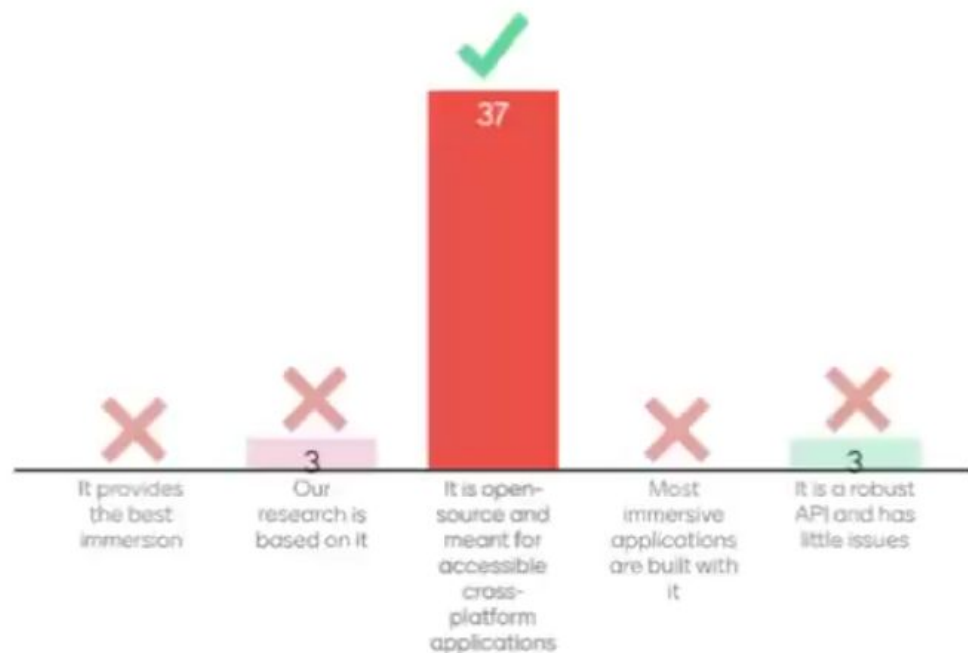
Typescript



Wait... what is the difference again?

Coz we come from C++

What is the main reason for choosing WebXR as the core development stack?

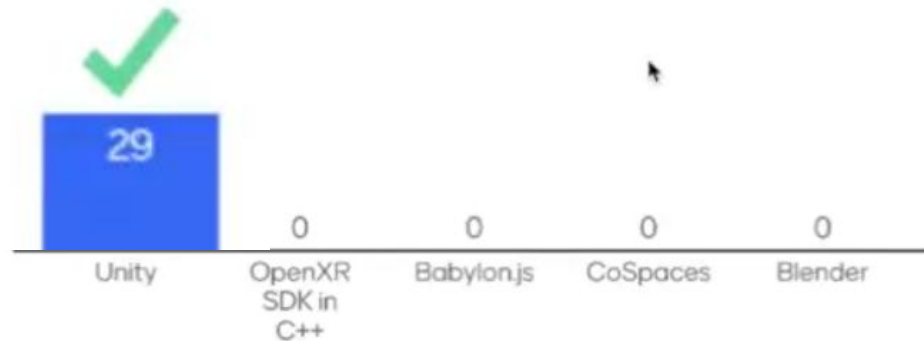


What is the optimal development tool for this project?

Mining simulator

5

You are engaged by a mining company to build a VR system for training their own miners to operate in a coal mine. They have funds to purchase any necessary hardware you propose that is suitable and within reasonable budget. They need the working system delivered within a short 8 months time. Which tool is most suitable for you to base your development on?



What is the optimal development tool for this project?

Metaverse app

14

You are building your own metaverse application, an immersive social network that aims to allow as many users as possible to participate in, using different platforms and devices. You have limited funds as an individual of course, and aim to spend as little as possible on development. Which tool is most suitable for you to base your development on?

Limited funds



What standard to focus on?

