CSC 3260 Principles of Computer Graphics

Course Project: My Town (20%)

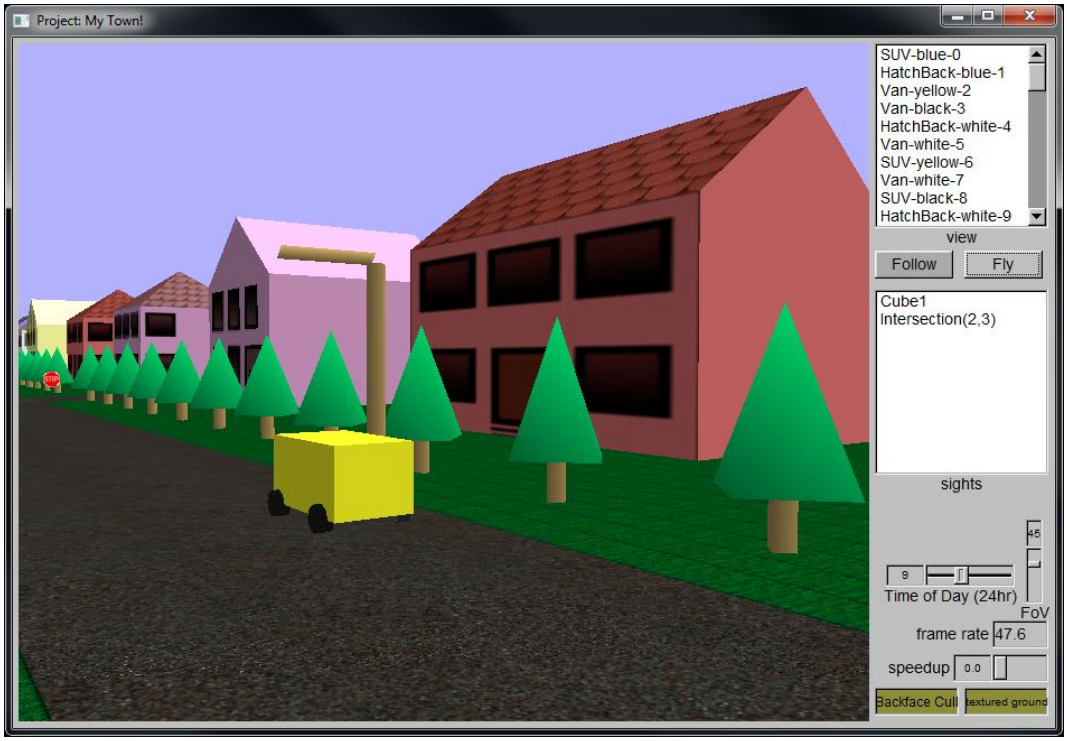
Due Time: 5:00pm, Dec 20 (Fri), 2013

Late penalty: NO Acceptance for Late Submission (zero point will be given)

