

COSC422: Assignment 2

Report

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Description.

The scene is of a mountainous terrain with water pooled in low areas of the terrain. The mountains are rendered using different textures for three levels of height, with grass at the base, rock in the middle, and snow at the top. The textures are blended together where they meet. The water is animated so that ripples travel from the deeper areas towards the shorelines, becoming more pronounced closer to shore. The water is highlighted at the shorelines and darker in deeper areas. The scene is lit with diffuse and ambient light, and the water also has specular highlights. An image of the scene is shown in Figure 1.

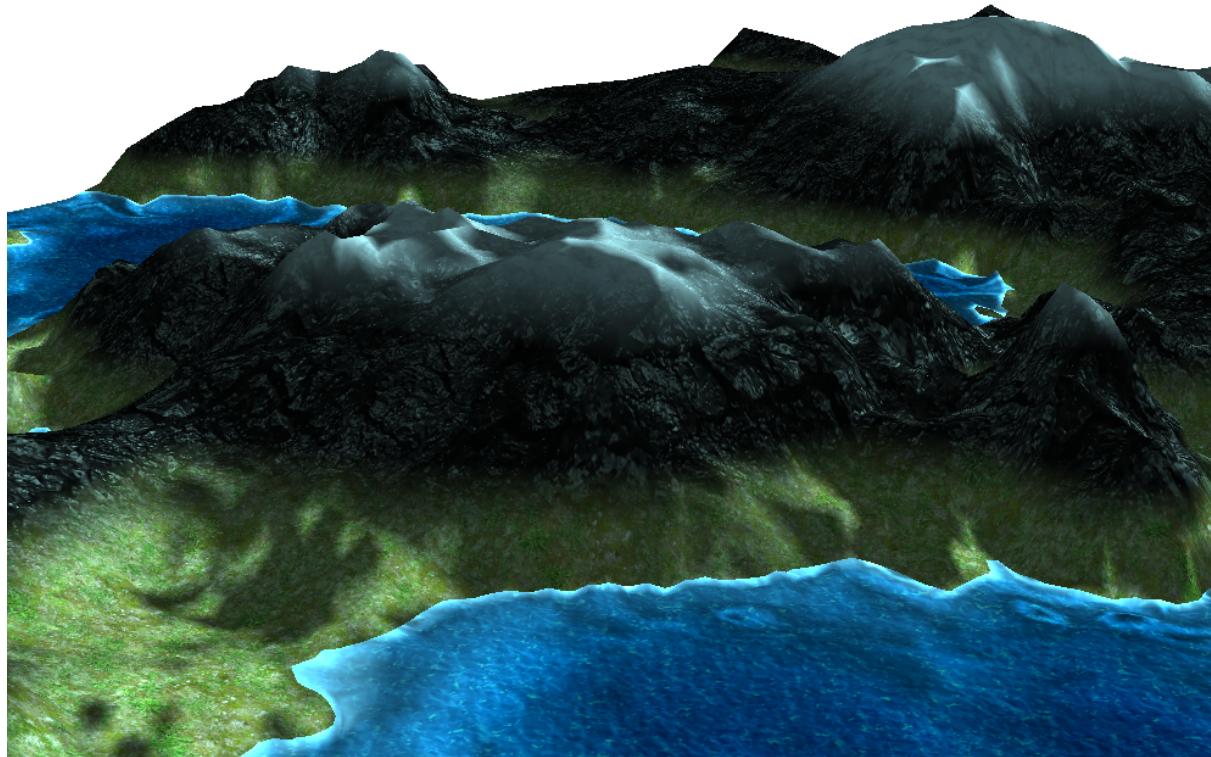


Figure 1: The scene

Extra Features

Removing Cracking

Cracking occurs when two adjacent patches have a different tessellation level and the vertices of the patches do not line up, creating cracks in the mesh. An image of the scene with cracking visible is shown in Figure 2.

Cracking was removed by changing the way that tessellation levels were calculated in the control shader. Rather than assigning the same tessellation level to an entire patch, each

edge of the patch had its tessellation level calculated separately, based only on the patch vertices on that edge. This means that patches that share edges will have the same tessellation level along adjacent edges. The scene in Figure 3 shows that cracking has been fixed.

