DigiPen INSTITUTE OF TECHNOLOGY EUROPE - BILBAO

MAT 300 | Curves & Surfaces
Project Description| Terrain Mesh Generation

Topics

- Bezier Surface Patches
- Height Map Processing
- Control Point Editing for Smoothness Adjustment
- Interactive Editor for Terrain Modification
- Road and River Path Integration

Goals & Grading:

- Height Map-Based Terrain Generation: 20%
- Bezier Patch Control for Smoothness: 25%
- Editor GUI for Control Points: 25%
- Road and River Adaptation to Terrain: 20%
- Demo Quality: 15%

Description

This project aims to create a terrain mesh using Bezier patches, with height map-based generation and adjustable smoothness through control points. Additionally, an editor interface will be implemented to allow manual editing of terrain patches and the integration of roads and rivers that conform to the generated surface.

Terrain Generation

- **Height Map Input:** The terrain mesh is generated based on a grayscale height map texture, where pixel intensity determines the elevation.
- **Bezier Patch Representation:** The terrain is divided into multiple Bezier patches, allowing smooth surface generation and easy modification.
- **Adaptive Resolution:** Higher density patches are used for complex terrain features, while flatter areas use fewer patches for efficiency.

Bezier Patch Control for Smoothness

- **Editable Control Points:** Each patch consists of a grid of control points that can be manually adjusted to refine terrain smoothness.
- **Continuity Preservation:** Ensuring continuity between patches to avoid visible seams.
- **Subdivision Strategy:** Dynamic patch subdivision based on terrain roughness to optimize detail where necessary.

Editor GUI for Terrain Modification

- **Control Point Editing:** Users can click and drag control points within the editor to reshape terrain features.
- **Height Adjustment Tools:** Direct height modification of selected patches to fine-tune terrain details.
- **Visual Feedback:** Real-time rendering of changes with shading and wireframe visualization modes.

Road and River Integration

- **Path Definition:** Users define roads and rivers by placing waypoints on the terrain.
- **Surface Fitting:** The defined paths automatically adjust to the underlying Bezier patches, ensuring natural integration.

README.txt

Additionally, you are **REQUIRED** to submit a README.txt file that is formatted as follows:

- Name/Student ID:
- Login:
- Additional Notes: Describe your extra credit part and how to use it here.
- Known Bugs: List any bugs that your submitted implementation has. If you had no bugs, leave this field blank.
- Time of implementation: This is the time it took you to complete the implementation.
- Time of testing: This is the time that you spent testing your work.
- Comments: Leave any comments that you might have about the assignment here.