CS3570 Introduction to Multimedia

Homework #2

Due: 11:59pm, 4/20/2015

Part 1 : Bézier curve

60% : Programming 37%, Report 23%

- To implement Bézier curve
- Different LoD
- Difference between scaling a bitmap and scaling a vector graphic

Part 2 : 3D Models

40% : Programming 33%, Report 7%

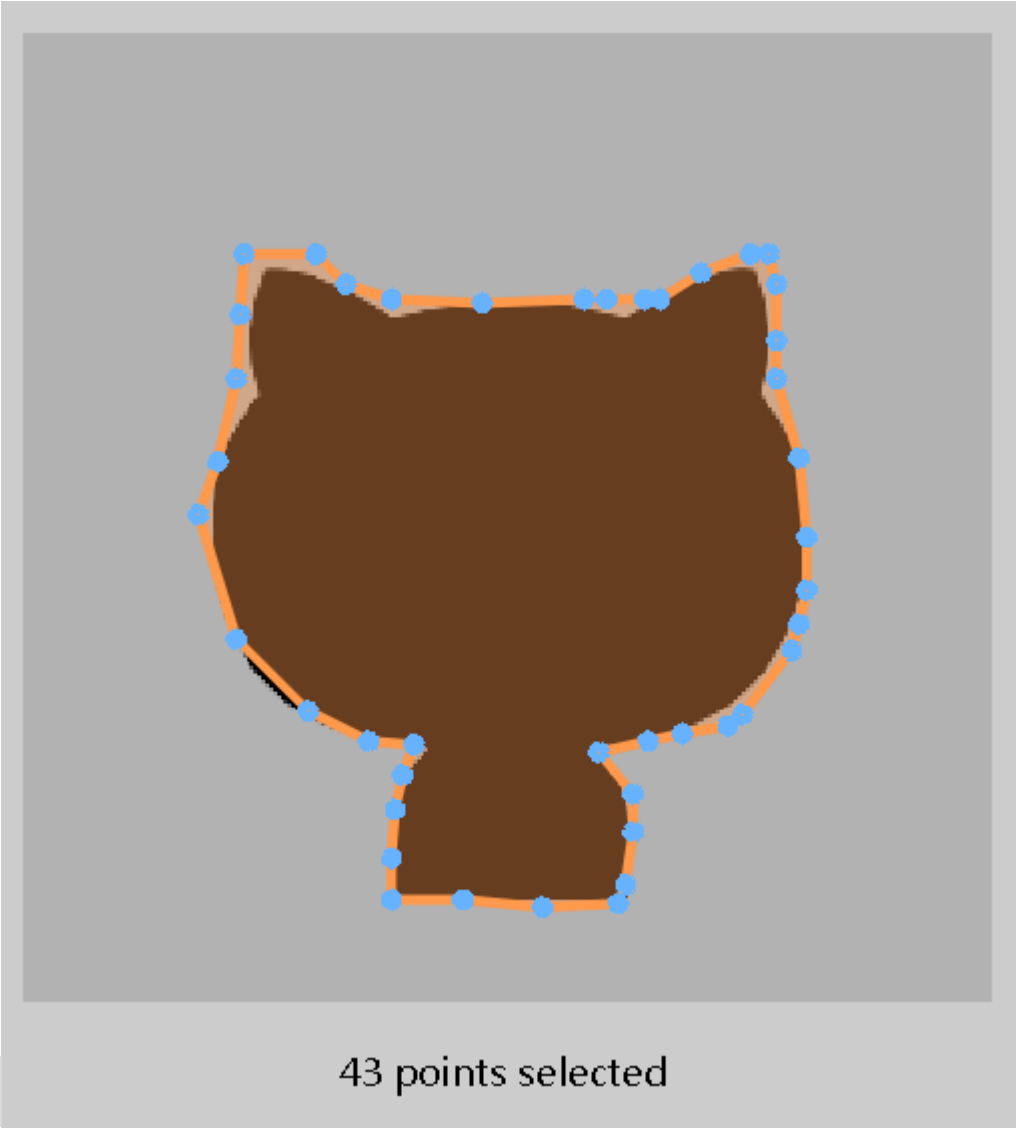
- Being familiar with .obj 3-D model format
- To generate simple geometrical models

Please indicate how to run your program to generate the results in your report.

