|  |  |
| --- | --- |
| **Project Case** |  |
| COMP6583 | COMP6583001  Computer Graphics |
| **Computer Science** | **O232-COMP6583-IG01-00** |
| ***Valid on*** *Odd Semester Year 2022/2023* | **Revision 00** |

1. Seluruh kelompok tidak diperkenankan untuk:

*The whole group is not allowed to:*

* + - Melihat sebagian atau seluruh proyek kelompok lain,

*Seeing a part or the whole project from another groups*

* + - Menyadur sebagian maupun seluruh proyek dari buku,

*Adapted a part or the whole project from the book*

* + - Mendownload sebagian maupun seluruh proyek dari internet,

*Downloading a part or the whole project from the internet,*

* + - Mengerjakan soal yang tidak sesuai dengan tema yang ada di soal proyek,

*Working with another theme which is not in accordance with the existing theme in the matter of the project,*

* + - Melakukan tindakan kecurangan lainnya,

*Committing other dishonest actions,*

* + - Secara sengaja maupun tidak sengaja melakukan segala tindakan kelalaian yang menyebabkan hasil karyanya berhasil dicontek oleh orang lain / kelompok lain.

*Accidentally or intentionally conduct any failure action that cause the results of the project was copied by someone else / other groups.*

1. Jika kelompok terbukti melakukan tindakan seperti yang dijelaskan butir 1 di atas, maka **nilai kelompok** yang melakukan kecurangan (menyontek maupun dicontek) akan di – **NOL** – kan.

*If the group is proved to the actions described in point 1 above, the score of the group which committed dishonest acts (cheating or being cheated) will be “Zero”.*

1. Perhatikan jadwal pengumpulan proyek, segala jenis pengumpulan proyek di luar jadwal tidak dilayani.

*Pay attention to the submission schedule for the project, all kinds of submission outside the project schedule will not be accepted.*

1. Bila Anda tidak membaca peraturan ini, maka Anda dianggap telah membaca dan menyetujuinya.

*If you have missed to read these regulations, so you are considered to have read and agreed on it.*

1. Persentase penilaiaan untuk matakuliah ini adalah sebagai berikut:

*Marking percentage for this subject is described as follows:*

|  |  |  |
| --- | --- | --- |
| **Tugas Mandiri**  *Assignment* | **Proyek**  *Project* | **UAP**  *Final Exam* |
| 40% | 60% | - |

1. Software yang digunakan pada matakuliah ini adalah sebagai berikut:

*Software will be used in this subject are described as follows:*

|  |
| --- |
| **Software**  *Software* |
| Chrome / Firefox / Microsoft Edge  Three JS  Visual Studio Code |

1. Ekstensi file yang harus disertakan dalam pengumpulan tugas mandiri, proyek, dan uap untuk matakuliah ini adalah sebagai berikut:

*File extensions should be included in assignment, project, and final exam collection for this subject are described as follows:*

|  |  |  |
| --- | --- | --- |
| **Tugas Mandiri**  *Assignment* | **Proyek**  *Project* | **UAP**  *Final Exam* |
| HTML, CSS, JS, Image Files (JPG / PNG), GLB | HTML, CSS, JS, Image Files (JPG / PNG), GLB | - |

## Soal

*Case*

**Hot Air Balloon**

William and Hans, both are hot air ballon enthusiasts that wants to make a simulation for a simple hot air ballon take off. The simulation will consist of how a balloon will take off through user input. William and Hans are having difficulties in creating how the simulation will look like. As their best friend you are asked to design the scene and animation using three.js library.

1. **Project Structure**

Your project should contain a main html file, several JavaScript files, assets, and the three.js library. You are to acquire three.js either from the three.js [official website](https://threejs.org/), [github repository](https://github.com/mrdoob/three.js/), or [CDN link](https://cdnjs.com/libraries/three.js).

