Procedural 3D Chinese Lantern

Members: Hongcheng Pan; Sicheng Xi; Libo Wang

Hongcheng Pan: 3D model Building; Simply Color

Sicheng Xi : Rendering; Animation

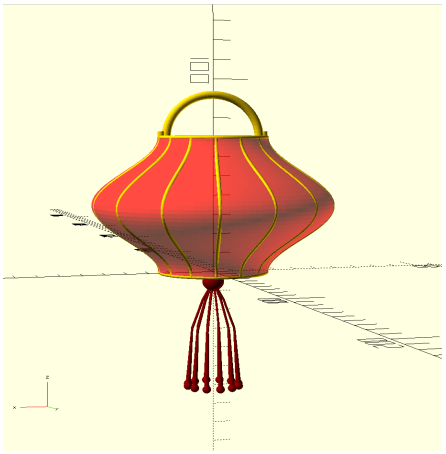
Libo Wang: Final PPT Design; Confirm Result

Hongcheng Pan : 3D Model And Simply Color

```
/* [Main Parameters] */
base_diameter = 50;       // Diameter at top and bottom (mm)
lantern_height = 70;      // Total height (mm)
paper_thickness = 0.8;    // Wall thickness (mm)

/* [Frame Settings] */
bulge_factor = 1.2;       // Middle bulge factor (1.0-1.5)
rib_count = 14;           // Number of ribs
rib_thickness = 2.0;      // Rib thickness (mm)

/* [Paper Rib Effect] */
rib_amplitude = 1.5;      // Paper bulge height between ribs (r
rib_width = 3.0;          // Width of each bulge (mm)

/* [Handle Settings] */
handle_height = 20;       // Handle arch height (mm)
handle_thickness = 4;     // Handle thickness (mm)

/* [Tassel Settings] */
tassel_length = 60;       // Tassel length (mm)
tassel_count = 12;        // Number of tassel strands

/* [Component Toggles] */
show_paper = true;        // Show paper shell
show_frame = true;        // Show internal frame
show_handle = true;       // Show top handle
show_tassel = true;       // Show bottom tassel
```

```
function radius_at_height(z) =
    let(
        t = z / lantern_height,
        bulge = bulge_factor * pow(cos(180 * (t - 0.5)), 2)
    )
    (base_diameter / 2) * (1 + bulge);
```

The inner contour radius calculation radius_at_height(z)-paper_thickness is exactly the same as the radius_at_height(z)-paper_thickness of the skeleton module, ensuring that the skeleton fits precisely to the inner wall of the paper shell. Utilize the difference sum method to create the lantern body



Set the decorative holes above the lantern to avoid conflict with the skeleton. Then set the handle. Finally, the whole lantern is modeled by adding a lantern spike directly below it, adding some colors for the subsequent members

Sicheng Xi: Rendering; Animation

The scene is initialized with a light cream background, the 3D scene is setted up using THREE.js with a light rice-paper background to match the tone of the lantern. Used a perspective camera with OrbitControls for smooth interactive viewing. Added ambient and directional lighting to simulate soft indoor light conditions.

The lantern components are then loaded using STLLoader. Applied a semi-transparent textured material to the paper shell using a custom texture map, and created metallic and rope textures for the frame and tassel using another texture map. Used a helper function to generate planar UV coordinates for the shell and tassel geometries.

All components are then grouped, rendered, and animated with a slow Y-axis rotation to simulate a hanging lantern swaying gently. Enabled window resizing and mouse-based rotation for user interactivity. The final result is a browser-based, textured, and animated 3D lantern ready for GitHub Pages deployment.

Yubo Wang: Final PPT Design

Collected and organized all group content and screenshots

Reviewed and debugged OpenSCAD parameters and module logic

Refined and finalized the slide structure for academic presentation

Translated technical code into visual-friendly documentation

Prepared full bilingual (EN/CH) versions of the slides

Optimized the output format for PDF hand-in

Managed group coordination and delivery planning