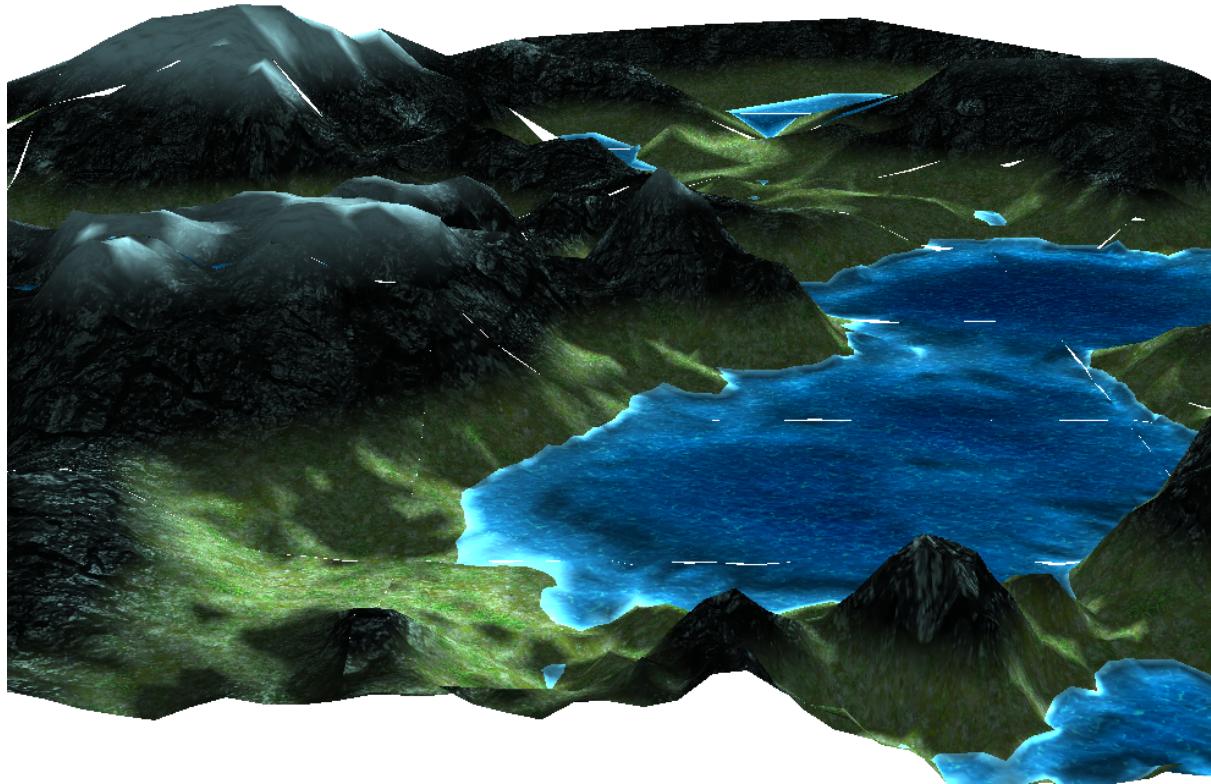


Figure 2: The scene with cracking

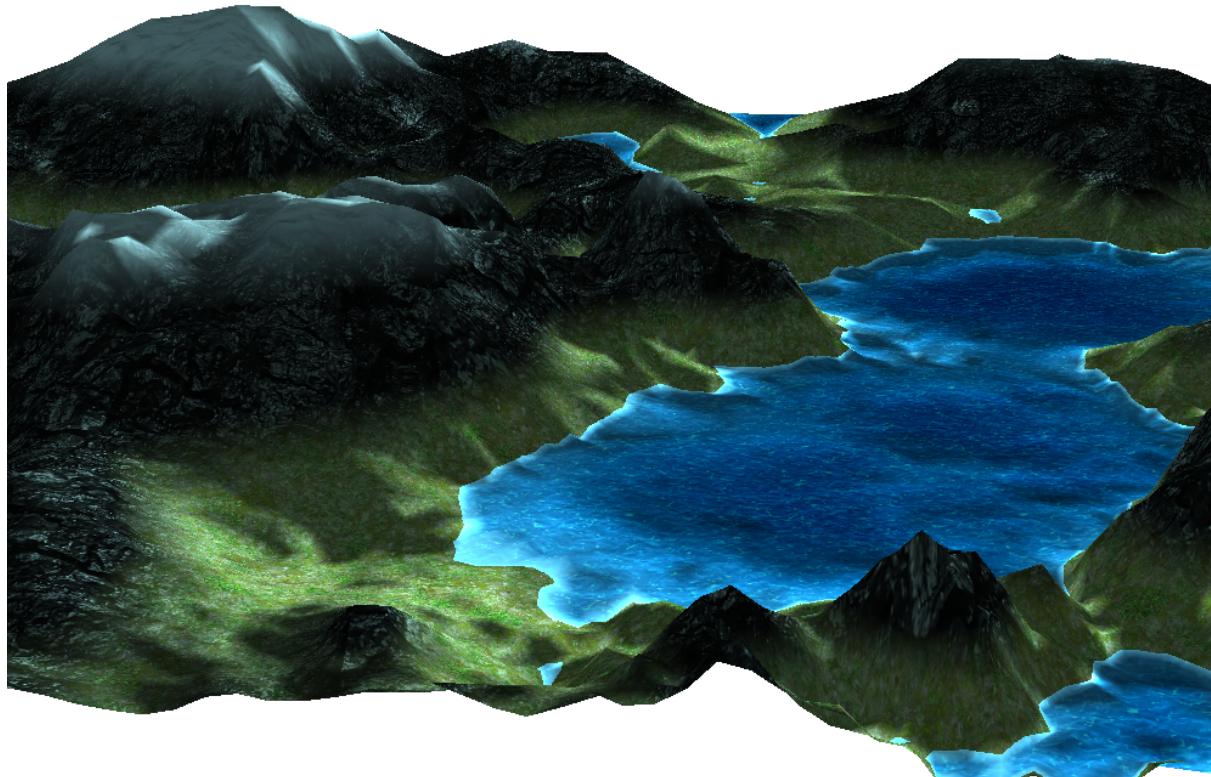


Figure 3: The scene without cracking

Water appearance

The colour of the water texture was modified to show deep and shallow areas. The depth of the water was found using the height map values. In areas where the water was deep, the water was made darker. Above a certain depth threshold, the water was instead made lighter to create highlights on the shorelines. This was done so that the highest areas which are at the very edges of the water are the brightest, and the highlight fades as the water gets deeper. The scene without these colour changes is shown in Figure 4, contrasting the scene shown earlier in Figure 3.