You are required to include the following piece of code in your html file.

|  |
| --- |
| <style>  \* { margin: 0; padding: 0; }  body { width: 100vw; height: 100vh; overflow: hidden; }  </style>  <script src="[path to index.js file]" type="module"></script> |

You are free to split your code into several different JavaScript file, but code the main logic for creating the scene inside “index.js” file.

1. **Scene**

Create a **full screen** scene that can be **dynamically resized** to **fit the window**. The scene also has **shadow map** **enabled** using **PCFShadowMap** as the shadow map **type** and **anti-aliasing** turned on.

1. **Camera**

Create **two cameras** which details will be specified below. By default, the scene will use the **Fixed Camera.**

* 1. **Fixed Camera**
     + This camera will have the following specifications:

|  |  |
| --- | --- |
| Property | Value |
| Type | Perspective Camera |
| FoV | 50 |
| Position | Vector3 (-180, 30, 0) |
| Near | 1 |
| Far | 5000 |

* + - This camera will focus on **Vector3 (0, 30, 0)** position and **cannot move or rotate**.
    - If user presses **space**, change camera view to **Free Camera** and all animations are **stopped.**

A picture containing sky

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**Figure 1. Viewing using Fixed Camera**

* 1. **Free Camera**
     + This camera will have the following specifications:

|  |  |
| --- | --- |
| Property | Value |
| Type | Perspective Camera |
| FoV | 50 |
| Position | Vector3 (-200, 50, 0) |
| Near | 1 |
| Far | 5000 |

* + - The camera will focus on **Vector3 (0, 0, 0)** and can move, rotate with **OrbitalControls**.
    - If user presses **space**, change camera view to **Fixed Camera.**

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**Figure 2 Viewing using Free Camera**

1. **Lighting**

There will be **four** global lights to illuminate the entire scene. There will be **two** types of lights, **SpotLight** and **AmbientLight**.

* 1. **Ambient Light**

|  |  |
| --- | --- |
| Property | Value |
| Type | AmbientLight |
| Color | #404040 |

* 1. **Spot Light 1**
     + The spot light will face the Vector3 (0, 50, 0) position
     + Below are the specifications:

|  |  |
| --- | --- |
| Property | Value |
| Type | SpotLight |
| Intensity | 1 |
| Color | #FFFFFF |
| Position | Vector3 (-100, 0, 100) |
| Distance | 300 |
| Cast Shadow | Yes |

* 1. **Spot Light 2**
     + The spot light will face the Vector3 (0, 50, 0) position
     + Below are the specifications

|  |  |
| --- | --- |
| Property | Value |
| Type | SpotLight |
| Intensity | 1 |
| Color | #FFFFFF |
| Position | Vector3 (-100, 0, -100) |
| Distance | 300 |
| Cast Shadow | Yes |

* 1. **Spot Light 3**
     + The spot light will face the Vector3 (0, 0, 0) position
     + Below are the specifications

|  |  |
| --- | --- |
| Property | Value |
| Type | SpotLight |
| Intensity | 0.5 |
| Color | #FFFFFF |
| Position | Vector3 (0, 200, 0) |
| Distance | 300 |
| Angle | / 4 + / 6 |
| Cast Shadow | Yes |

1. **Objects**
   1. **Ground**

* Below are the specifications:

|  |  |
| --- | --- |
| Property | Value |
| Geometry Type | Plane |
| Widht | 1000 |
| Height | 1000 |
| Material Type | Mesh Standard Material |
| Color | #8c3b0c |
| Position | Vector3 (0, -5, 0) |
| Rotation | Euler (- / 2, 0, 0) |
| Receive Shadow | Yes |

A picture containing night sky

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**Figure 3 Ground**

* 1. **Hot Air Balloon**
* Place the balloon exactly at the **middle** of the scene
* Load model from the **GLTF** **file** **“**model/scene.gltf**”**
* When first load the model’s **size** and **orientation** is not the most optimal, so you need to **adjust** it yourself
* Below are the specifications

|  |  |
| --- | --- |
| Property | Value |
| Cast Shadow | Yes |
| Receive Shadow | Yes |