11

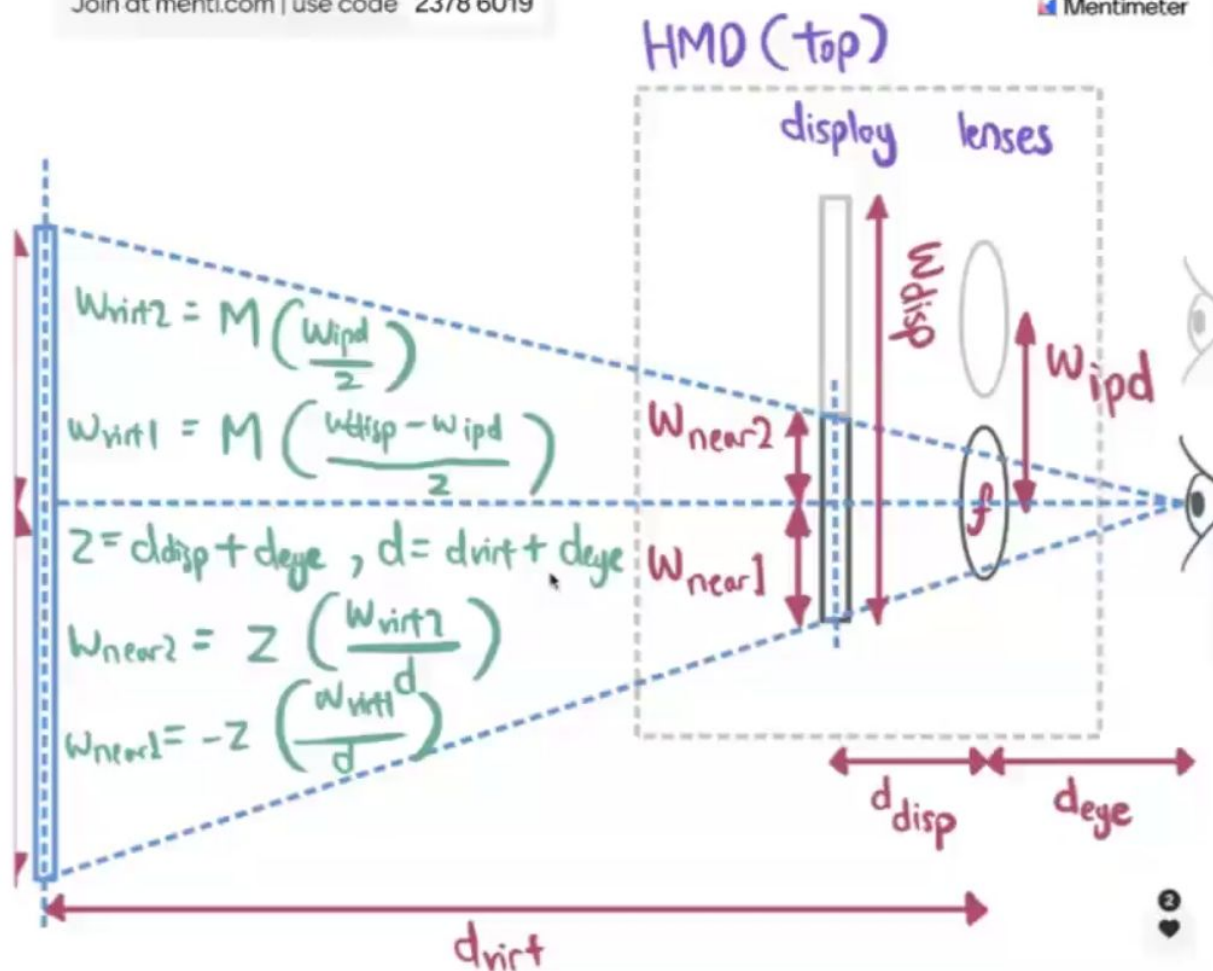
You need to implement a cross-platform native VR experience using a novel hand tracking algorithm and you want to focus on implementing VR components with the same underlying code-base across Meta's Quest HMDs, HTC's Vive HMDs, Google Cardboard. You hope to align it to an open standard so that there is a vibrant developer ecosystem and that the underlying tooling will be constantly improved. What standard should you be targeting?

cross platform **native** VR experience using a novel hand tracking. focus on implementing VR components with the same underlying code base across all these different things, you hope to align it to an open standard so that there is a vibrant developer ecosystem. Constantly improve.

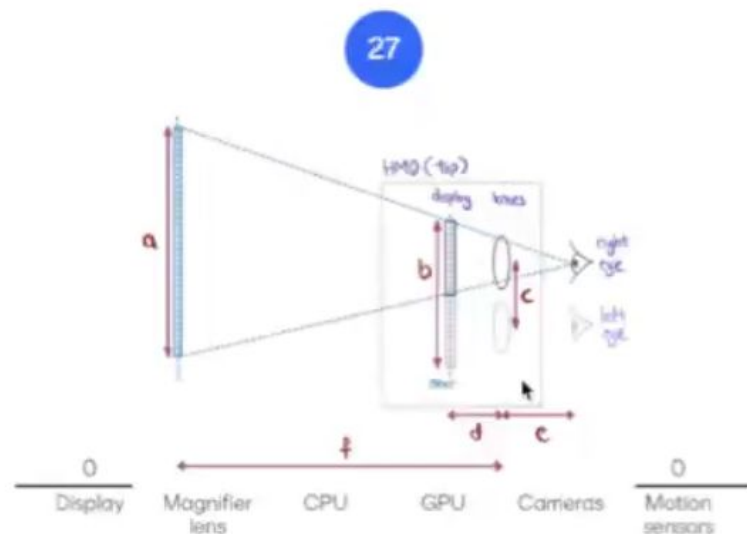


Lesson 5

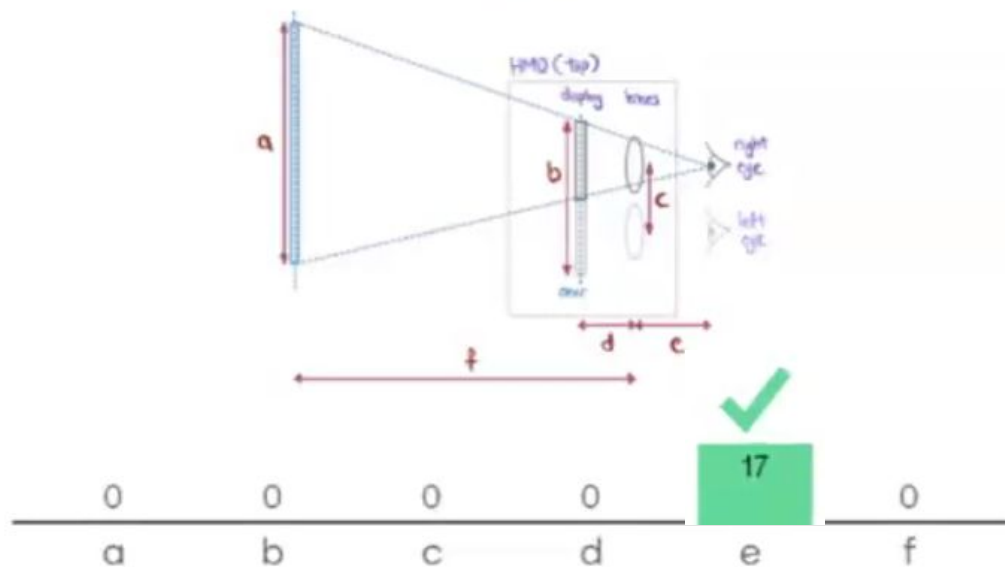
explain the
image
formation
process in
typical XR
HMDs



What is the main difference between the hardware in a modern smartphone and a HMD?