Part 1 : Bézier curve

- Launch the sample MATLAB script provided by TA to select some control points, which coarsely approximate the object shape.
- Empirically, 40~70 points is recommended.
- Now you've got a list of control points in **ctrlPointList**.

hw2_part1.m



Part 1 : Bézier curve

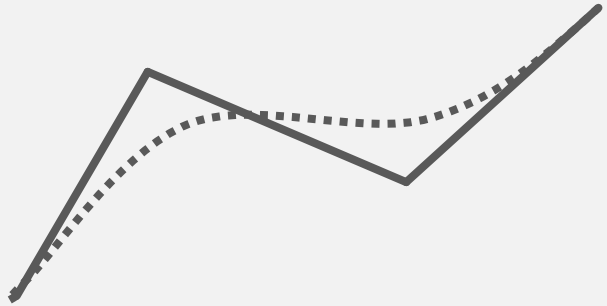
You can modify the code to use a list of pre-defined control points

- Compute the Bézier curve from these sampled control points (every group contains 4 points) to form the object shape using interpolation strategy.

(1a)

25%

- Show the results using different (at least 2)
  - sampling rate (sampling density)
  - levels of detail.

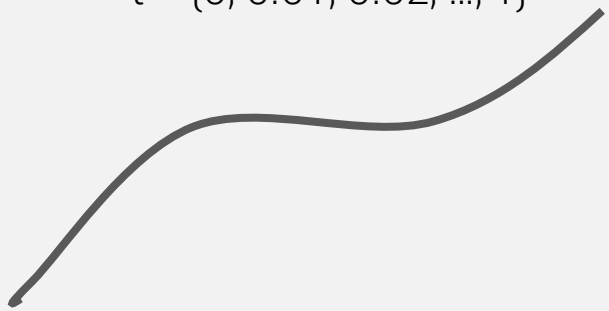


Control points and Bézier curve

t = {0, 0.2, 0.4, …, 1}

Low LoD discrete recovery

t = {0, 0.01, 0.02, …, 1}



High LoD discrete recovery

Part 1 : Bézier curve

- Briefly describe how you implement the interpolation. — 5%

- Discuss the result between different sampling rate and different level of detail.
  You may need to define “level of detail”,
  for instance, “interpolated points of each group”. — 5%

github_icon.png ✓ imresize (1b)

- Scale the bitmap by 4 times using NN interpolations.
- Scale the recovered object shape by 4 times. — 12%

- Compare the results (show the difference and discuss it). — 8%

✓ imresize

- Anything else worth mentioning. — 5%

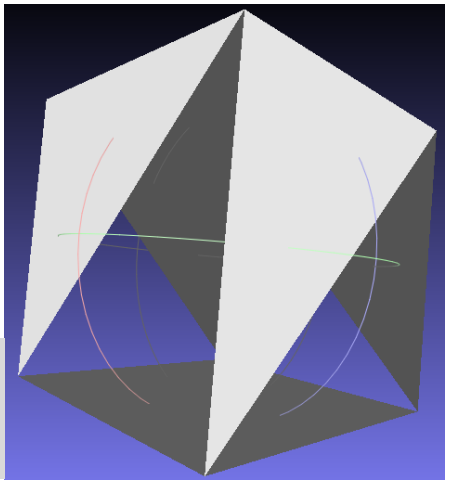
Part 2 : 3D Models

- Download and install MeshLab.
- Open Appetizer/1.Triangle.obj
  - To realize the format of vertices and faces in an .obj file.
- Open Appetizer/2.RGBTriangle.obj
  - To realize the format of color model in an .obj file.
- Open Appetizer/3.RGBTetrahedron.obj
  - To realize how to define a colored 3-D model.