A hot air balloon in the sky

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**Figure 4 Hot Air Balloon**

* 1. **Crate A**
     + Place the crates around the balloon in a **varying position, rotations, sizes.**
     + Below are the overall specifications:

|  |  |
| --- | --- |
| Property | Value |
| Geometry Type | Box Geometry |
| Material Type | Mesh Phong Material |
| Texture 1 |  |
| Cast Shadow | Yes |
| Receive Shadow | Yes |

* + - Below are the specifications for each crate:
    - 1st Crate

|  |  |
| --- | --- |
| Property | Value |
| Width | 10 |
| Height | 10 |
| Depth | 10 |
| Position | Vector3 (-30, 0, -40) |
| Rotation | Euler (0, 0) |

* + - 2nd Crate

|  |  |
| --- | --- |
| Property | Value |
| Width | 5 |
| Height | 5 |
| Depth | 5 |
| Position | Vector3 (-30, -2, -48) |
| Rotation | Euler (/ 6, 0, 0) |

* + - 3rd Crate

|  |  |
| --- | --- |
| Property | Value |
| Width | 10 |
| Height | 15 |
| Depth | 10 |
| Position | Vector3 (-40, 2.5, 30) |
| Rotation | Euler (0, / 4, 0) |

* 1. **Crate B**
     + Place the crates around the balloon in a **varying position, rotations, sizes.**
     + Below are the specifications:

|  |  |
| --- | --- |
| Property | Value |
| Geometry Type | Box Geometry |
| Material Type | Mesh Phong Material |
| Texture | A picture containing wooden, outdoor, building, wood  Description automatically generated |
| Cast Shadow | Yes |
| Receive Shadow | Yes |

* + - 1st Crate

|  |  |
| --- | --- |
| Property | Value |
| Width | 20 |
| Height | 20 |
| Depth | 20 |
| Position | Vector3 (30, 5, 40) |
| Rotation | Euler (0, / 3, 0) |

* + - 2nd Crate

|  |  |
| --- | --- |
| Property | Value |
| Width | 40 |
| Height | 15 |
| Depth | 30 |
| Position | Vector3 (30, 2.5, -60) |
| Rotation | Euler (0, - / 6, 0) |

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**Figure 5 Crates**

* 1. **Tires**
     + Place tires in **front** of the balloon, with **rotation** that faces the balloon.
     + All tires will have the same **size** but different **rotation** and **position**.
     + Below are the specifications:

|  |  |
| --- | --- |
| Property | Value |
| Geometry Type | Torus Geometry |
| Material Type | Mesh Standard Material |
| Color | #3e444c |
| Cast Shadow | Yes |
| Receive Shadow | Yes |
| Radius | 5 |
| Tube Radius | 2.5 |
| Radial Segment | 16 |
| Tubular Segment | 100 |
| Tire 1 Position | Vector3 (-70, -5, 0) |
| Tire 1 Rotation | Euler (0, /2, 0) |
| Tire 2 Position | Vector3 (-65, -5, 20) |
| Tire 2 Rotation | Euler (0, /2 + (/9 \* 1), 0) |
| Tire 3 Position | Vector3 (-65, -5, -20) |
| Tire 3 Rotation | Euler (0, -( /2 + ( /9 \* 1)), 0) |
| Tire 4 Position | Vector3 (-55, -5, 40) |
| Tire 4 Rotation | Euler (0,  /2 + (/9 \* 2), 0) |
| Tire 5 Position | Vector3 (-55, -5, -40) |
| Tire 5 Rotation | Euler (0, -(/2 + (/9 \* 2)), 0) |