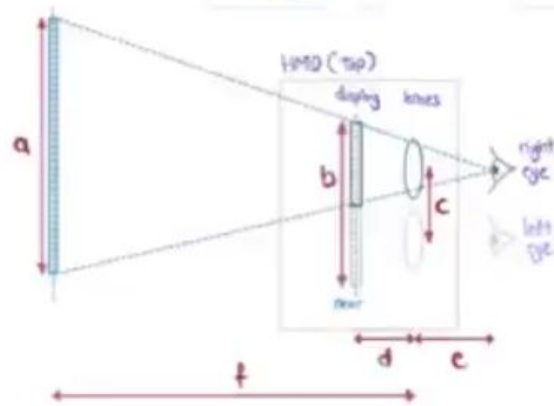


45



In the schematic HMD diagram, where is the width of the virtual image?

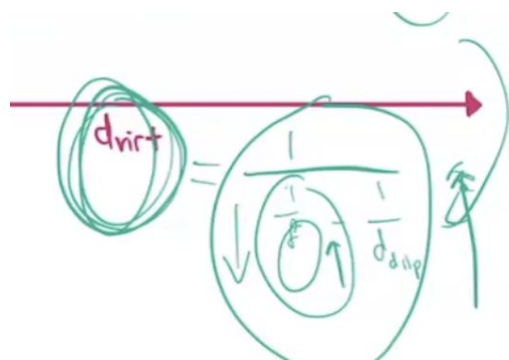
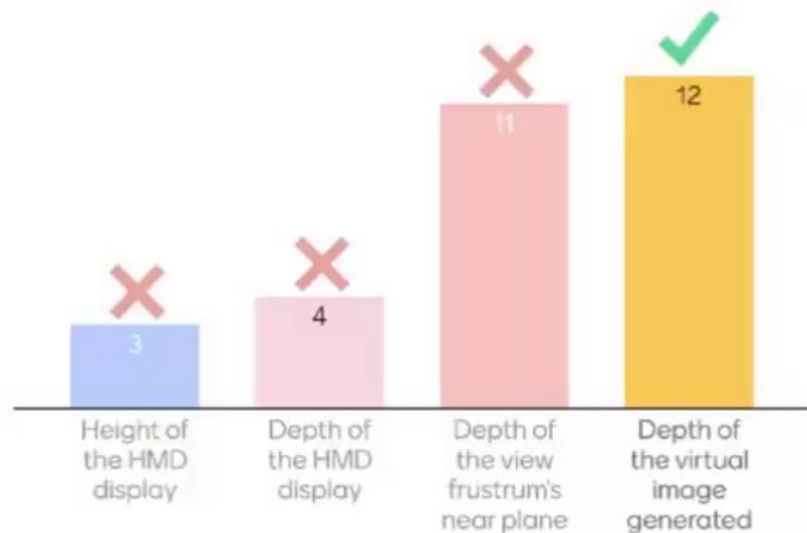
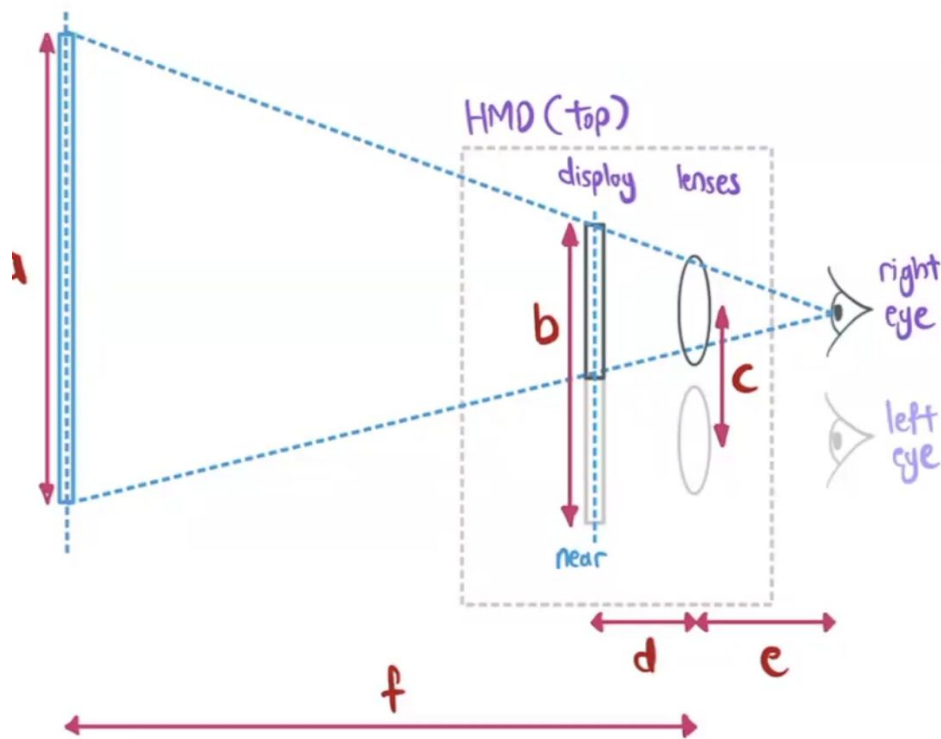
9



