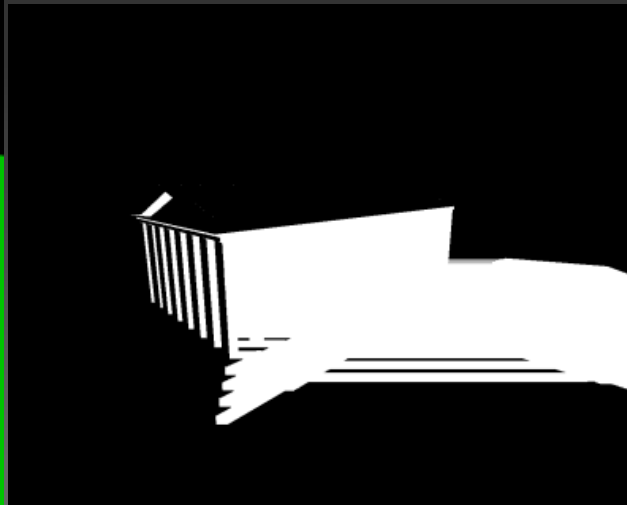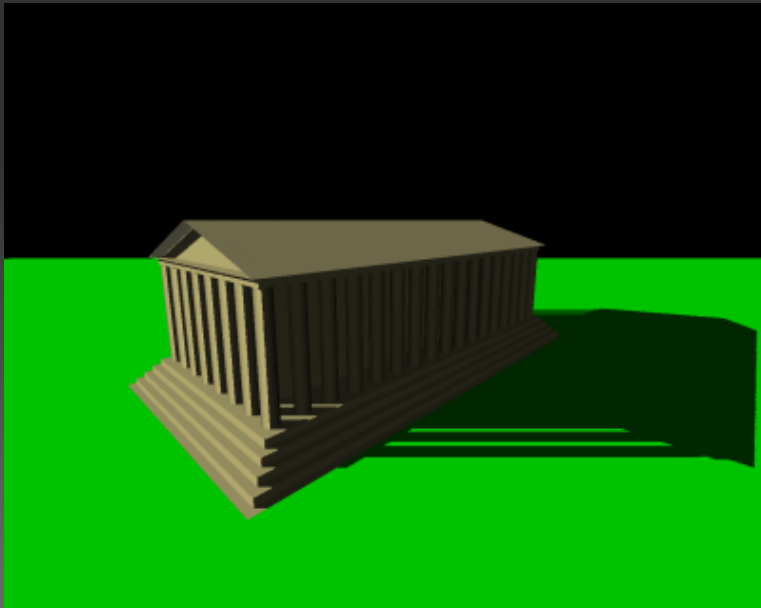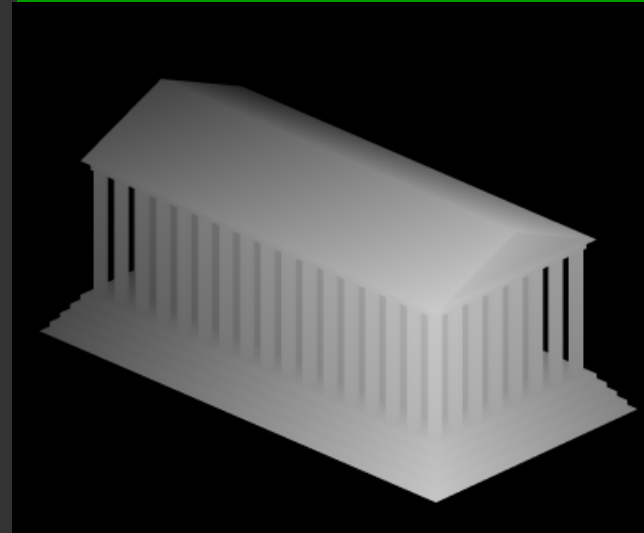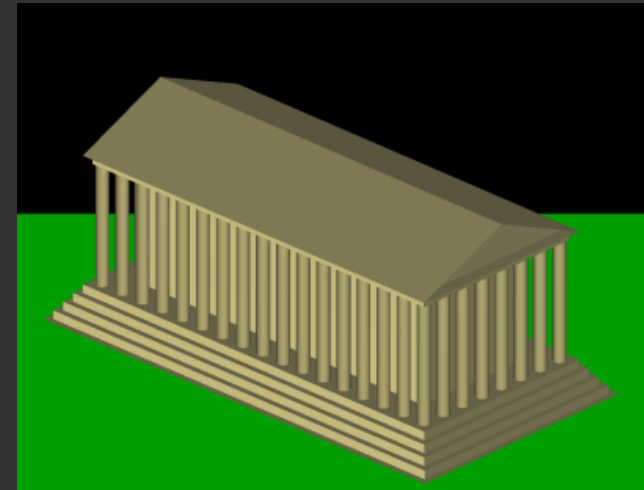# Rendering Fake Soft Shadows with Smoothies

