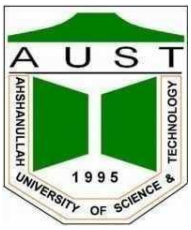
Ahsanullah University of Science & Technology
Department of Computer Science & Engineering



A Medieval Castle

Computer Graphics Lab (CSE 4204)

Project Final Report

Submitted By:

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Project Requirements:

3D Objects:

1. Castle walls [with texture]

2. Drawbridge [with texture]

Keyboard Interaction:

- Camera will move around the castle

Mouse Interaction:

- Drawbridge will raise and lower

Animation:

- Sky color will change to simulate different times of the day

Software Platform:

1. VS Code (Visual Studio Code) - Version 1.91

Visual Studio Code (VS Code) is used for writing and debugging the project's code. Its support for JavaScript, along with features like IntelliSense, Git integration, and a wide range of extensions, provides an efficient development environment.

2. Adobe Photoshop

We used Adobe Photoshop for creating and manipulating textures for the 3D models. Its powerful tools for photo editing and graphic design enable the creation of high-quality visuals, essential for the project's realistic rendering.

3. Node.js - Version 20.15.0

Node.js is utilized for server-side development, allowing us to run JavaScript code outside the browser. Its rich library of modules facilitates file system I/O, network communication, and data streaming, ensuring robust performance for our 3D application.

Project Features:

The project incorporates several advanced features to create an interactive and visually appealing 3D scene.

- Custom Shader: A custom shader is partially implemented for the ground, featuring a gradient effect that dynamically changes the color based on the position of the vertices. This adds depth and variation to the landscape, improving the overall visual quality.
- Perspective Projection: The scene employs perspective projection to create realistic depth and spatial relationships. The camera moves around the environment, providing a detailed and immersive view of the landscape, including the castle, trees, cliffs, and river.
- Trees and Foreground: High-quality textures are loaded for different seasonal effects. Summer textures are applied to trees and the foreground to represent the environment dynamically. Castle and River: The castle, cliffs, and river are modeled and textured to match a high level of detail, enhancing the realism of the environment.
- Camera Movement: Users can move the camera using keyboard inputs (arrow keys) to explore the 3D environment from different angles. Day-Night Cycle: Using the 'u' and 'l' keys, users can raise or lower the drawbridge and switch between night and day modes, changing the lighting and visibility of the sun and moon dynamically.