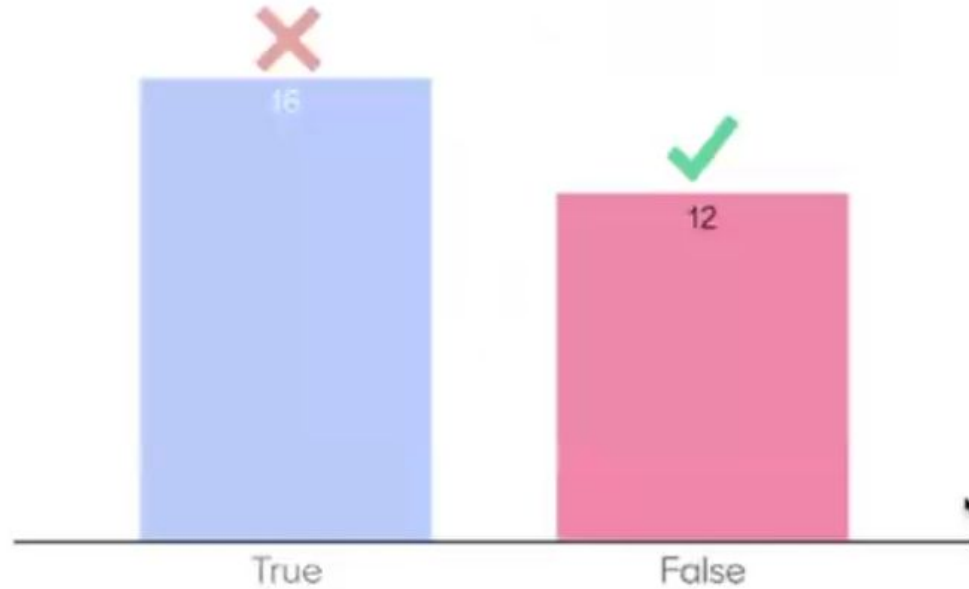
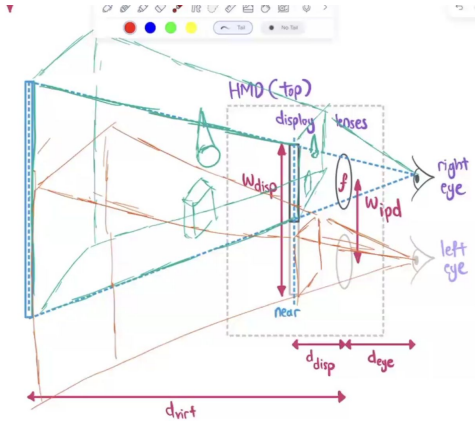
24



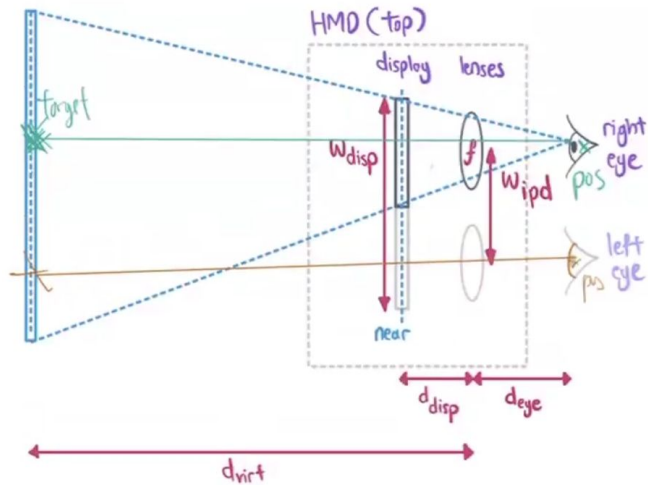
In HMDs, what effect will changing the focal length of the lens have?



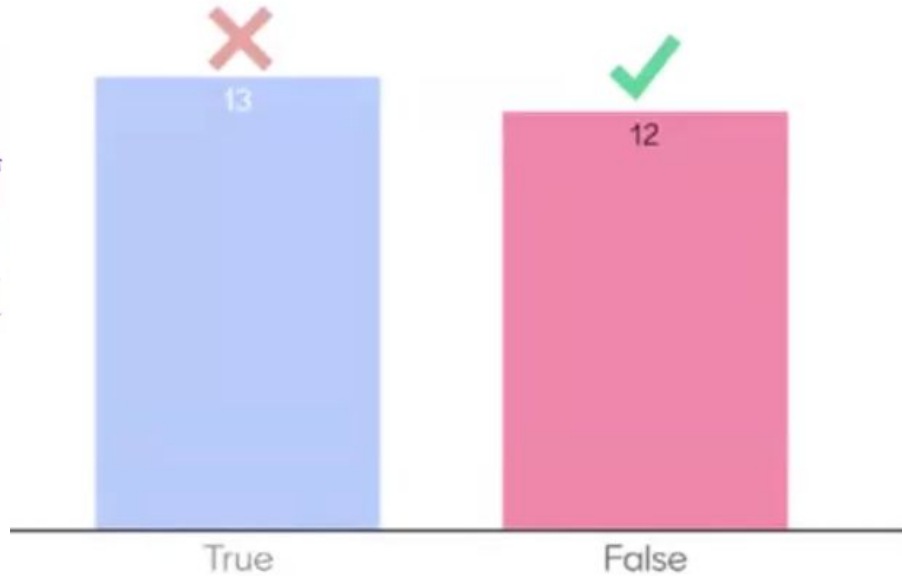
The perspective matrix for rendering in HMDs is the same for both eyes.



