

Graphics Intro + Scotty 3D

- Computer Graphics Intro
- Scotty 3D UI Walkthrough
- Scotty 3D Command Line Tools
- Q&A

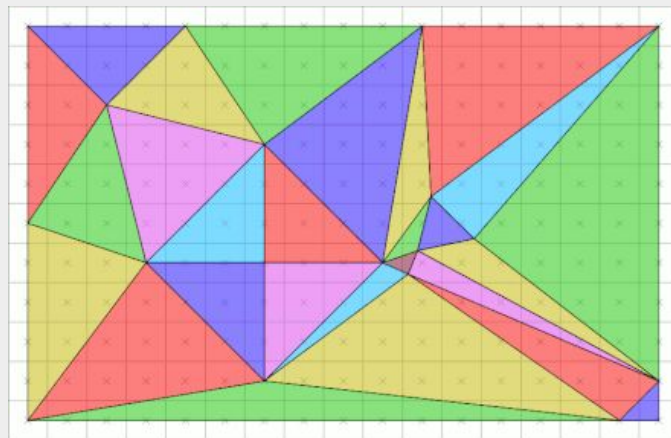
A1 - Rasterization

Rasterization

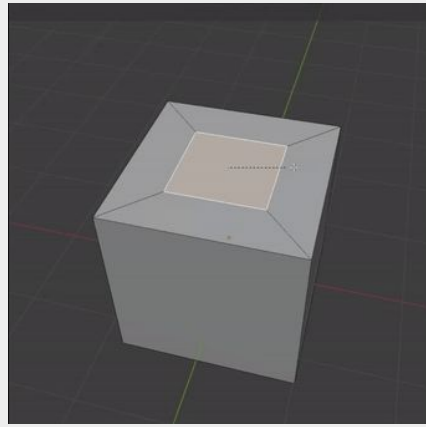
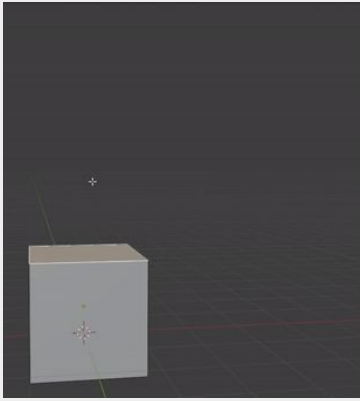


Rasterization is a easy and **efficient** way to convert geometry into shaded pixels on your screen

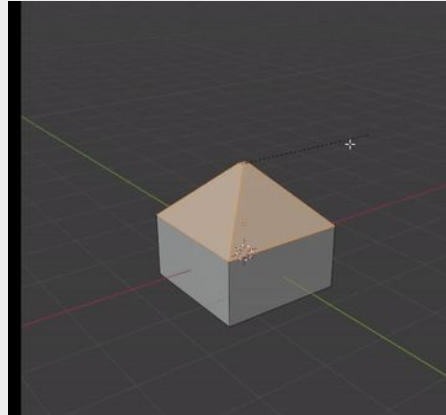
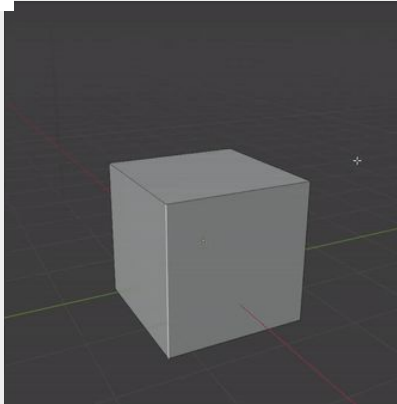
This makes it useful for real-time rendering or performance dependent applications