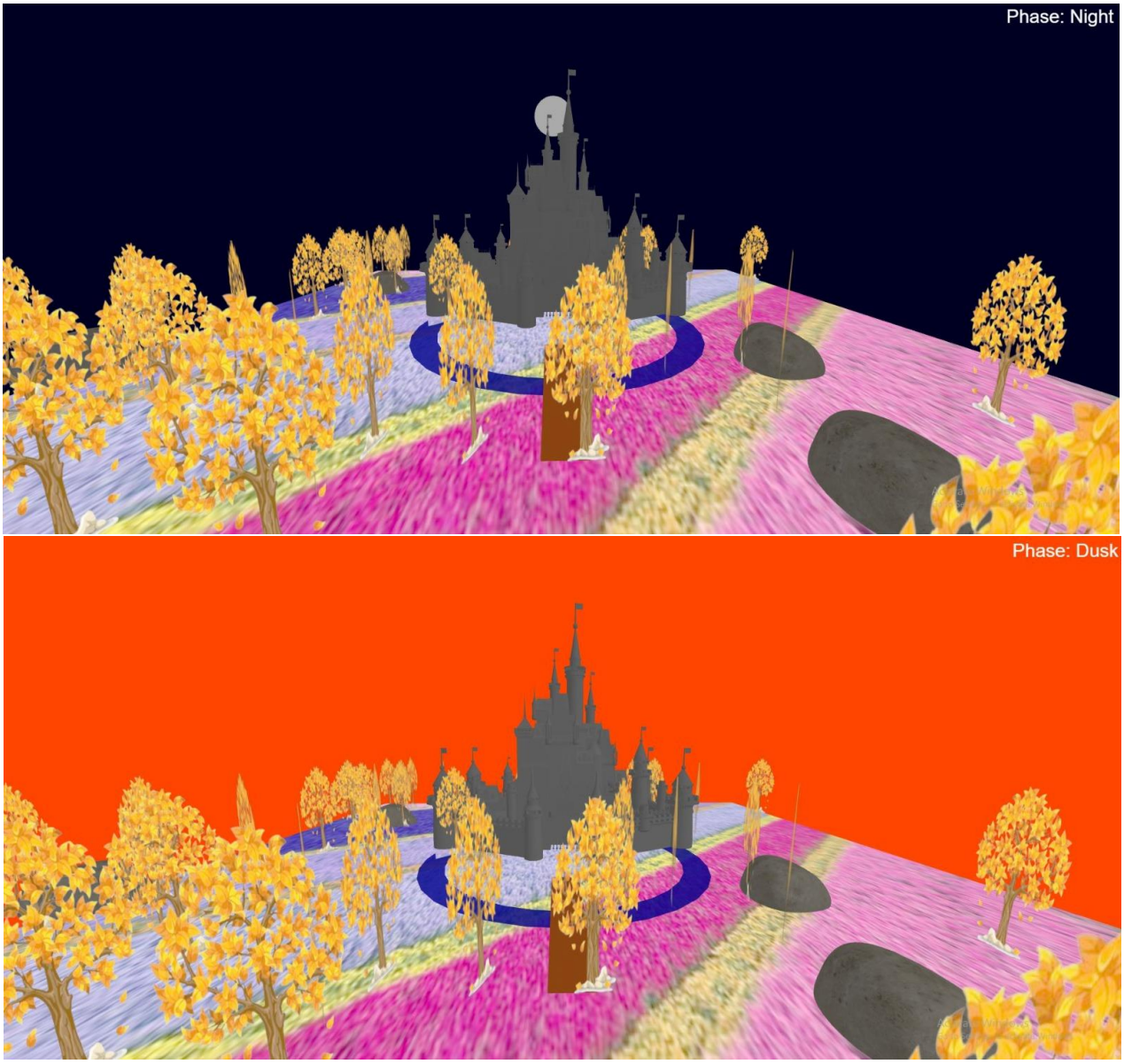
Attach a table with all your required/additional features and classify them into three categories: Implemented, Partially Implemented and Not Implemented.

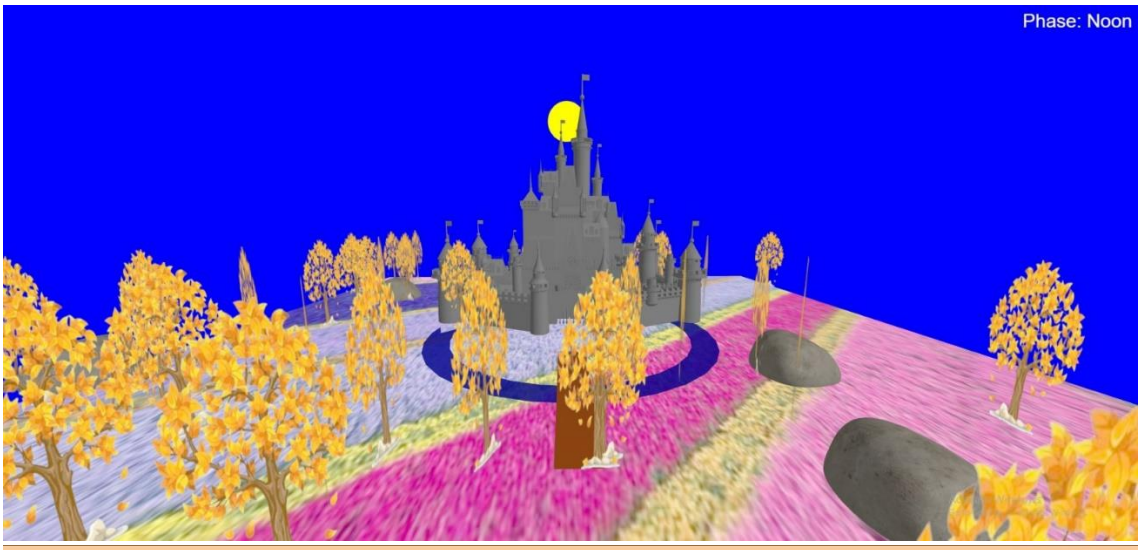
#	Features	Status
1	Custom Shaders	Partially Implemented
2	Perspective Projection	Implemented
3	Trees and Foreground	Implemented
4	Camera Movement	Implemented
5	Comprehensive and Immersive 3D Experience	Implemented
6	Mouse and Keyboard Interaction	Implemented