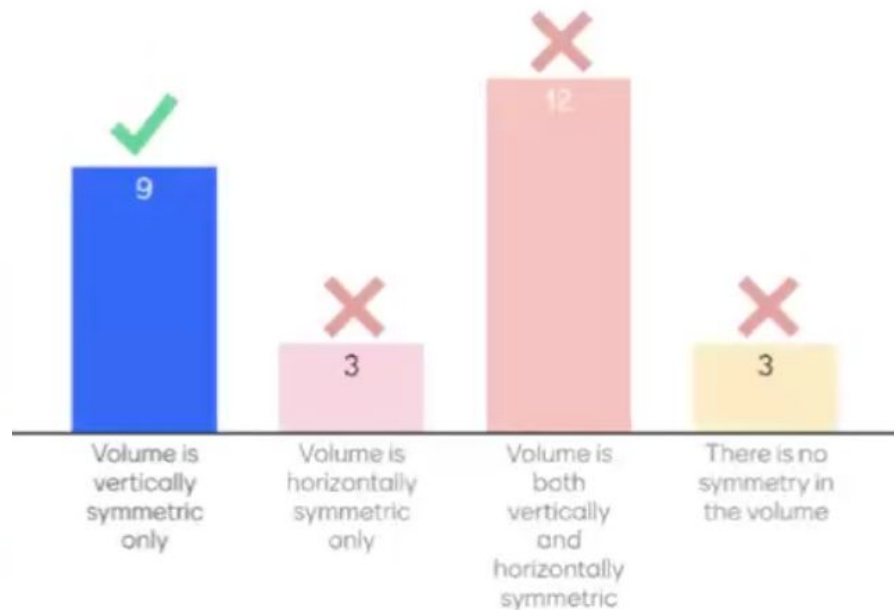
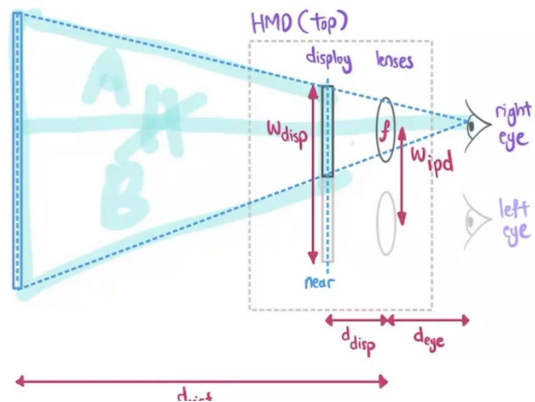
The view matrix for rendering in HMDs is the same for both eyes.



