

Creating Virtual Environments

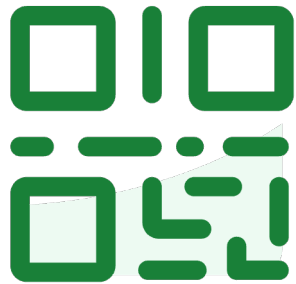
Notes for the SIT-DP module: **Developing Immersive Applications**

Created by: Chek Tien TAN



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**Join at slido.com
#week06-create-ve**

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#what-to-improve

Good professor and really nice setup for assignments. That being said.. I believe many would prefer more pdfs and slides than focusing on more videos. It would be faster to digest all the terminologies used in this module instead of having to search for them hard.

Would definitely enjoy more programming labs/assignments for this module

lots of coding,
myabe hard

I...want...to...code.....I'm dying of boredom from all the theory :(

If we are allowed to navigate to google.com, youtube.com, wikipedia.org, stackoverflow.com, immersive-web.github.io, doc.babylonjs.com, npmjs.com, what is the point of using respondus other than making our lives harder to look up for information ourselves. pls use some common sense. thanks

Out of your control (I know), but the class is really **noisy** and I can't hear you over the microphone at times.

#thoughtful-feedback

Honestly, the module feels a bit **disorganised**. While I understand some of the concepts being presented to us about AR/VR, some aspects of it still feel really **subjective**. For example, I still can't really believe that *Strava is considered not as much of a "real world app" compared to beat saber*. It feels like some of the metrics used to determine that defies common sense/logic. I guess that's maybe how academia is like? Which I am not used to. Also, I think the slido thing is insanely difficult to "score" for. I **really want the extra 1%** but I keep getting bamboozled by the options or the questions. Even though I watch the videos, some of the questions/answers are so **subjective** that it's really hard to be able to consistently and accurately give the correct answer, which has been my main gripe with every single SIT module so far. There's no consistency in the questions, and there's always a ton of **ambiguity** with no wiggle room. We're always at the whim of the professor, and our views, thoughts and perspectives are always molded to fit theirs even if we might have some differing ideas, which overall gives the modules a very stifling and **aphyxiating** feeling to them. Also in the very first question, the one about CoSpaces (assuming the order is not randomised) has 2 of the same options.... Also we were told that we would be able to browse whitelisted websites but there's no instruction on how to do that. I feel like these sorts of issues shouldn't even happen in the first place? We don't get this for digipen modules. This is literally only an SIT thing that happens.

```
# Chat with llama3.3
1 ## Prompt:
2
3 > What is aphyxiating
4
5 ---
6 Aphyxiating refers to a condition of being unable to breathe or experiencing severe respiratory distress, often leading to a lack of oxygen in the body. The
   term "aphyxiating" comes from the word "aphyxia," which means a lack of oxygen or an inability to breathe.
7
8 In medical contexts, aphyxiating can describe a range of conditions that impair breathing, such as:
9
```



#thoughtful-feedback

Feedback about classes and in-class quizzes so far: I like how enthusiastic and well spoken the professor is. He is clearly very passionate both about the subject and about **ensuring that we get the best learning experience possible**. I am **enjoying the classes** so far. I appreciate the provision of **learning materials before lectures** so I can take my time to really understand the material. I don't usually finish looking through all the readings, but the main lecture is usually quite informative, and I enjoy being able to **watch it at my own pace** so that I can **pause the lectures** at any time and look through the supplementary materials. I strongly believe that other modules should adopt a similar approach. Some of the in-class quiz questions, however, are a bit too subjective, or use ambiguous phrasing. It can be a bit **frustrating answering MCQs** because I may understand the underlying concepts, but I may not interpret the questions' wording the way the question-setter intended, resulting in me picking the "wrong" choice. Hopefully the graded quizzes will not fall into the same trap, or will at least give me the opportunity to explain my thought process so I can be graded on my understanding instead of how well I can read the question-setter's mind. I would like **more small exercises that let us play with developing WebXR**. Some thought exercises that get us to **engage with and interpret actual research papers** would be nice, too. As the module lead is an academic, I'd love to learn about how software development differ when motivated by academic goals, as opposed to purely commercial ones. Overall, I am enjoying the module so far, and would like to **thank the professors for their hard work**. --- Other misc feedback: For question 1 of this quiz, there were two of the same options. Question: "Rank the tools from the most accessible (for developers without coding experience to use) to the least." Options: CoSpaces, CoSpaces, Unity, OpenXR SDK in C++. --- I don't know how to access whitelisted domains from the LockDown Browser.

#what-worked-well

Going good so far! Nice use of **slido** for audience **engagement**.