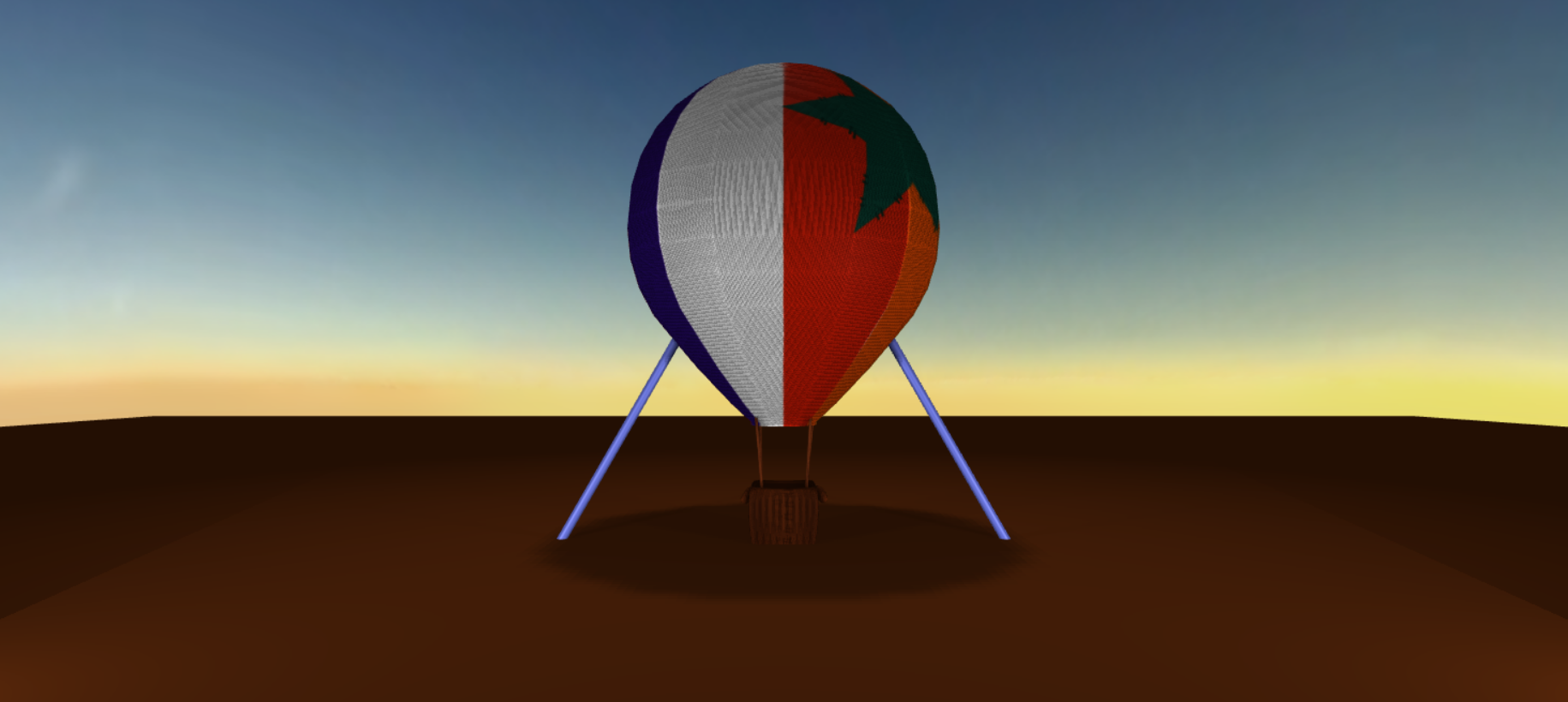
A hot air balloon in the sky

Description automatically generated with medium confidence

**Figure 6 Tires**

* 1. **Poles**
     + Place the 2 poles **next** to the balloon**.**
     + Below are the overall specifications:

|  |  |
| --- | --- |
| Property | Value |
| Geometry Type | Cylinder Geometry |
| Material Type | Mesh Phong Material |
| Color | #646FD4 |
| Radius Top | 1 |
| Radius Bottm | 1 |
| Height | 50 |
| Radial Segments | 16 |
| Cast Shadow | Yes |
| Receive Shadow | Yes |
| Pole 1 Position | Vector3 (0, 15, 35) |
| Pole 1 Rotation | Euler (- / 6, 0, 0) |
| Pole 2 Position | Vector3 (0, 15, -35) |
| Pole 2 Rotation | Euler (/ 6, 0, 0) |