Part 2 : 3D Models

- Launch the sample MATLAB script provided by TA to get an incomplete cube.

makeRGBCube.m
RGBCube.obj

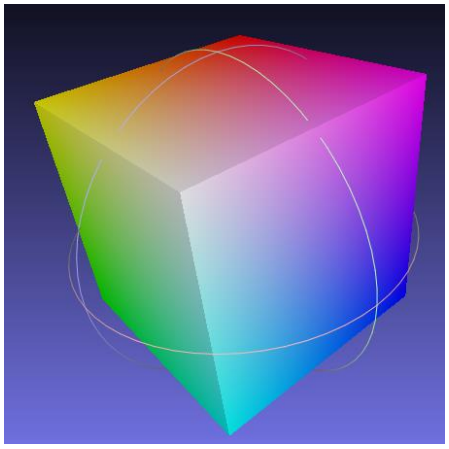


- Modify the code to get an .obj file which describes a RGB color cube.

Position and volume are not strictly restricted,
as long as the result is a cube.

(2a)

11%



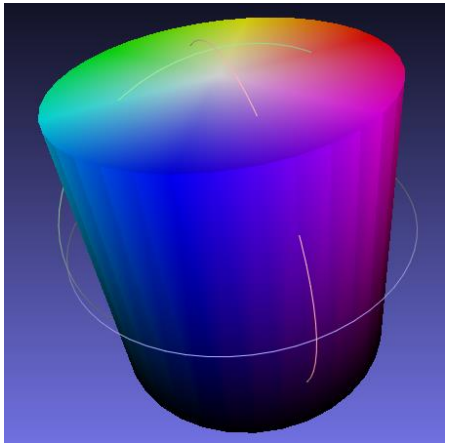
Part 2 : 3D Models

- Generate an .obj file which describes an HSV color cylinder.

  Position and volume are not strictly restricted.

(2b)

22%



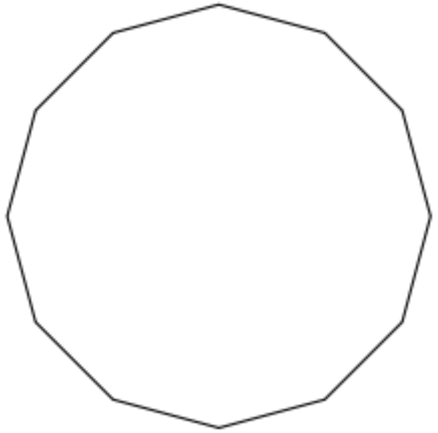
- Briefly describe how you build these models.

7%

Part 2 : 3D Models (Hints)

- To approximate a circle, we usually use a regular polygon.

```
numOfVert = 12; %12 for Visualization, 60 in practice
vertsPolarAngle = linspace(0,2*pi, numOfVert +1 )' ;
vertsX = cos(vertsPolarAngle) ;
vertsY = sin(vertsPolarAngle) ;
```

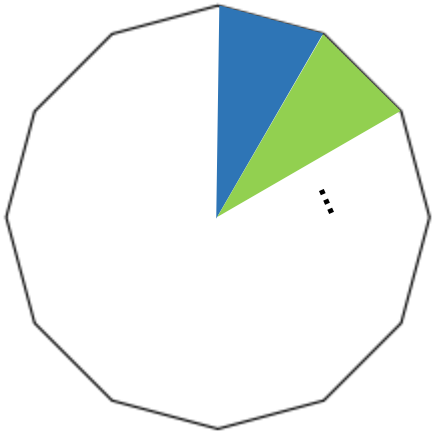


- To approximate a circle, your number of vertex should be at least 60.

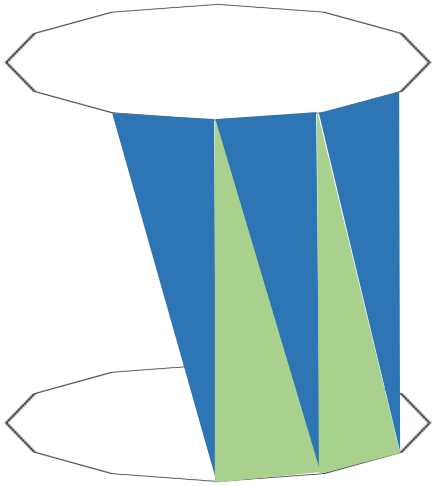
Part 2 : 3D Models (Hints)

- To fill the top surface

  or the bottom surface :



- To fill the side surface :



- See also :
  - rgb2hsv
  - hsv2rgb