Great Module, I like your **videos**, learn alot. This formative quiz has a typo for the 1st qn where there are 2 of the same options?


So far the stuff being taught is pretty **interesting** and **fun**.The **slido** questions are nice and **engaging** but too little time is given for them.I also don't really like how the team project is purely a written assignment.

This module has been very enjoyable and **engaging** so far.

Fun and **interesting** classes, very engaging :)

Interesting and **fun** learning experience.

Thank you its been **fun** !



#just-chilling

happy chinese new year

Thanks for the fun VR demos in class, prof!!

very interesting module, is better than othe modules other than game project. But i think we will be focus alot on game project so, very sorry prof I will try to pay more attention one. 新年快乐，祝你新的一年里突然暴富，股票大涨，digipen涨工资

all good but babylon.js abit chim

More headsetssss so that compare differences in the headsets

Some revision on hw/sw

Let's repeat some questions...

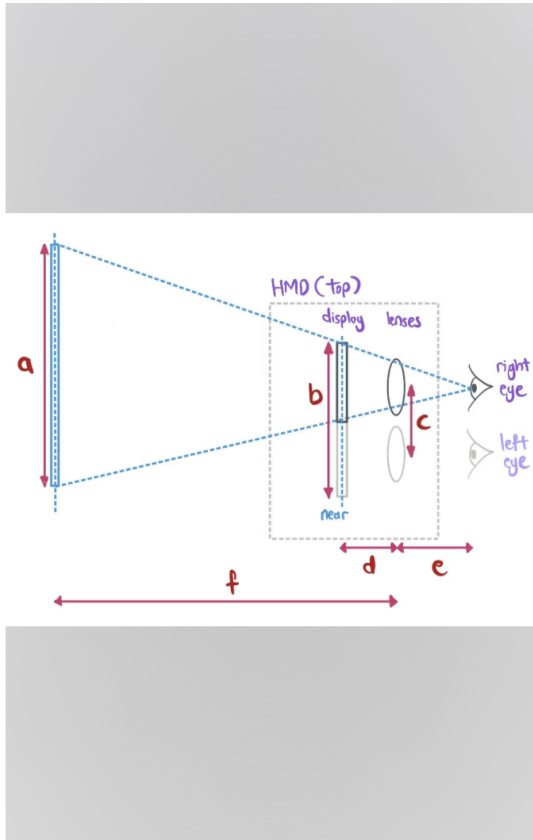
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**In HMDs, what effect will
changing the focal length of the
lens have?**

① Start presenting to display the poll results on this slide.



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

- ☒ Height of the HMD display
0%
- ☒ Depth of the HMD display
0%
- ☒ Depth of the view frustrum's near plane
0%
- ☒ Depth of the virtual image generated
0%

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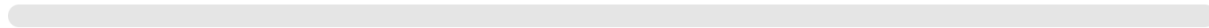


**The view matrix for rendering in
HMDs is the same for both eyes.**

① Start presenting to display the poll results on this slide.

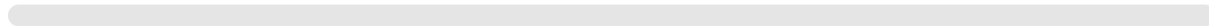
The view matrix for rendering in HMDs is the same for both eyes.

☐ True



0%

☐ False



0%

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

① Start presenting to display the poll results on this slide.