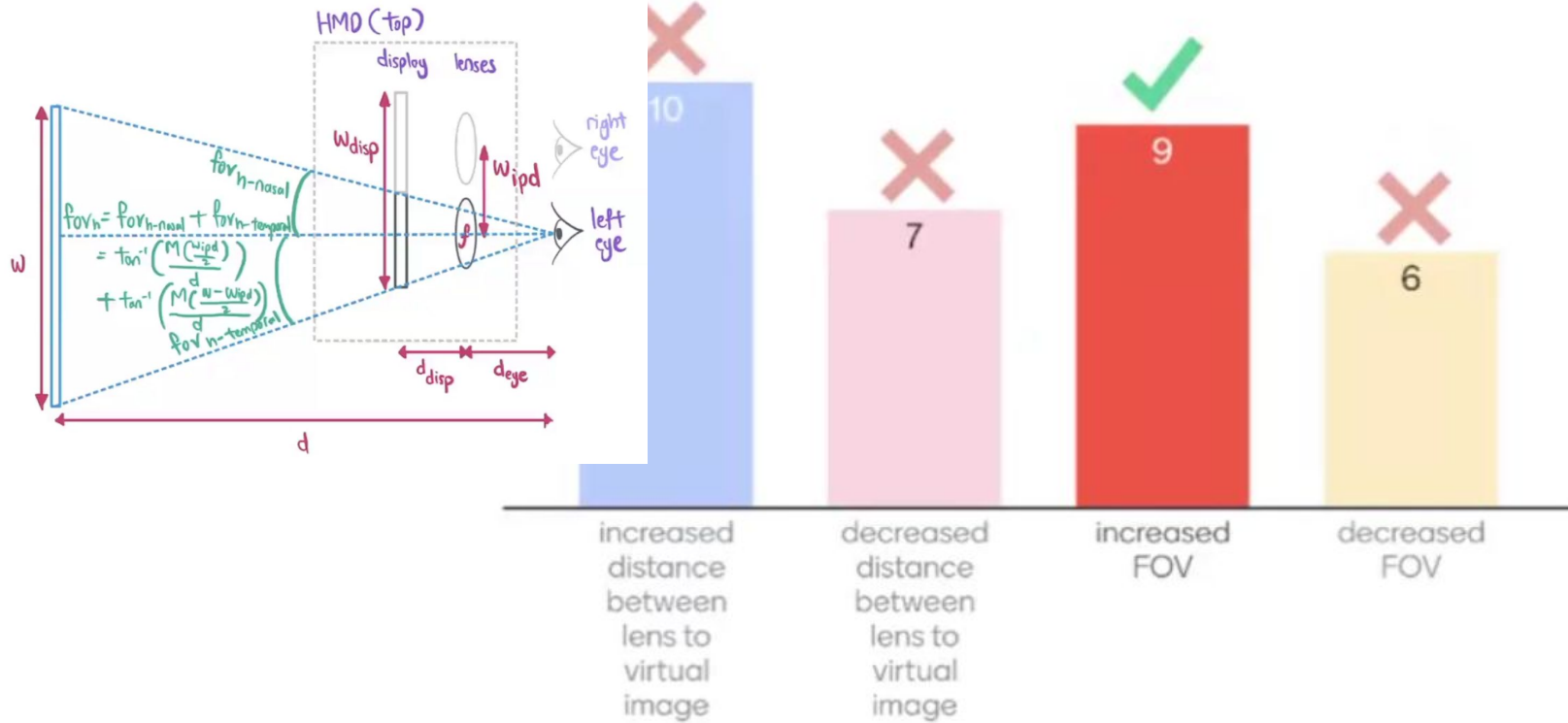
`.lookAt (pos, target (up))`

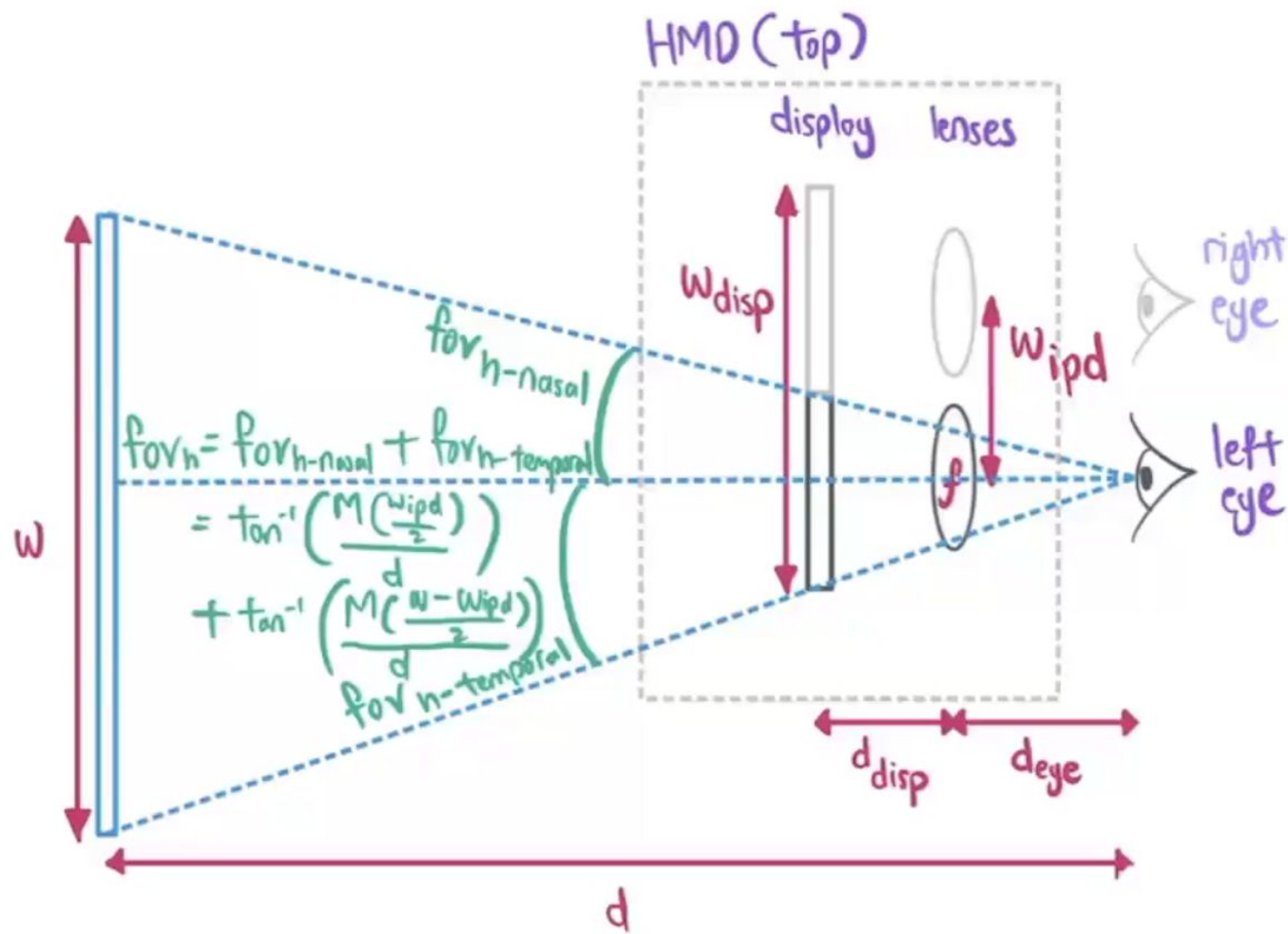


What is a valid property of the view frustum generated by typical HMDs?

