Rendering

1. Specular reflections
   1. Sample-based cameras (see paper)
   2. Depth image (i.e. z-buffer) approximation of reflected objects, 1D search of intersection between reflected ray and z-buffer by projecting ray onto z-buffer and tracing the projection (see paper on Reflected Scene Impostors)
   3. ?
2. Diffuse reflections
   1. Photon mapping?
   2. Radiosity?
3. Soft shadows
   1. CUDA for using GPU for advanced rendering algorithms
   2. Assign potentially blocking triangles to output image samples, then render blocking triangles for every output image sample with light as image plane (see GEARS paper)
      1. <https://www.cs.purdue.edu/cgvlab/courses/434/434Spring2014/Lectures/Shadows/>
   3. ?
4. Many-light rendering (e.g. 10,000 dynamic lights)
   1. See paper in lectures folder
5. Surface geometry
   1. See paper: P. Rosen, V. Popescu, K. Hayward, C. Wyman, "Non-Pinhole Approximations for Interactive Rendering", *IEEE Computer Graphics and Applications*, 2011. [PDF](http://www.cs.purdue.edu/cgvlab/papers/popescu/popescuNPI_CGA11.pdf) [Video](http://www.cs.purdue.edu/cgvlab/papers/popescu/popescuNPI_CGA11.mov)
6. Ambient occlusion

Animation

Augmented Reality

* Problem 1: anchoring annotations
* Problem 2: transparent display
  + Find scene depth
  + Find user head position
  + Reproject scene color and depth to user view
* Applications
  + Telementoring
  + Navigation assistance
  + Education

Virtual Reality

Image Processing

* Segmentation
* Color manipulation
* Cropping to fit small screens
* Video abstraction and summarization
* Edge extraction
* Occlusion management
* Deciding whether two portrait photographs show the same person

Computer Vision

* Extraction of 3D from images / videos
  + Stereo (passive, just images)
  + Structured light (active, injecting energy into scene)
* Tracking of scene elements
* Recognition of scene elements
* Free viewpoint video