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

☐ Volume is vertically symmetric only



0%

☐ Volume is horizontally symmetric only



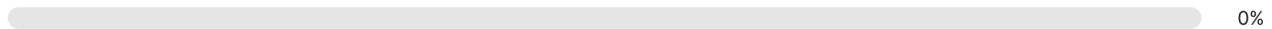
0%

☐ Volume is both vertically and horizontally symmetric



0%

☐ There is no symmetry in the volume

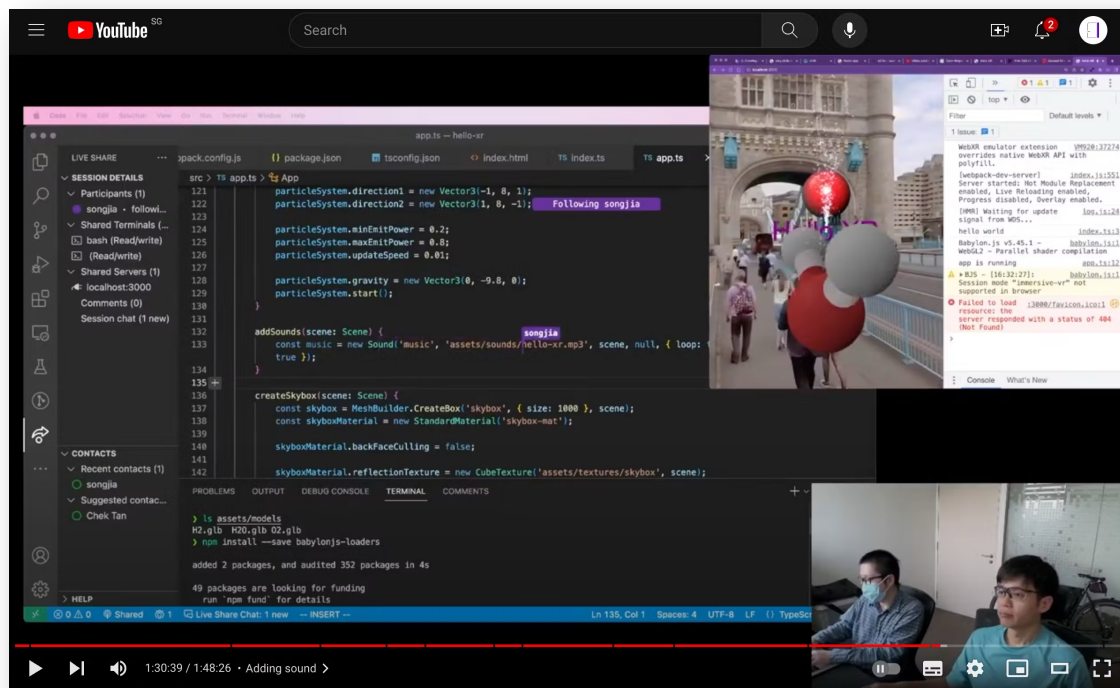


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Creating Virtual Environments

Yes the video...

Video highlights...



- skyboxes & skydomes
- primitives
- loading models
- textures & materials
- lighting
- audio
- other effects

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**Why do we need the following
code?**

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

Why do we need the following code?

- ☒ User is outside the skybox mesh viewing the back face of the textures

0%

- ☒ User is inside the skybox mesh viewing the back face of the textures

0%

- ☒ Skybox is a cube that is meant to be visible from all sides.

0%

- ☒ Removing backface culling is a graphics programming good practice

0%

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

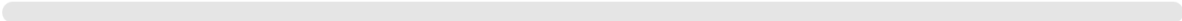
① Start presenting to display the poll results on this slide.

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

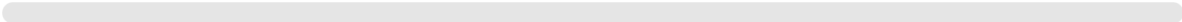
☒ skyboxMat.backFaceCulling = false

 0%

☒ skybox.reflectionTexture.coordinatesMode = Texture.SKYBOX_MODE

 0%

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

 0%

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

 0%

☒ skybox.material = skyboxMaterial

 0%

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What will the following code do?

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

What will the following code do?

- ☒ after "click" down on Btn, show location of pointer

0%
- ☒ after "click" is released on Btn, show location of pointer

0%
- ☒ after "click" is released on Btn, show location of Btn

0%
- ☒ after "click" down on Btn, show location of Btn

0%
- ☒ Compile error

0%

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This code has a runtime error. Which line is the offending line that causes this?