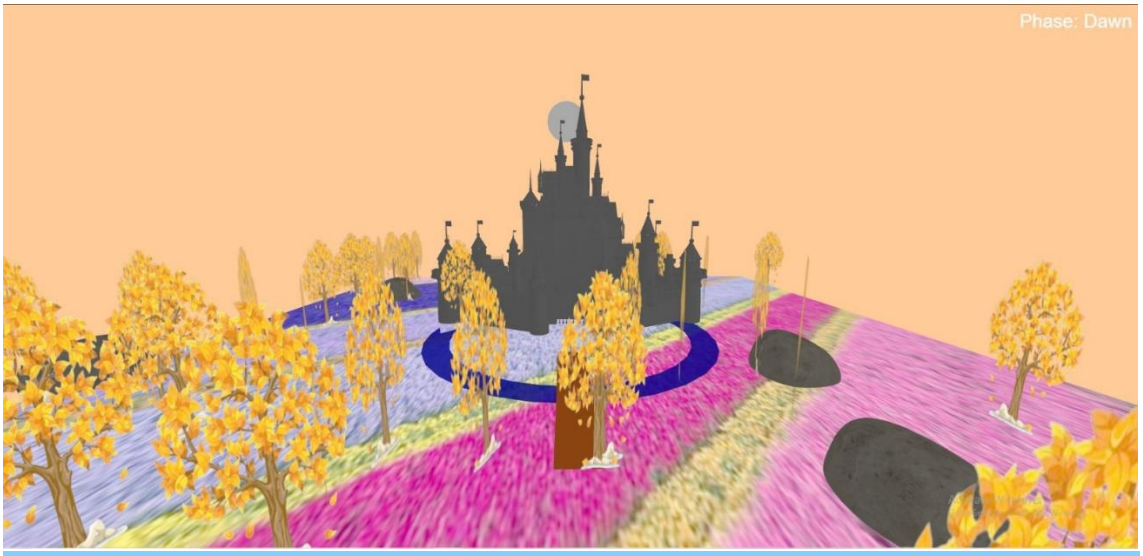
Table 01: Project Feature Table

Snapshots:

Implementation of Lighting of every time of the day:

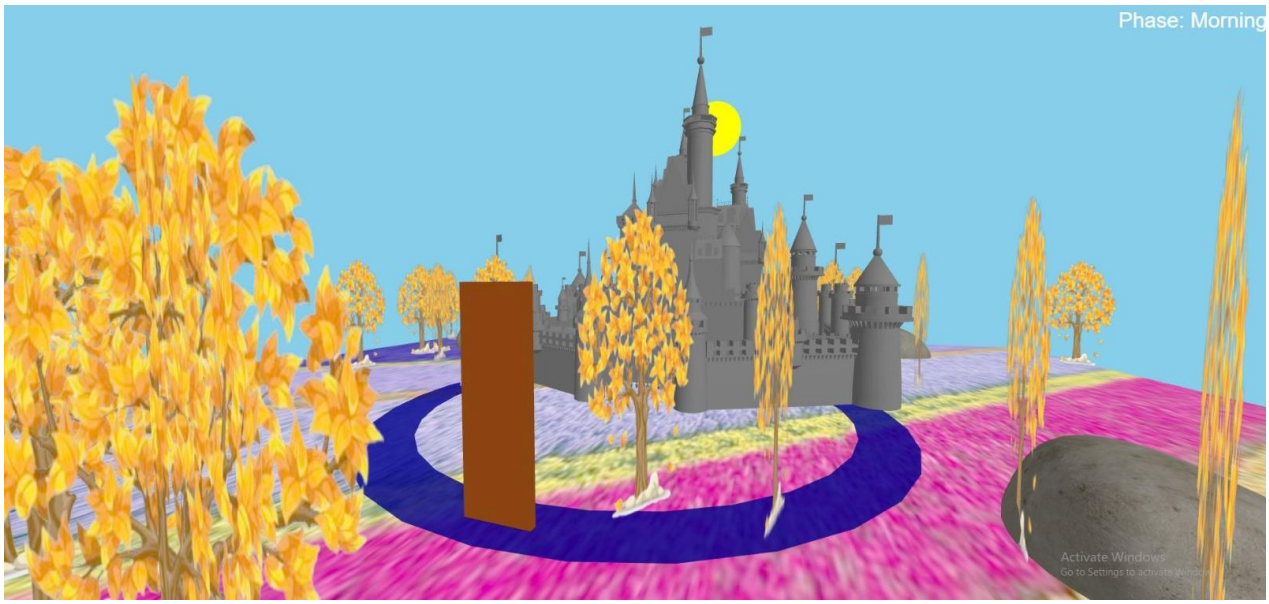


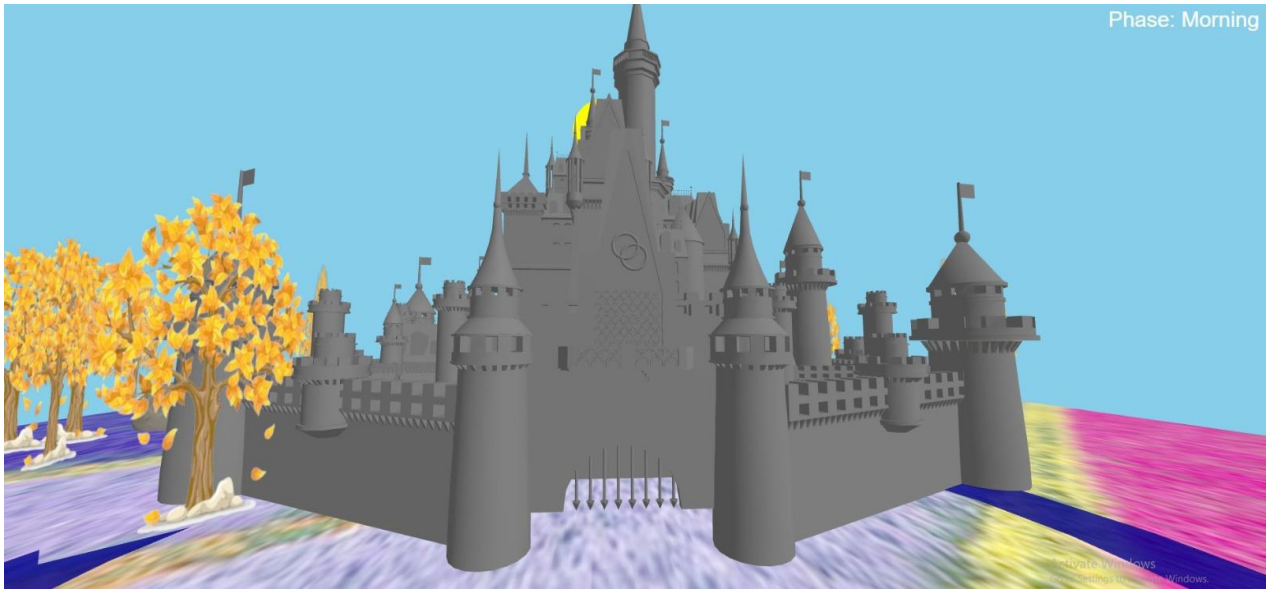

Phase: Noon


Phase: Dawn

