CSE170 Introduction to Computer Graphics

Example Topics for the Final Project

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Instructions

- The final project has 3 main required parts
  - 1)Checkpoint, 2)presentation, and 3)submission
    - Submission needs: a) report, b) code, and c) representative image.

- A topic has to be chosen!
  - A custom topic can be accepted but:
    - You will have to include some use of a curve or surface, and
    - Identify “at least 3 interesting features”
      - An individual project needs 3 features, group projects need more or more complex features, every member will need a well-defined part
      - Please no groups with more than 3 people

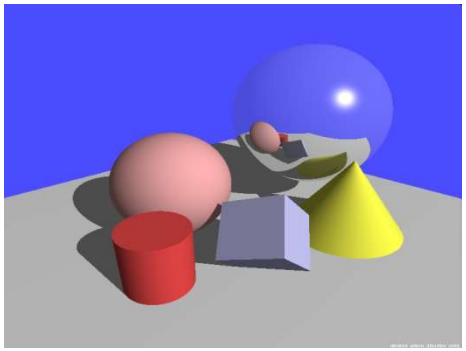
- Presentations
  - Come prepared to run your project ! You have to run it !
  - I will bring my laptop computer, you can use it
  - You may of course bring your own laptop (check projector connection in advance)

- Grading and Additional Information
  - See Proj2-Description.pdf

Topic 1 - Ray Tracer

- Goal: Render 3D scene descriptions with simple primitives
- Features
  - produce multiple scenes with light interactions among multiple primitives
  - produce examples with interesting inter-reflections
  - produce examples with interesting shadows
- Curve/Surface
  - a flying camera along a curve will be used to create an animated flying view of your scene (ok to pre-compute image sequences, it is easy to read the frame buffer and save images)

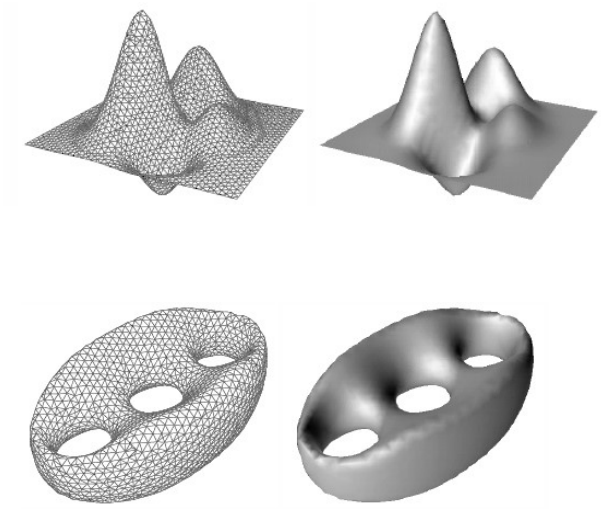
    Or: add a primitive with some curved surface.

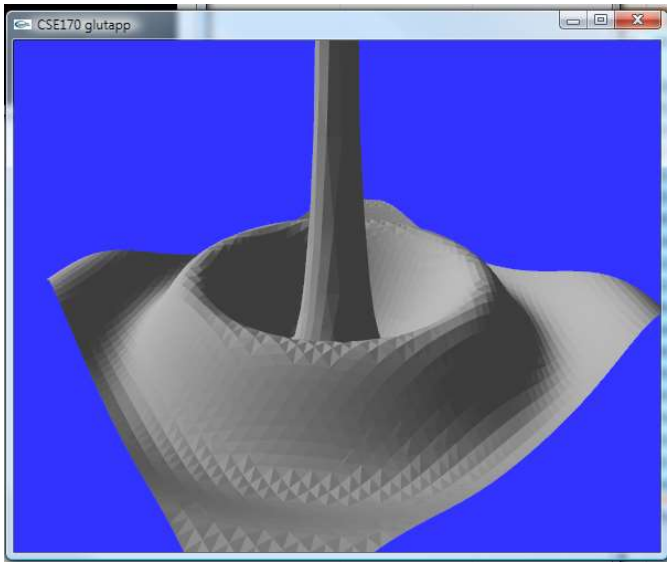


(these two images are from previous CSE170 final projects!)