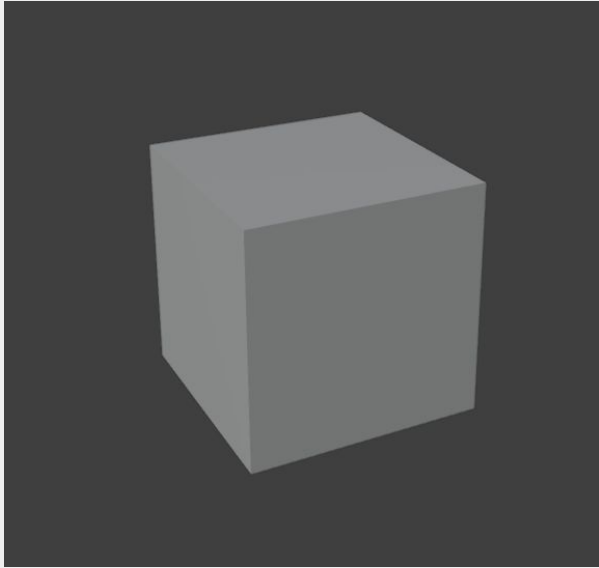


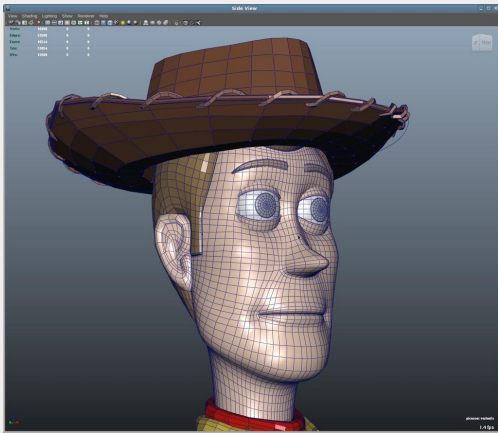
A2 - Geometry



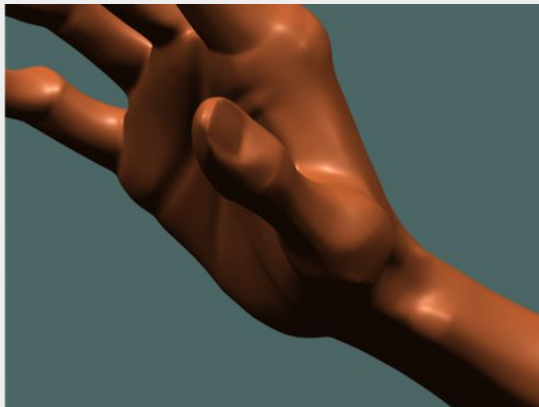
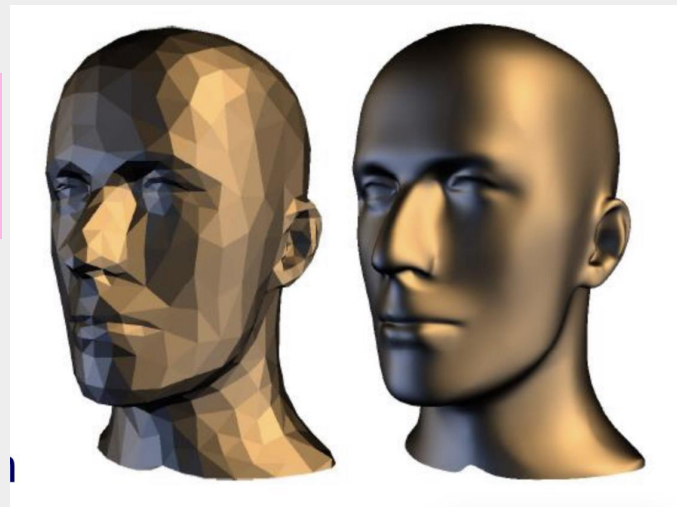
Mesh Operations







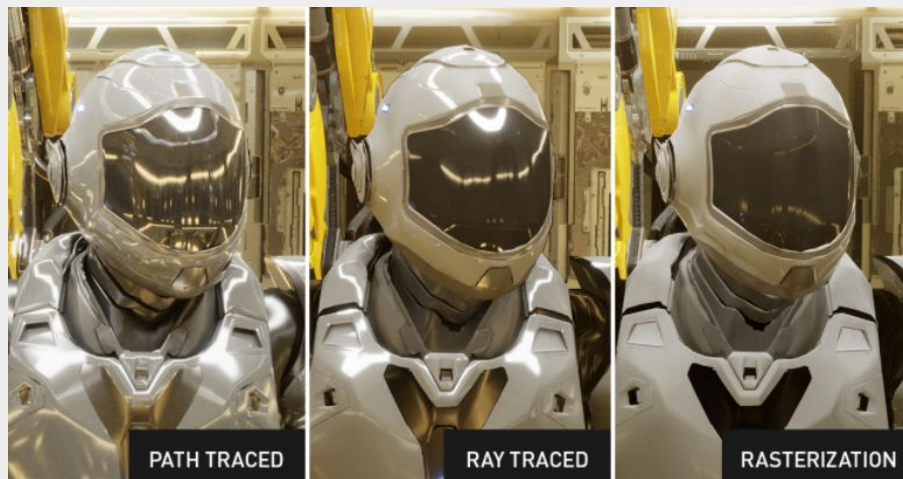
Geometric processing



A3 - Path Tracing

Path Tracing

Path tracing allows us to simulate how light bounces around a scene in a physically-based way



Realistic vs Stylized

Path tracing helps us achieve realistic lighting, but stylized/cartoon renderings often use it too to add a sense of realism to otherwise animated scenes!