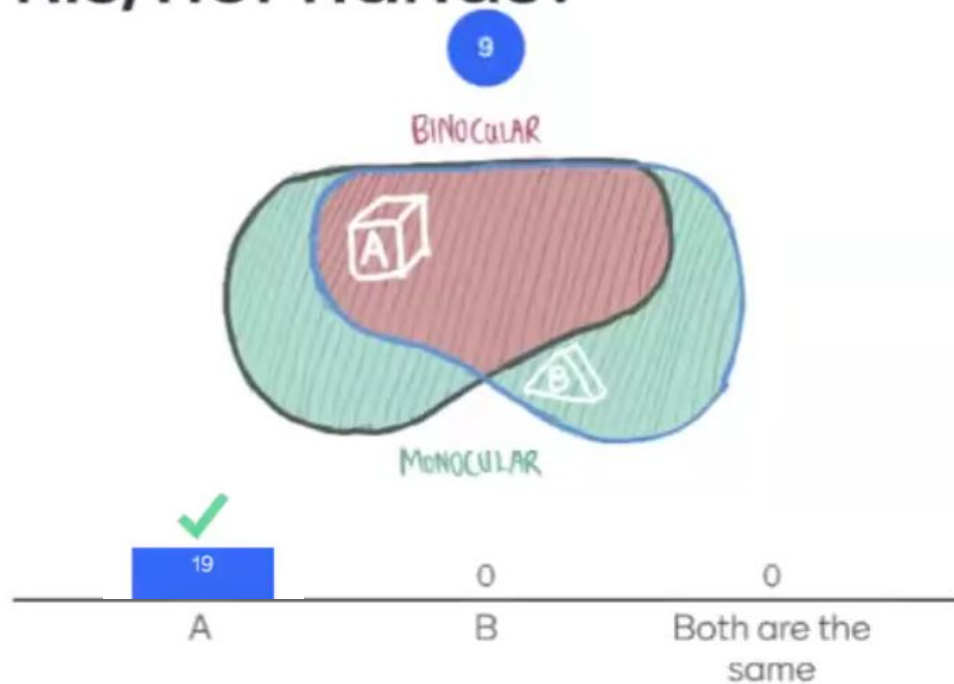


What is a result of reducing the eye relief?





Which object is easier for the user to reach out and grab with his/her hands?



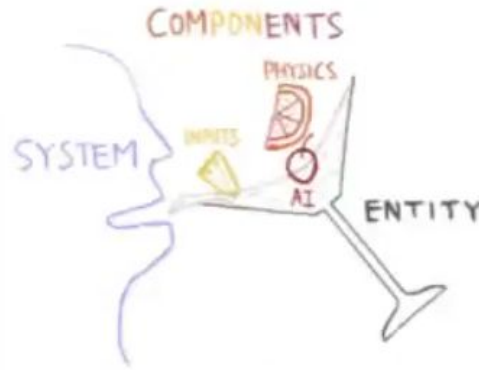
Which software component is the least important in the XR application described?

1

We built a Web VR application for caregivers to empathize with patients suffering from dementia. The experience is primarily audio-visual with the main interaction being navigating around a house. The main content is based on 360 video capture.



What is the top reason for using ECS over straightforward OOP in your app architecture.



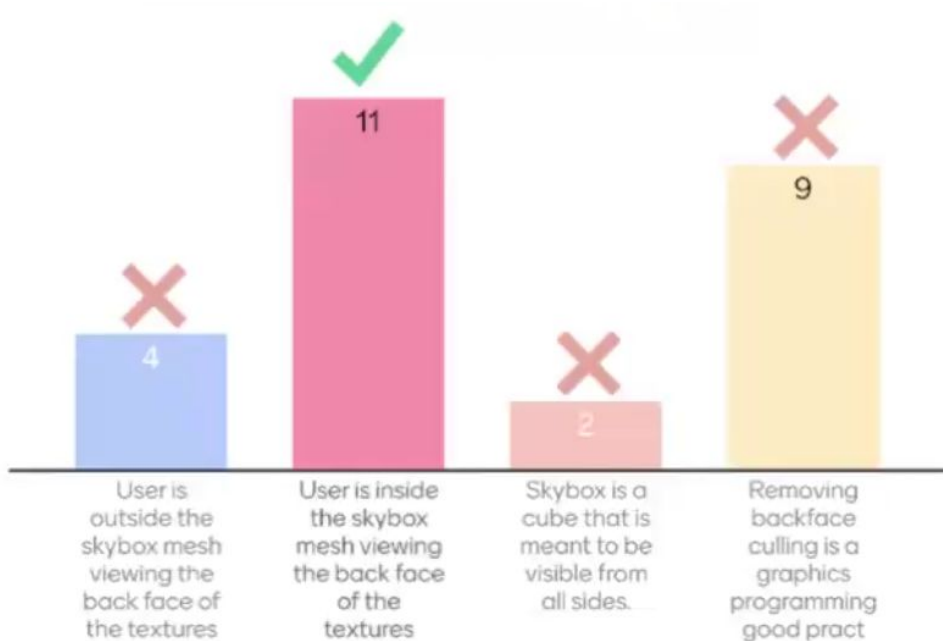
Ans: There are different virtual objects created at runtime

Lesson 6

Why do we need the following code?

5

```
// this is usually done for skybox materials  
skyboxMaterial.backFaceCulling = false;
```



Which line of code makes the skybox feel like it is part of the background surrounding the user?



8

```
skybox =  
MeshBuilder.CreateBox("skyBox",  
    {size:1000.0}, scene)
```

0

```
skyboxMat  
    .backFaceCulling = false
```

0

```
skybox  
    .reflectionTexture.coordinatesMode  
    =  
    Texture.SKYBOX_MODE
```

0

```
skyboxMat = new  
StandardMaterial("skyBox",  
    scene)
```

0

```
skybox.material =  
skyboxMaterial
```

What will the following code do?