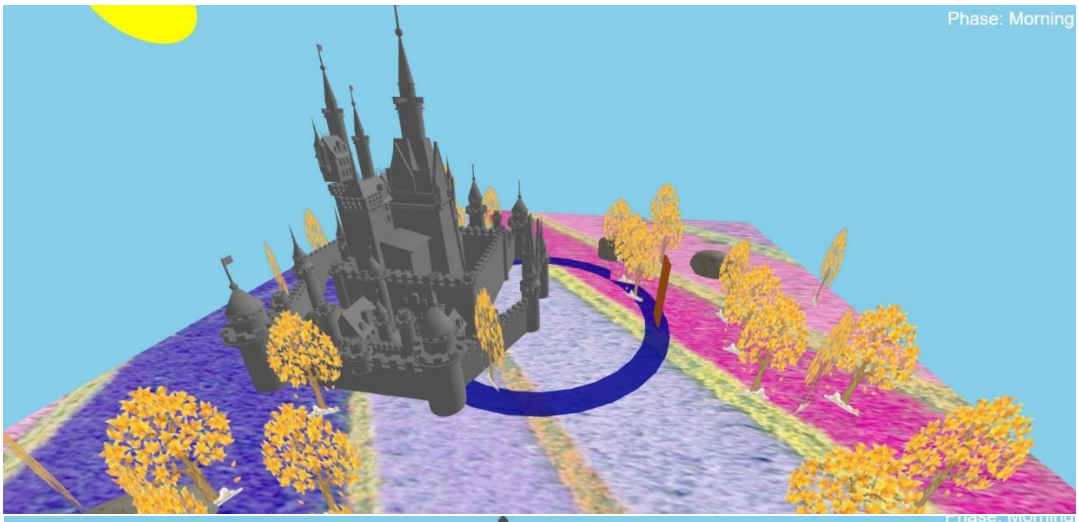

Phase: Afternoon

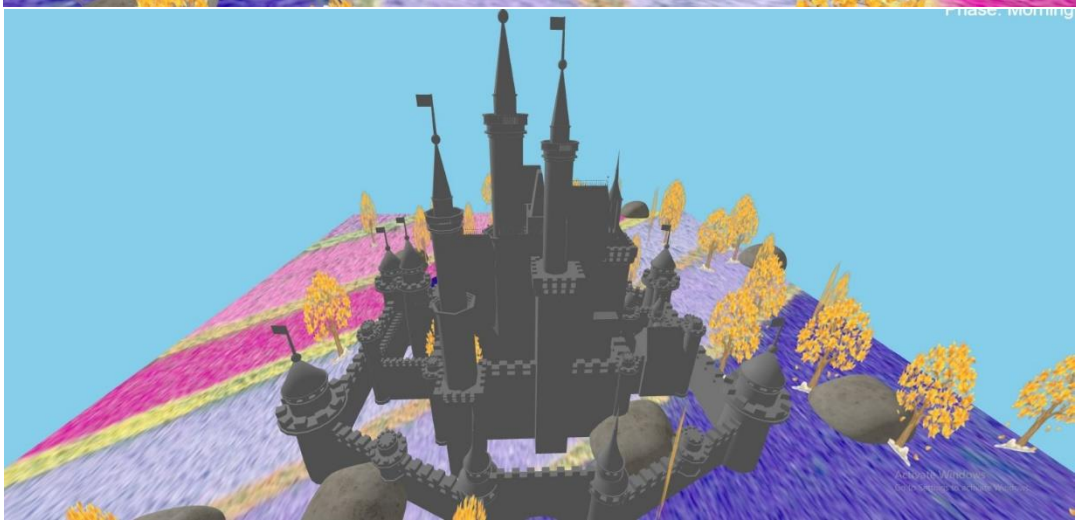
Texture for each object:



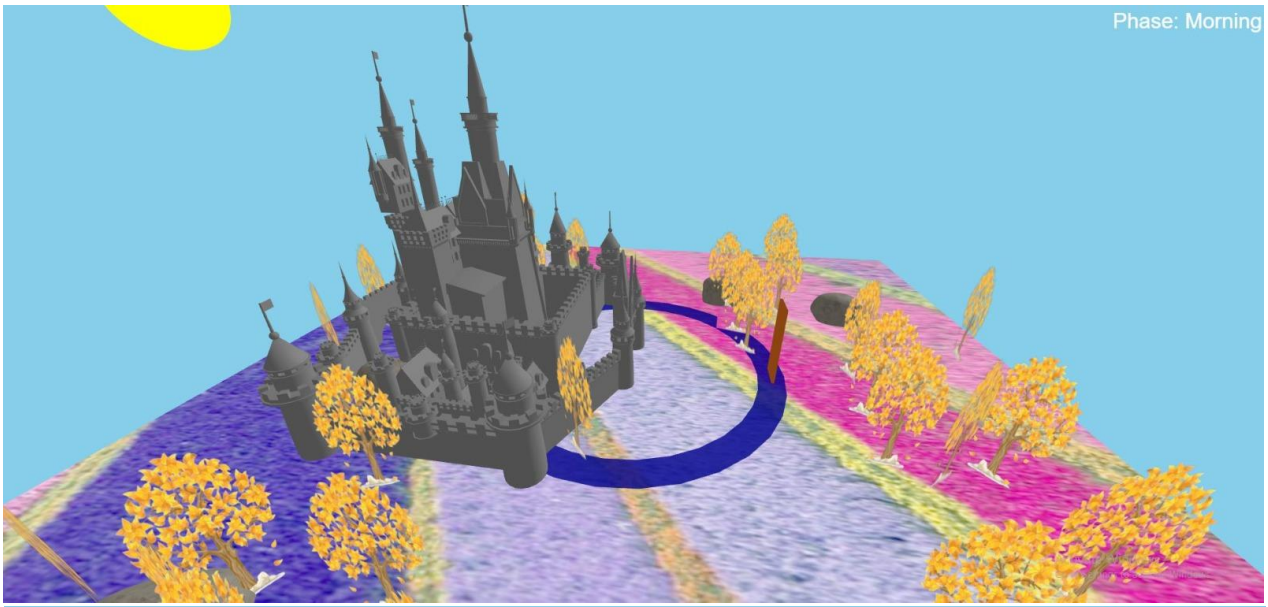


Perspective Projection:





Mouse and Keyboard Interaction:



Contribution:

20200104032 (Fahim Faisal Akif): Implementation of the project, Structuring the 3D models, Designing the scene.

20200104030 (Md Nafiur Rahman Konok): Setting up the ambient and directional lights, Modeling wheels, Report Writing.

Future Work: To improve the project, ensure that all texture paths are correctly linked, as missing textures can result in objects appearing white or not rendering properly. The bridge raising and lowering could be animated more smoothly, instead of an instant flip. Additionally, check the random positioning of cliffs to ensure they are placed correctly outside the castle boundary. To prevent users from moving the camera too far out of the scene, camera boundary limits should be implemented. If performance issues arise due to the number of models, instanced meshes for the trees. Lastly, the day-night cycle could be enhanced by animating the sun and moon's movement across the sky, creating a more natural transition.

These improvements would make the project more engaging, lifelike, and enjoyable for users.