Environment Mapping

- Path tracing is **really** expensive to compute
- Setting up lighting in a scene is also really tough!
- There are people whose *sole* job is setting up lighting in scenes



LIGHTING ARTIST
Missions, skills, training, responsibilities

LIGHTING ARTIST - JOB DESCRIPTION

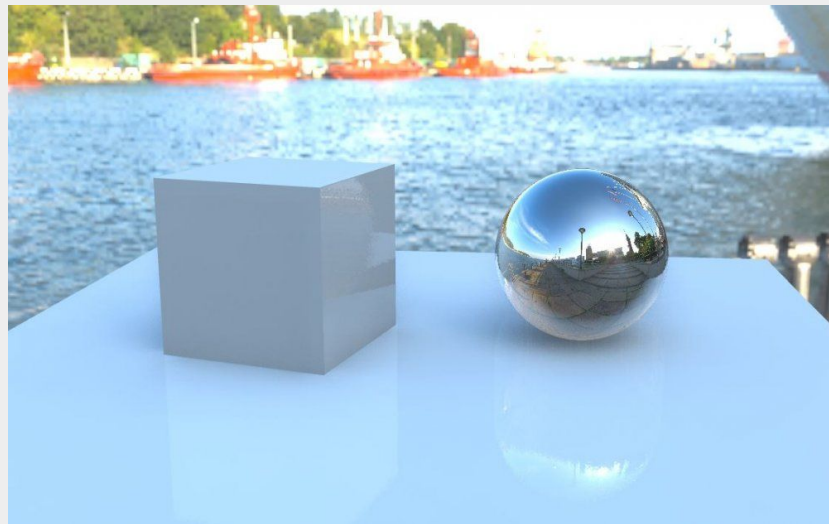
Definition:

The Lighting Artist creates the lighting for a pre-rendered 3D scene or a real-time video game.

They enhance characters and environments while maintaining a consistent visual style.

Environment Mapping

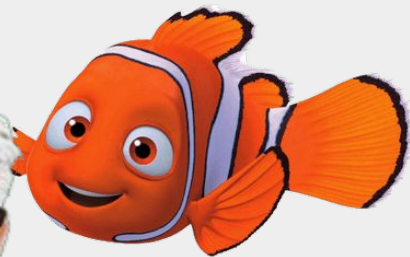
- Instead, environment mapping lets us wrap a scene with a “background” image
- We can then use this background and sample from it as if it were illuminating the scene



A4 - Animation

Skeletons and skinning

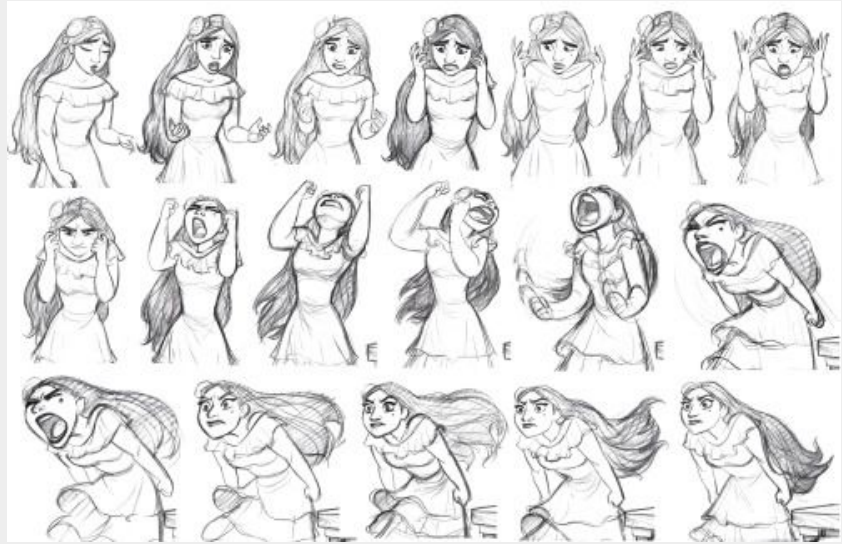
Skeletal animation and linear-blend skinning help create the exciting characters look realistic (or stylized) in movies, virtual reality, and video games



Splines

Splines are crucial in keyframe animation, where smooth transitions between movements are necessary.