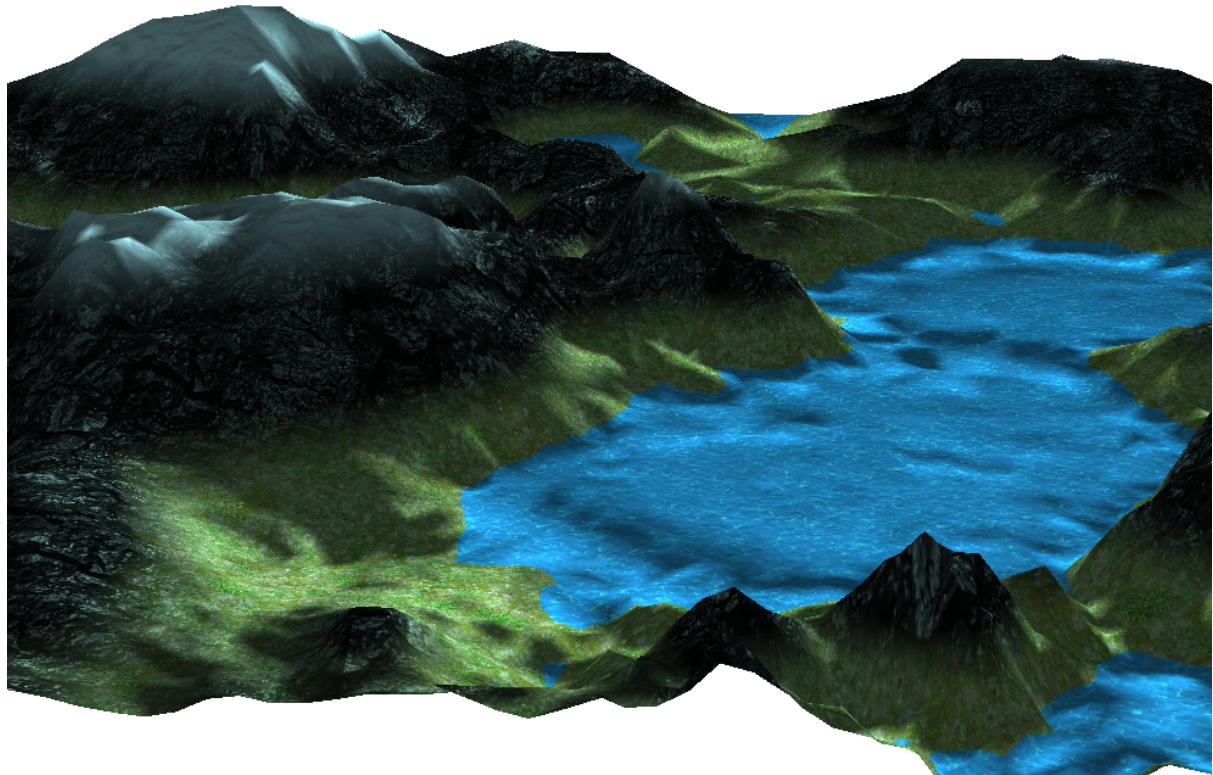


Figure 4: The scene without water colour variation

Water ripples

Water ripples were implemented using a sine function based on the depth of the water at each point. A tick counter would increase over time and this would be used to update the sine function so that it would make ripples that moved from deep areas towards shallow areas. The magnitude of the sine function was multiplied by $(1 - \text{depth})$ so that areas closer to the shore would have stronger waves.

The normal vectors used to calculate lighting were calculated in the evaluation shader. To find normal vectors of points on the water was calculated by sampling points around each