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Project 1: Modeling Seashells with Perlin Noise

The project implemented a sweep representation to model different types of seashells, following the work presented in *Modeling Seashells* and *Seashell Architectures*. Specifically, the script 'sweep.py' defines a model by "sweeping" a generating shape around a coiling axis. This is converted to a polygonal mesh at regular intervals, and the parameters of the sweep are specified by the coiling radius, the scaling factor of the generating object, and the distance between successive coils. 'sweep.py' includes a general implementation under the function 'generate_sweep()', and specific examples have been coded which reproduce the shells shown in Figure 2 of *Modeling Seashells*. (All sweep code was originally produced following the algorithm described in *Modeling Seashells*.) The project also tries to address one area of further research for *Modeling Seashells*: accurately modeling shell openings. This is done by adjusting the generating shape via a linear homotopy during the sweep, i.e, the generating shape is continuously defored as it is wrapped around the coiling axis. This technique helps accentuate the opening, but greater artistic skill or real world measurements would be needed to produce a more realistic model.

The project also implemented texturing with Perlin noise according to the methods outlined in *An Image Synthesizer*. This was done by writing four shaders in OSL (Open Shading Language): turbulence, marble, fire, and water. After the 'sweep.py' script has generated the seashell models, the script 'genTextures.py' selects every object in the Blender file and applies

one of these four procedural textures to it. This is simply to demonstrate the different textures. In order to modify the parameters of each OSL shader, we can go to the "Shading" window in blender, where there is a script node specifying the generating parameters of the texture (see below). For example, you might change the center and radius of the fire texture, the period between the perturbations in the marble, or the colors represented by high or low turbulence values in water. Additionally, all textures have a Time parameter which a more advanced user might link to frames in Blender, allowing for animation of the texture. All of these parameters let the user customize the texture to make the seashell appear realistic (or not, if they choose).