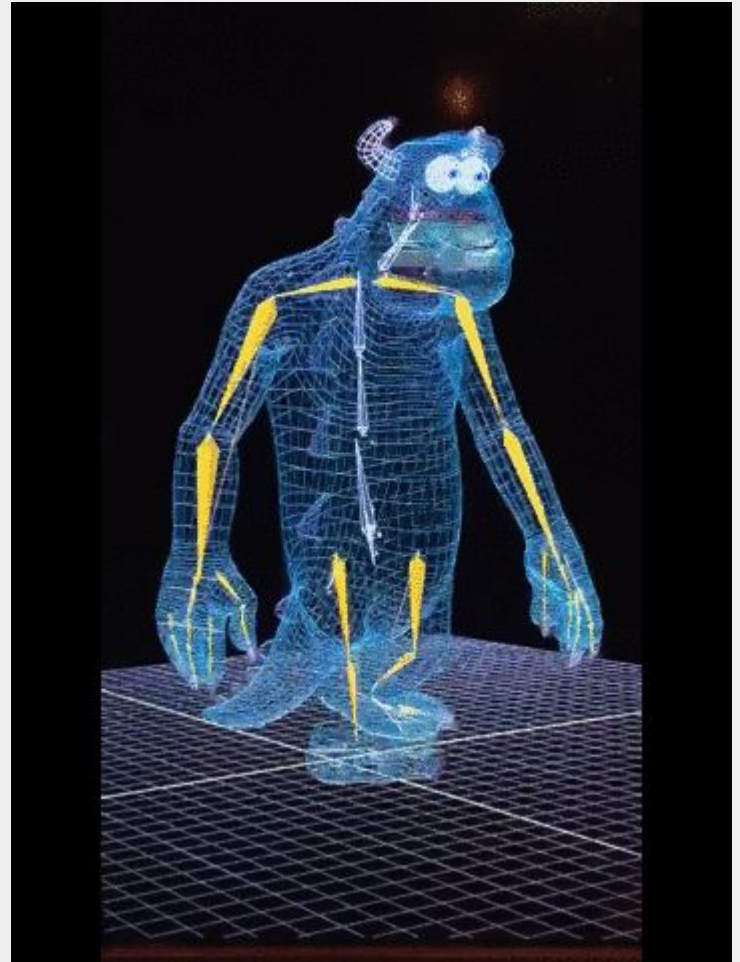
Think cameras, vehicles, or paths for objects in both movies and video games.



Endless possibilities...

Snow castle

©Disney



- Computer Graphics Intro
- **Scotty 3D UI Walkthrough**
- Scotty 3D Command Line Tools
- Q&A

Scotty3D UI Walkthrough

- [Walkthrough Doc](https://tinyurl.com/reci-1-2025) : <https://tinyurl.com/reci-1-2025>



- Computer Graphics Intro
- Scotty 3D UI Walkthrough
- **Scotty 3D Command Line Tools**
- Q&A