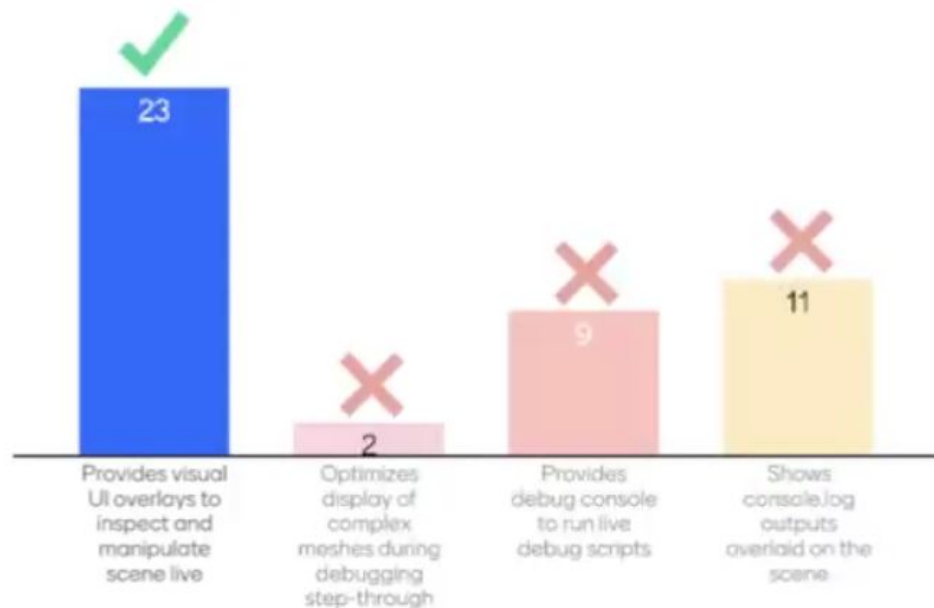
18

after "click"
is released
on Btn,
show
location of
Btn

0

```
Btn.onPointerUpObservable.add((evtData) => {  
  alert("Hello Button at:\n x: "  
    + evtData.x  
    + " y: "  
    + evtData.y);  
});
```

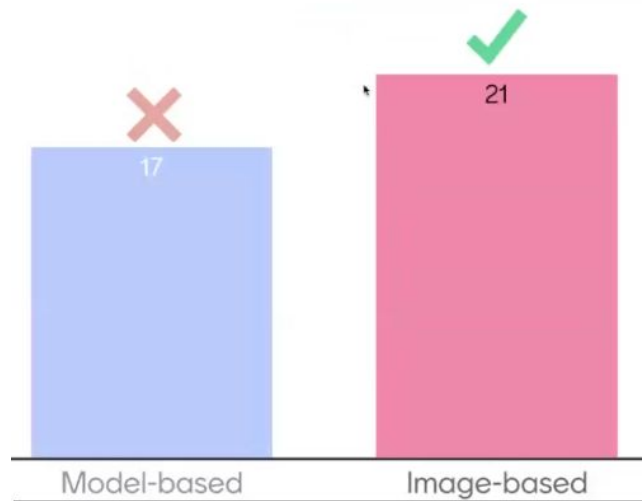
What is the function of the debugLayer in the Scene class of Babylon.js?



What is the optimal approach?

4

You are tasked to build a VR application to provide a virtual tour of an art gallery. The goal is to provide potential bidders with a sense of scale and depth close to viewing the real thing. What is the optimal approach for creating the virtual environment?



You are tasked to build a VR application for caregivers to empathise with patients suffering from dementia. The experience is intended to be primarily audio-visual with the main interaction being navigating around a house. Realism should be the focus of the immersion. What is the optimal approach for creating the virtual environment?



11

Image-based



You are tasked to build a VR application to teach physics in a classroom. Kids will be able to throw virtual balls to hit cans placed at different distances and heights. Plausible interactions should be the main focus of the immersion. What is the optimal approach for creating the virtual environment?



You are building a VR application that includes a novel immersive experience that is not commonly seen in current VR applications. You are part of a research lab that has some funding to obtain resources deemed necessary for development. Which tool(s) can likely be used for you to base your development on?

- ☐ CoSpaces
- ☐ Blender
- ⇒ ☒ Babylon.js
- ⇒ ☒ Unity
- ⇒ ☒ OpenXR SDK in C++

Rank the tools from the most accessible (for developers without coding experience to use) to the least.

- ⇒ 4 OpenXR SDK in C++
- ⇒ 3 Unity
- ⇒ 2 Babylon.js
- ⇒ 1 CoSpaces

In your VR application, realistic graphics is the most important and you need to have fine-grained control of GPU resources when rendering. You hope to align it to an open standard so that there is a vibrant developer ecosystem and that the underlying tooling will be constantly improved. What standard should you be targeting?

- ☒ Vulkan
 - ☐ OpenXR
 - ☐ OpenCL
 - ☐ WebGL
 - ☐ WebXR
 - ☐ OpenGL
-

In your project directory containing your WebXR typescript-based app bundled with webpack, you changed the index.ts (entry point to your main app logic) hello.ts and you see a new "Module not found" error and your web app does not show in your browser anymore. Name the configuration file you should amend to resolve this error.

(webpack.config.js)

You introduced a new "/components" directory containing new source files for your BabylonJS project. Which file should you modify to reflect this?

- ☐ package-lock.json
- ⇒ ☒ tsconfig.json
- ☐ package.json
- ☐ index.html
- ☐ main.ts
- ☐ app.ts