Chan and Durand

Shadow Mapping

- Render scene from light's perspective, just keep depth-buffer (depth map)
- Render from camera, transform each point in to light space coordinates
- Compare z against depth map at same x and y - if closer, draw lit, further, draw in shadow
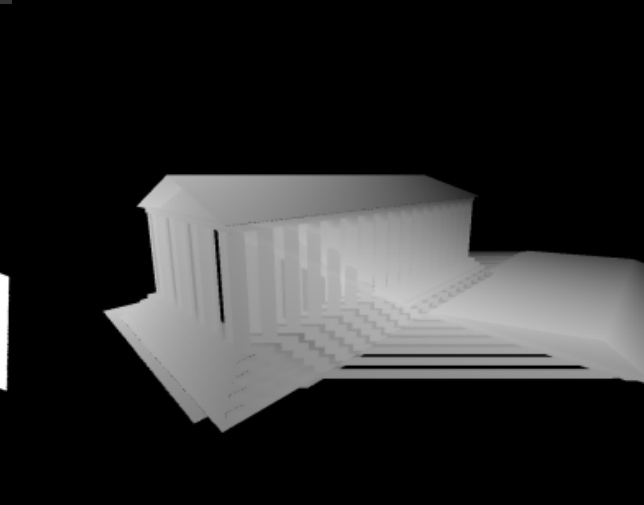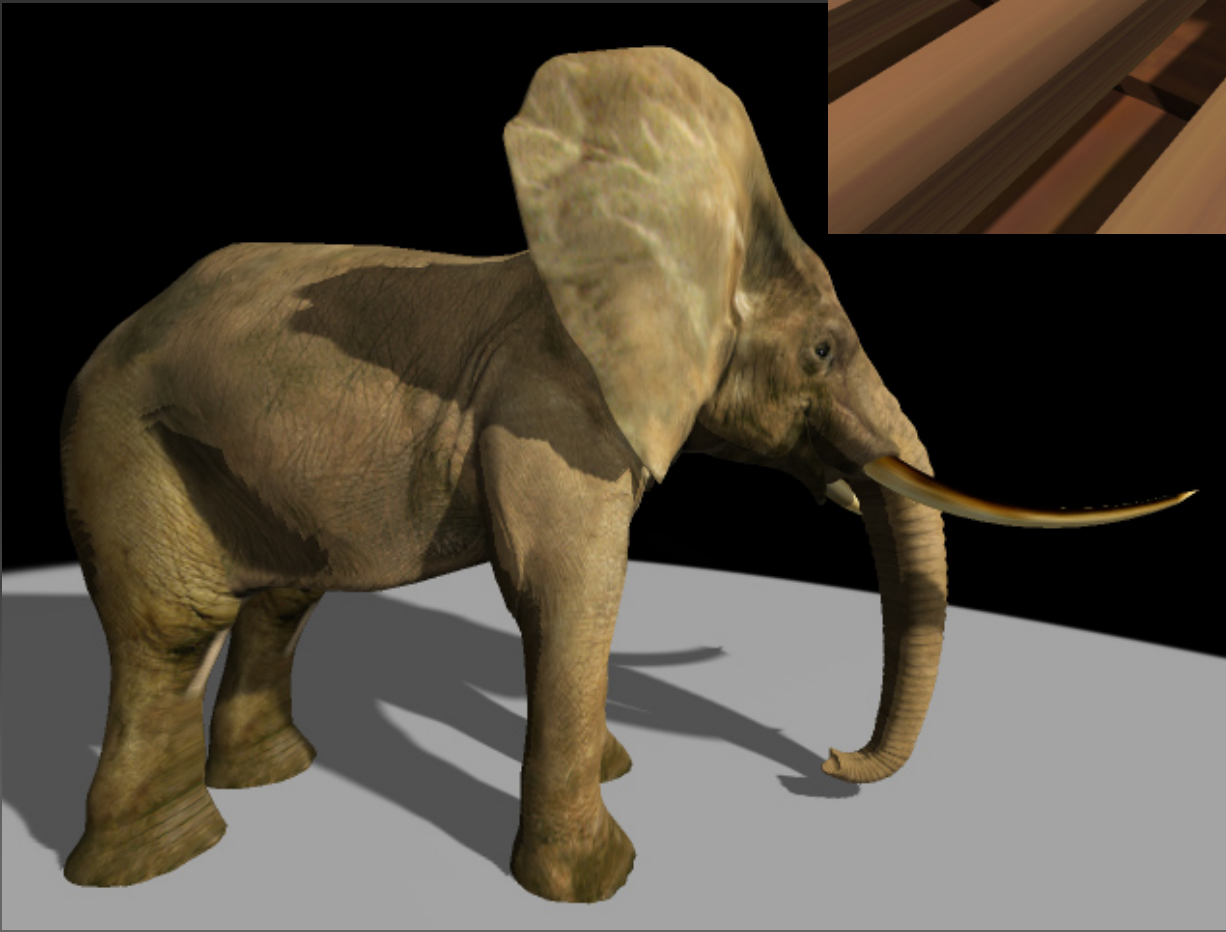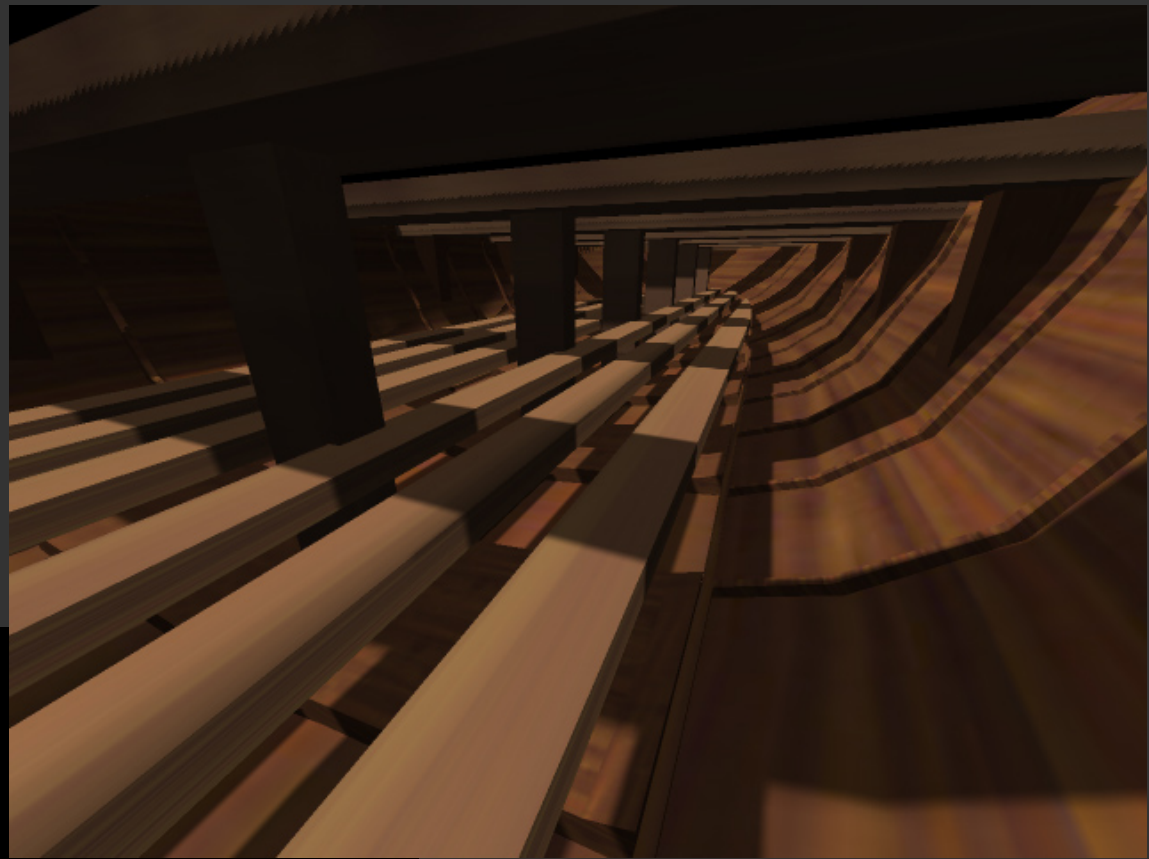
Problems with Shadow Mapping

- Aliasing artifacts, especially for low-resolution maps projected at steep angles
- Sharp edges - no soft shadows

- Solution: Smoothies!
  - Fake penumbras
  - Unrealistic, but convincing and aesthetically pleasing
  - Relatively fast, take advantage of hardware

- Example

Smoothies

- How do they work?
  - Like this!

- Some results:
  - Video

Problems with smoothies

- Penumbra only extends outward - doesn't look right when light size (t) is too large
  - Example

- Frame rate in complex scene? Multiple lights?

Discussion

- Real-world use in game engines?
  - Not that we know of
- Extending smoothies inward to better deal with large light sources?
  - To shrink the umbra, we would have to somehow modify the regular shadow map, or combine it with the smoothie buffer, or do depth testing differently.
  - Also, we don't have depth values in z buffer for points on the receiver that are obscured from the light, need those to calculate alpha
- Break large lights in to multiple smaller ones
  - Probably works, but probably slow