Fail the course if any plagiarism is found

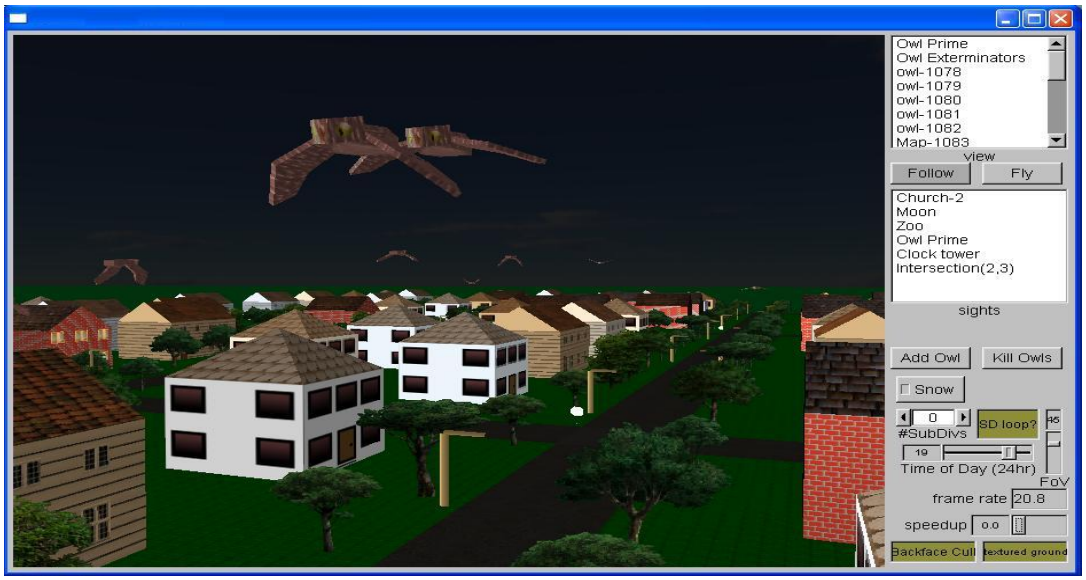
I. Introduction

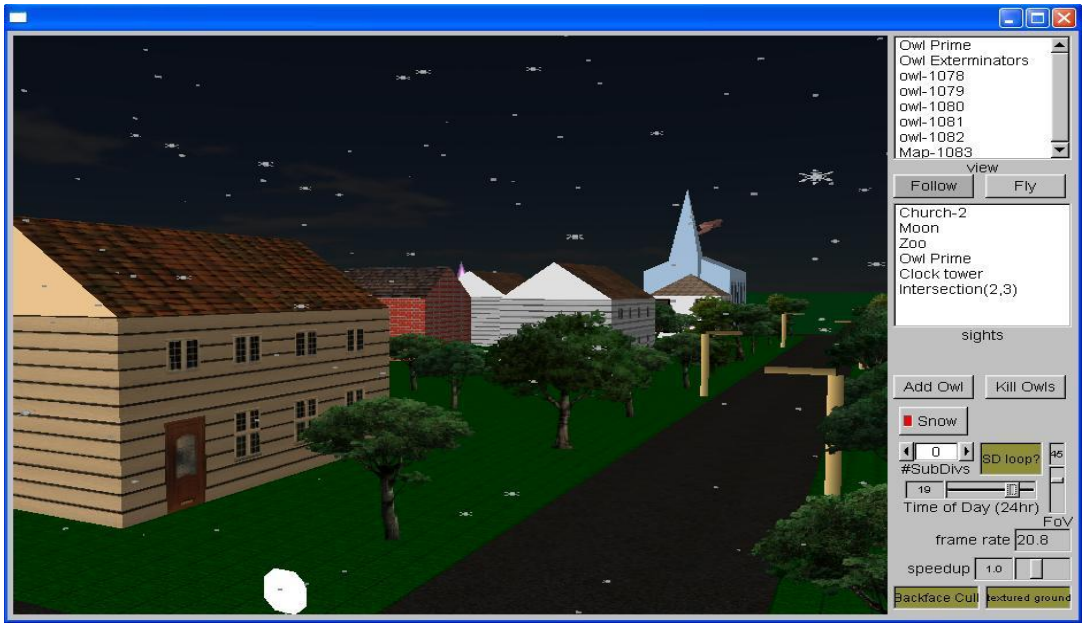
In this project, you are given a preliminary town scene and the task is to use OpenGL to enrich it. The initial scene is as follows. Buildings, trees, roads, and vehicles are already provided, but are not beautified.



You are required to write your own codes to add more types of objects, textures, and movements. The program will also allow the user to explore the town from different perspectives. Snapshots of good solutions are shown below.

You are also required to submit a project report (less than 4 pages). The report should at least contain student ID, student name, snapshots of your project and a list of functionality you have implemented.


Owl Prime
Owl Exterminators
owl-1078
owl-1079
owl-1080
owl-1081
owl-1082
Map-1083
view
Follow
Fly
Church-2
Moon
Zoo
Owl Prime
Clock tower
Intersection(2,3)
sights
Add Owl
Kill Owls
Snow
0
#SubDivs
SD loop?
46
19
Time of Day (24hr)
FoV
frame rate 20.8
speedup 0.0
Backface Cull
textured ground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SD loop?
46
19
Time of Day (24hr)
FoV
frame rate 20.8
speedup 1.0
Backface Cull
textured ground


WE'RE OWL EXTERMINATORS
Owl Prime
Owl Exterminators
owl-1078
owl-1079
owl-1080
owl-1081
owl-1082
Map-1083
view
Follow
Fly
Church-2
Moon
Zoo
Owl Prime
Clock tower
Intersection(2,3)
sights
Add Owl
Kill Owls
Snow
0
#SubDivs
SD loop?
46
22
Time of Day (24hr)
FoV
frame rate 31.3
speedup 0.0
Backface Cull
textured ground

The ultimate objective of this project is to give you an opportunity to explore topics in interactive graphics: how do you make things that look interesting, and be interactive. While some of this is artistic, some of it is technical: you need to pick things that can be implemented efficiently and have interesting behavior. We'll provide a singleton framework, which includes basic control of the GUI and some basic features of the system, so you can focus more on the graphics and OpenGL, and try to implement and extend the whole system with cool effects.