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```
1  async function loadModel() {  
2      const result = SceneLoader.ImportMeshAsync(  
3          "",  
4          "assets/models/",  
5          "dragon.glb",  
6          scene  
7      );  
8      result.meshes[0].position.y = 1;  
9  }  
10 loadModel();
```

This code has a runtime error. Which line is the offending line that causes this?

☐ 1

0%

☐ 3

0%

☐ 5

0%

☐ 8

0%

☐ 10

0%

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

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

☒ Provides visual UI overlays to inspect and manipulate scene live

0%

☒ Optimizes display of complex meshes during debugging step-through

0%

☒ Provides debug console to run live debug scripts

0%

☒ Shows console.log outputs overlaid on the scene

0%

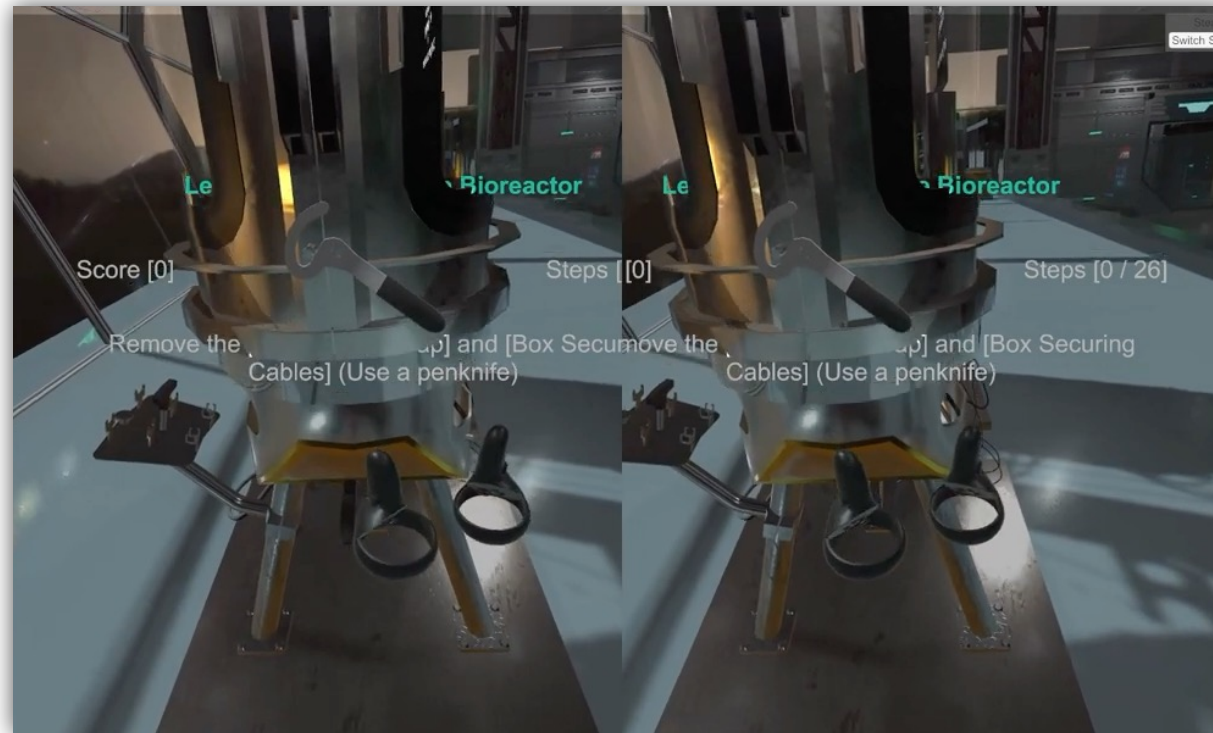
Learning Objectives

- create a 3D virtual environment with a skybox and geometric primitives in WebXR
- implementing a simple GUI in an XR application
- implement anchors to overlay 3D virtual objects in camera video in WebXR
- implement basic audio in WebXR applications
- differentiate model-based vs image-based methods to create virtual environments

Model-based approach

- hand-made 3D models using 3D modelling tools
- requires deep technical art expertise
- enables full interactive implementations

Model-based Approach



<https://youtu.be/zMEs2bhJOMI>

Image-based approach

- 360 photos/videos
- more accessible to untrained creators
- limited to static surroundings
- sometimes 3D reconstruction used to bridge towards model-based

Image-based Approach



<https://dementia.org.sg/2022/03/30/experience-dementia-in-singapore/>



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You are tasked to build a virtual application to provide a virtual tour of an art gallery with artworks that changes every day. 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?


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① Start presenting to display the poll results on this slide.

You are tasked to build a VR application to provide a virtual tour of an art gallery with artworks that changes every day. 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?

 Show Image

 Show poll options



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You are tasked to build a VR application to allow users to experience the daily living challenges faced by individuals with physical disabilities. The experience is primarily a point-and-click adventure format but visual/aural realism is crucial. You have only a month to develop this. What is the optimal approach for creating the virtual environment?

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You are tasked to build a VR application to allow users to experience the daily living challenges faced by individuals with physical disabilities. The experience is primarily a point-and-click adventure format but visual/aural realism is crucial. You have only a month to develop this. What is the optimal approach for creating the virtual environment?

 Show Image

 Show poll options



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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?

① Start presenting to display the poll results on this slide.

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?

 Show Image

 Show poll options



Hybrid Approaches



<https://github.com/singaporetech/immersification-demoConstruct>

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What is not allowed during QUIZ01?

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What is not allowed during QUIZ01?

☒ watching youtube videos



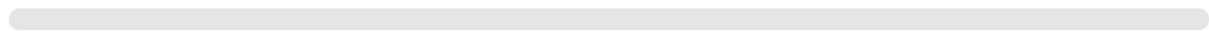
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☒ posting a question on a repo on GitHub



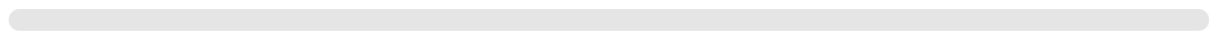
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☒ using earphones/headphones for youtube videos



0%

☒ using stackoverflow.com



0%

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Audience Q&A

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