Topic 2 - Marching Cubes/Tetrahedra

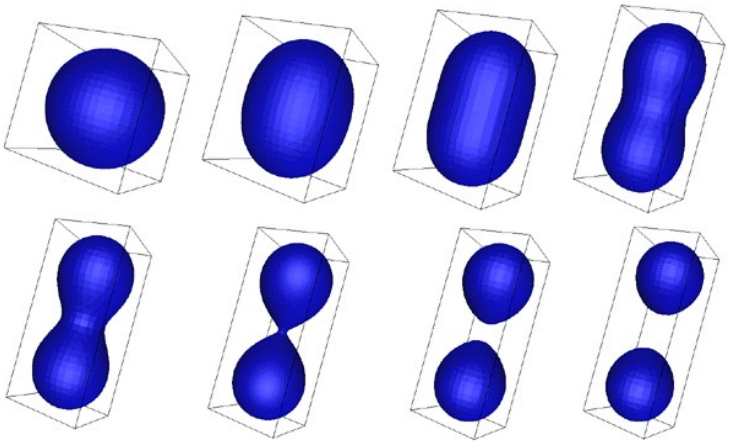
- Goal: Visualization of several interesting implicit surfaces
- Features:
  - Change the resolution interactively with hierarchical subdivision
  - Visualize the result in smooth or flat shading with interesting lighting
  - Present an interesting solution to include texture mapping and show how it works for surfaces with holes (bee bottom-left example below)
- Curve/Surface: several implicit surface examples are shown
  - Be sure to include interesting ones with holes (see below)!

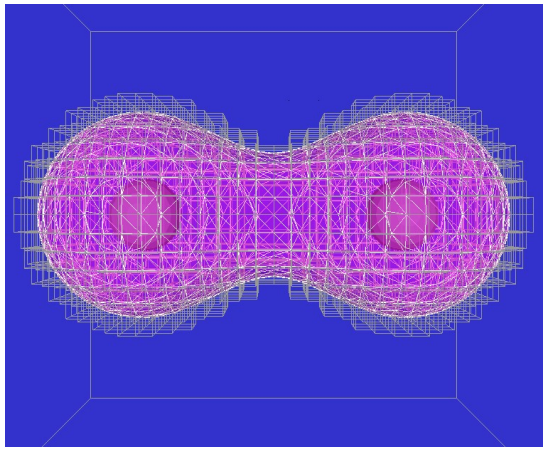




Topic 3 - Metaballs

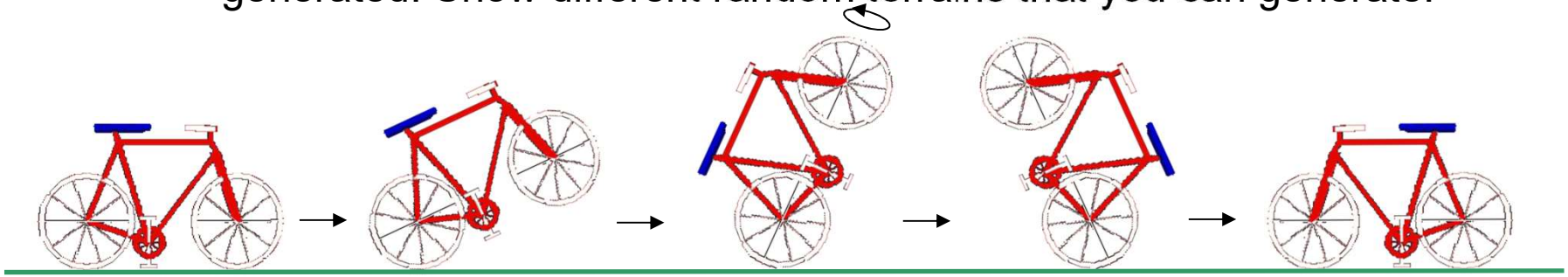
- Goal: Visualize metaball objects with marching cubes
- Features:
  - Animate and control multiple 3D points to be used as metaball centers moving around your scene space
  - Apply your marching cubes algorithm to determine the resulting boundaries in real time
  - Visualize the result in smooth shading with interesting lighting or textures
- Curve/Surface: already included