Scotty3D Command Line Tools

Building

`node Maekfile.js`

Running Tests

`./Scotty3D --run-tests __`

Example: `./Scotty3D --run-tests a0.`

Opening a Scene

`/Scotty3D --scene __`

Example: `./Scotty3D --scene
~/path/to/scene.js3d`

Scotty3D Command Line Tools Cheat Sheet

```
args.add_option("--run-tests", tests_prefix, "Run all tests starting with prefix", true);
args.add_option("-s,--scene", set.scene_file, "Scene file to load");
args.add_option("--write", write_file, "Re-save file and exit");
args.add_flag("--trace", pathtrace, "Path trace scene without opening the GUI");
args.add_flag("--rasterize", rasterize, "Rasterize scene without opening the GUI");
args.add_option("-c,--camera", camera_name, "Camera instance to render (if headless)");
args.add_option("-o,--output", output_file, "Image file to write (if headless) [for animation, can also be a directory]");
args.add_flag("--animate", animate, "Output animation frames [min_frame,max_frame] (if headless)");
args.add_option("--min-frame", min_frame, "First animation frame");
args.add_option("--max-frame", max_frame, "Last animation frame (-1 is last keyframe)");
args.add_flag("--no_bvh", no_bvh, "Don't use BVH (if headless)");
args.add_option("--exposure", exp, "Output exposure (if headless)");
args.add_option("--seed", RNG::fixed_seed, "Use fixed seed for RNG when rendering; (0 disables).");
args.add_option("--film-width", film_width, "Override camera film width (pixels)");
args.add_option("--film-height", film_height, "Override camera film height (pixels)");
args.add_option("--film-samples", film_samples, "Override film samples-per-pixel (for pathtracer)");
args.add_option("--film-max-ray-depth", film_max_ray_depth, "Override film max ray depth (for pathtracer)");
args.add_option("--film-sample-pattern", film_sample_pattern, "Override film sample pattern (for rasterizer)");
args.add_option("--force-dpi", Platform::force_dpi, "Force DPI to a given number (will scale UI).");
```


Scotty3D Command Line Tools Cheat Sheet

```
args.add_option("--run-tests", tests_prefix, "Run all tests starting with prefix", true);
args.add_option("-s,--scene", set.scene_file, "Scene file to load");
args.add_option("--write", write_file, "Re-save file and exit");
args.add_flag("--trace", pathtrace, "Path trace scene without opening the GUI");
args.add_flag("--rasterize", rasterize, "Rasterize scene without opening the GUI");
args.add_option("-c,--camera", camera_name, "Camera instance to render (if headless)");
args.add_option("-o,--output", output_file, "Image file to write (if headless) [for animation, can also be a directory]");
args.add_flag("--animate", animate, "Output animation frames [min_frame,max_frame] (if headless)");
args.add_option("--min-frame", min_frame, "First animation frame");
args.add_option("--max-frame", max_frame, "Last animation frame (-1 is last keyframe)");
args.add_flag("--no_bvh", no_bvh, "Don't use BVH (if headless)");
args.add_option("--exposure", exp, "Output exposure (if headless)");
args.add_option("--seed", RNG::fixed_seed, "Use fixed seed for RNG when rendering; (0 disables).");
args.add_option("--film-width", film_width, "Override camera film width (pixels)");
args.add_option("--film-height", film_height, "Override camera film height (pixels)");
args.add_option("--film-samples", film_samples, "Override film samples-per-pixel (for pathtracer)");
args.add_option("--film-max-ray-depth", film_max_ray_depth, "Override film max ray depth (for pathtracer)");
args.add_option("--film-sample-pattern", film_sample_pattern, "Override film sample pattern (for rasterizer)");
args.add_option("--force-dpi", Platform::force_dpi, "Force DPI to a given number (will scale UI).");
```

Scotty3D Command Line Tools Cheat Sheet

<code>--run-tests {tests_prefix}</code>	Run all tests starting with prefix
<code>-s,--scene {set.scene_file}</code>	Scene file to load
<code>--write {write_file}</code>	Re-save file and exit
<code>--trace {pathtrace}</code>	Path trace scene without opening the GUI
<code>--rasterize {rasterize}</code>	Rasterize scene without opening the GUI
<code>-c,--camera {camera_name}</code>	Camera instance to render (if headless)
<code>-o,--output {output_file}</code>	Image file to write (if headless) [for animation, can also be a directory]
<code>--animate {animate}</code>	Output animation frames [min_frame,max_frame] (if headless)
<code>--min-frame {min_frame}</code>	First animation frame");
<code>--max-frame {max_frame}</code>	Last animation frame (-1 is last keyframe)");
<code>--no_bvh</code>	Don't use BVH (if headless)
<code>--exposure {exp}</code>	Output exposure (if headless)
<code>--seed {seed}</code>	Use fixed seed for RNG when rendering; (0 disables).
<code>--film-width {film_width},</code>	Override camera film width (pixels)
<code>--film-height {film_height},</code>	Override camera film height (pixels)
<code>--film-samples {film_samples},</code>	Override film samples-per-pixel (for pathtracer)
<code>--film-max-ray-depth {film_max_ray_depth}</code>	Override film max ray depth (for pathtracer)
<code>--film-sample-pattern {pattern}</code>	Override film sample pattern (for rasterizer)
<code>--force-dpi {dpi}</code>	Force DPI to a given number (will scale UI)

- Computer Graphics Intro
- Scotty 3D UI Walkthrough
- Scotty 3D Command Line Tools
- Q&A