

# Visual effects in PuzzleBloom

## the game

### Fertile Ground

Transition effect from wasteland to greenland environment. In pixel shader: each pixel evaluates if it's inside or outside of the affected radius. The edge is additionally modified by low-frequency noise - the waves - and high-frequency - the spots. Based on this, the greenland textures fade in. The foliage is alpha-faded in by vertex shader depending on radius. Finally, particles are emitted from a ring-shaped mesh expanding with the boundaries.



### Avatar

The visual appearance of the avatar is based on three effects: physics-based simulation of the flame/head, the glow combined with toon shading and trail and particle renderers.

The character is a rigged model. In parallel to the rig a chain model based on rigidbodies connected with joints is attached to the head, following it with some inertia as the avatar moves. The behaviour of this model is then translated to the position and orientation of the bones in the avatar's flame rig. This solution simplified the animators' job and allowed the avatar's most exposed attribute to behave naturally.

### Edge Detection

Edge detection is based on G-buffer discontinuities. The whole scene is rendered with replacement shaders into a single render texture storing normals and depth. If neighbouring pixels differ considerably on normal direction or depth, they overwrite the normally rendered scene pixel with black colour.

Some objects (like the Avatar or foliage) needed not to obtain the black outline. These are rendered into the G-buffer with a different replacement shader and treated specially at the final stage.

### Toon shading

Most solid objects in the scene are toon-shaded. The shader performs a cube map look-up and blends it with the object's regular texture.

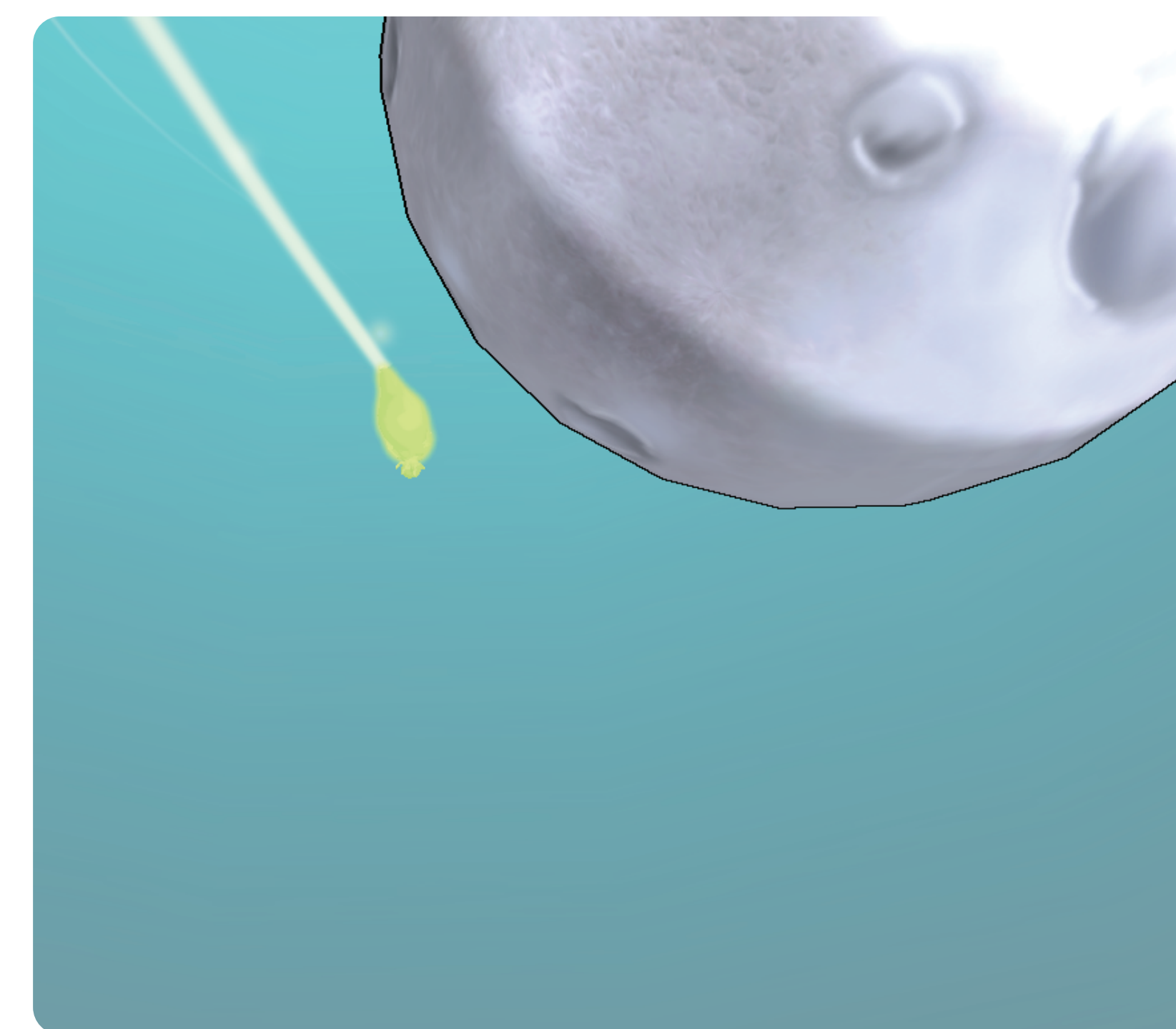


### Grass

Grass blades were not placed manually, they were 'grown' according to the profile of grass patches - low-poly meshes modeled by an artist to define shape and height. Then, at runtime, grass patches are filled with single mesh composed of quads - the grass blades.

Grass is animated in the vertex shader and rendered in two passes: cut-out and alpha blending, which gives soft edges and no need for sorting.

The game was developed in the Unity engine during a one month Dadiu production in March 2009.



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