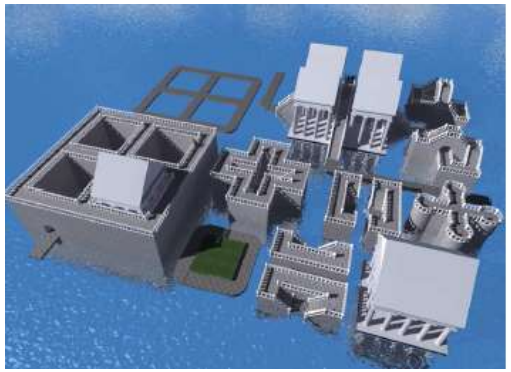
Topic 4 - Keyframe Animation

- Goal: use your hierarchical object of Project 1 and build your own library of keyframe animations for it
- Features
  - Define at least 5 non-trivial keyframe animations: each animation is defined as a sequence of poses that are interpolated when activated
  - Have different animations to concatenate as you press some keys in order to achieve complex movements with meaningful global motion
  - Include some special keys to trigger interesting long sequences of animations
- Curve/Surface
  - Make your object to follow a terrain defined by several Bezier patches in a floor grid, and have the control points to be randomly generated. Show different random terrains that you can generate.



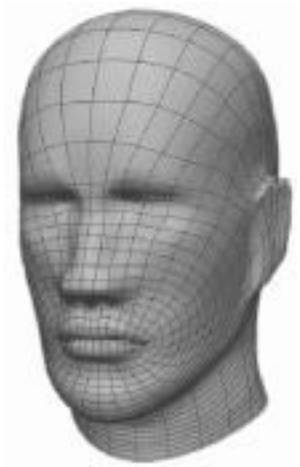
Topic 5 – Camera Fly-Through

- Goal: visualize a large environment with smooth camera motions along trajectories (at least 3) inside the environment
- Features
  - The environment will have several buildings and also buildings with “at least 2-floors interiors with windows”
  - The trajectories are based on control points defining a parametric curve that will control both the camera position and the target point of view position. Basically you will be applying a parametric curve to interpolate/approximate the camera parameters, including the camera orientation.
  - At least one camera trajectory will enter inside a 2-floor building and get out through a window without collisions with the building.
- Curve/Surface:
  - already included as camera trajectories.



Topic 6 - 3D Head Modeler

- Goal: build your own modeler application with the tools needed to “sculpt” a head!
  - You will start with any closed smooth surface (sphere, ellipsoid, etc). The surface can then be edited (locally deformed) and decomposed to higher resolution as needed.
- Features:
  - A location in the surface can be specified with the mouse in order to apply local mesh operators of different shape and radius of influence
    - Consider using subdivision surfaces
  - One operation will apply local depressions
  - Another operation will apply local bumps



- Curve/Surface:
  - Included to generate the initial mesh

Topic 7 – A Videogame or Simulation

- Goal: build your own video game
  - It must be in 3D!
  - It can also be a “scene simulation”
  - It has to include “moving things”

- Features:
  - It includes interesting lighting and textures
  - It implements interesting user control/interaction
  - It includes interesting non-trivial animations with hierarchical objects

- Curve/Surface:
  - Included to generate trajectories for moving entities
  - Used to procedurally generate elements in the environment, like a complex terrain