**Figure 7 Poles**

* 1. **Button**
     + Place the button **diagonally** in front of the balloon, the button will **face** the **Fixed Camera**.
     + Below are the specifications:

|  |  |
| --- | --- |
| Property | Value |
| Geometry Type | Box Geometry |
| Material Type | Mesh Phong Material |
| Width | 10 |
| Height | 16.5 |
| Depth | 14.5 |
| Color | #848482 |
| Cast Shadow | Yes |
| Receive Shadow | Yes |
| Position | Vector3 (-43, 3, 65) |
| Rotation | Euler (0, - / 6, 0) |

|  |  |
| --- | --- |
| Property | Value |
| Geometry Type | Shpere Geometry |
| Material Type | Mesh Phong Material |
| Color | #dc143c |
| Cast Shadow | Yes |
| Receive Shadow | Yes |
| Radius | 4.5 |
| Width Segment | 32 |
| Height Segment | 16 |
| Position | Vector3 (-46, 3, 63) |

A picture containing sky, aircraft

Description automatically generated

**Figure 8 Button**

* + - When the button is **clicked** it will play an animation to **rotate** both poles to an **upright** position.
    - During the animation if the button is clicked **nothing** will happen.
    - When the animation is over, then the button will **change color**.
    - Below are the specifications:

|  |  |
| --- | --- |
| Property | Value |
| New Color | #fada5e |

**A picture containing sky, balloon, aircraft

Description automatically generated**

**Figure 9 Button Event 1**

* + - After changing the color, the button is clickable one more time.
    - If it is **clicked** the balloon will start to slowly **fly** **upwards**. Then the button will **change** its **color** once more.
    - The balloon will have **rotating** animation while flying upwards.
    - Below are the specifications:

|  |  |
| --- | --- |
| Property | Value |
| New Color | #32cd32 |

**A screenshot of a video game

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**Figure 10 Button Event 2**

* 1. **Text**
     + Place the text above the **button’s** position.
     + When first load, you must adjust the **font size** and **height**.
     + Below are the specifications:

|  |  |
| --- | --- |
| Property | Value |
| String | Click Me! |
| Font Type | Helvetiker Bold |
| Material Type | Mesh Phong Material |
| Color Front | #FF5B00 |
| Color Side | #990000 |
| Cast Shadow | Yes |
| Receive Shadow | Yes |
| Position | Vector3 (-35, 25, 50) |
| Rotation | Euler (0,  \* 3 + 1, 0) |

A picture containing text

Description automatically generated

**Figure 11 Text**

1. **Skybox**

Create the skybox using **cube mapping technique** with the following specifications:

|  |  |
| --- | --- |
| Property | Value |
| Size | 1000 x 1000 x 1000 |
| Texture  (In sequence: dawn-right, dawn-left, dawn-top, dawn-bottom, dawn-front, dawn-back) | |  |  |  | | --- | --- | --- | |  |  |  | |  |  |  | |

**References**

<https://www.pinterest.com/pin/666884657293952974/>

<https://sketchfab.com/3d-models/low-poly-hot-air-balloon-3eff436e33ce4db3a54d4d8edc43528b>

<https://www.pinterest.com/pin/361062095115109688/>

<https://www.pinterest.com/pin/522769469231434180/>

Here are the **rules** that you must follow to create your project:

1. Use **appropriate software** for this subject based on **Sistem Praktikum** that can be downloaded from Binusmaya.
2. Collect **appropriate files** for this subject based on **Sistem Praktikum** that can be downloaded from Binusmaya.
3. Include the **other files** that can support your project, such as:
   * All files in your project.
   * Other files (image, audio, video, etc.) used in your project.
   * \*.doc file (documentation of your project) that contains all pages in your project, reference links of additional files (image, audio, video, etc.) used in your project, the description about how to use your application, etc.

**If you do not understand, please ask your assistant! Do not make your own assumption!**