point and applying the sign function to the sampled points. This could then be used to calculate the normal vector.

Keyboard controls

The camera can be moved using the arrow keys. The up and down arrows move the camera forward and back, and the left and right arrows rotate the camera left and right.

Pressing the spacebar toggles the view from the regular view to a wireframe model. The wireframe model is shown in Figure 5.

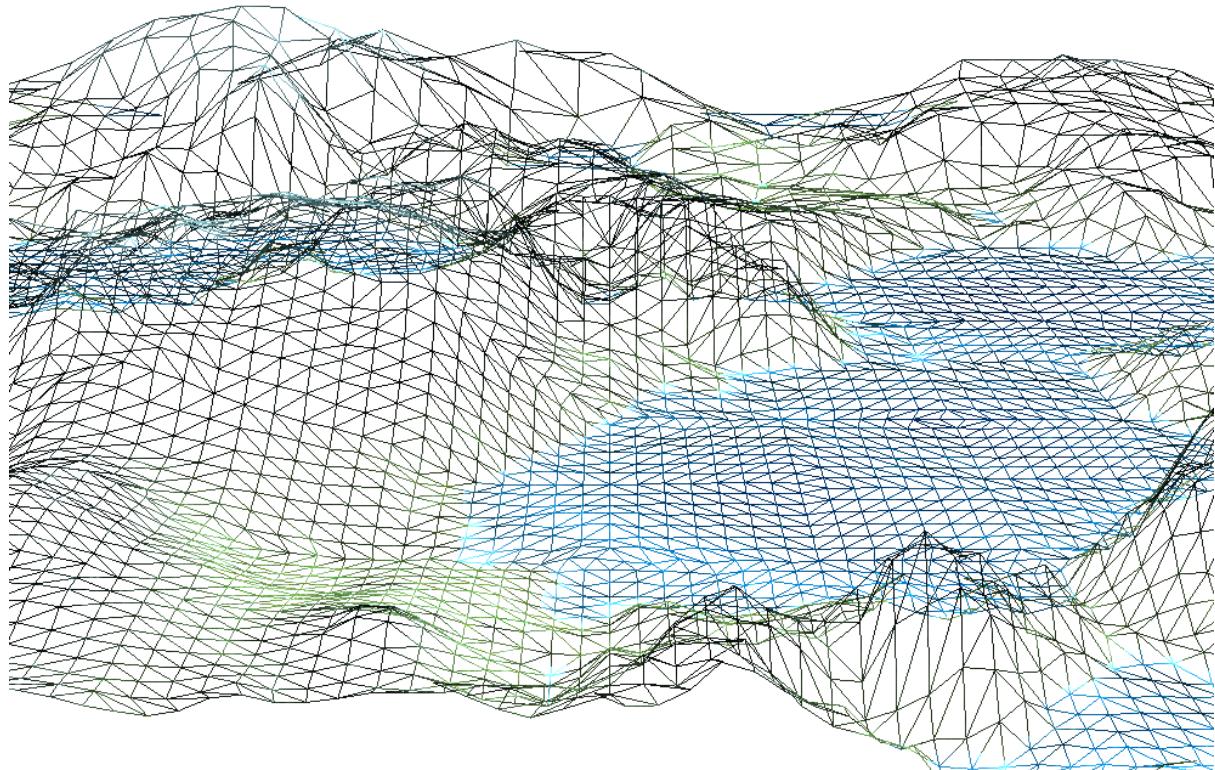


Figure 5: Wireframe model of scene

Textures

All textures used were those supplied in exercise 14. Terrain_hm_01.tga was used to generate the terrain. Water.tga, Grass.tga, Rock3.tga and Snow.tga were used for textures.