II. Basic Requirements

You should accomplish the following goals to get the basic points.

1 New moving objects. (3 pts)
   You need to add or modify multiple (at least two) types of moving objects (e,g., dogs, pedestrians, birds, helicopters, robots, etc). OpenGL primitives and very simple objects do not count. You can start by modifying the car to make it look more realistic and to attach different parts.

2 More behaviors of the moving objects. (2 pts)
   Associate moving objects with different behaviors (at least two new behaviors such as flying, jumping, hand waving etc.).

3 Multiple types of buildings/scenery. (3 pts)
   You are required to add different types (at least two) of buildings and scenery, such as an elliptical race track with two cars moving on it, fountains, museums, playground, parking lots, skyscraper etc.

4 New textures. (2 pts)
   Add textures for trees, houses, cars and your own objects. Some may not be flat (that is, it wraps onto multiple polygons)

5 You must add something that is affected by the time of day. (2 pts)
   For example, you can have an object that changes color (the shader is sensitive to the time of day) and shape (something besides the shader is sensitive to the time of day).

III. Bonus Features

You can use all the techniques learned from the course to decorate your town. The bonus points are given depending on the excellence and difficulty of your work. Implementing challenging and diverse visual effects will make you get high score. Here are several suggestions.

- Incorporate animation techniques, such as Particle Systems, to realize smoke, fountain, firework etc.
- Use "advanced" texture mappings: multi-texturing, projective texturing, environment mapping, bump mapping, or shadow mapping.

- Build an object made out of a curved surface. You can implement subdivision, or some form of parametric surfaces, or do a surface of revolution.
- Improve the lighting effects in the scene.
- Other features are encouraged, such as anti-aliasing.

Each advanced feature will add 1 to 3 points to your score depending on the visualization and technique behind, but the total will not exceed 6 points. We will only check the features that you say that you have implemented correctly. Partial credit will be given for advanced features, but negative credit may be given for really incorrect features (it is better to not say you implemented a feature than to show us something that is totally wrong).
Also, remember that in your demo, you will have to show off the feature, so think about what demonstration will convince us that it works. You should probably turn in example tracks that show off the features.

IV. Framework and Files

1. Build MyTown
   We provide a segment of skeleton codes for you to start from. There are three folders under the *ProjectFramework*:
   GrTown: Includes all files (.cpp, .h and vs2008.sln) that you need to work on.
   Utilities: Includes utility files that you may need. Don't modify them if not necessary.
   WinFltk: Includes the Fltk tool kit for the user interface. Don't modify them if not necessary.

   There is one thing to be aware of: the user interface (the widgets and whatnot) is defined in the "GraphicsTownUI.fl" file. Fluid (the FlTk UI designer) turns this file into a .cxx and .H file. Do *not* edit those files if not necessary. In case you ***cannot*** compile the solution in VS2008.net, try replacing line 9 in GraphicsTownUI.cxx, "`static using std::vector;`" with "`using std::vector;`"

2. GUIs for MyTown
   There are sliders to control the time of day (which does not change itself), the field of view of the camera, and the speedup factor (you can set it to zero to stop time, or set it higher to speed things up).
   The "Fly" button puts the system into flying mode (the default). The flying interface uses the following keys:
   * Left mouse button = steer
   * Right mouse button = fly (warning - if the flying gets "stuck" you will need to

click the mouse again)

* Arrows = turn
* Space = go forward
* 'x' = reverse
* Arrow keys on the keypad = translate (strafe)
* NumPad5 = forward
* NumPad0 = reverse
* 'WASD' keys do what you might expect if you play shooter games

The default town is pretty boring - it is made of a small number of simple objects, and a few behaviors. Your job in the assignment is to create a better town.

3. How to Start

You can actually do most of the work of the assignment without changing much of the existing code.

1. To complete the design of objects like cars and trees, you need to modify files under "Examples Objects and Behaviors"
2. To create an elliptical road for example, you need to modify the Roads.h/.cpp under the directory "Roads" to insert a new type of roads.
3. To design your own objects/behaviors/shaders, you'll need to change main.cpp, and you'll need to add new files for new GrObjects and Behaviors.

V. Marking Scheme

- Basic Requirements (60%)
- Bonus Features (30%)
- Report (10%)
- NO Acceptance for Late Submission (zero point will be given)

VI. Guidelines for Submission

1. Prepare at least four snapshots of your town in a report file (.doc or .html), including (1) the added moving object, (2) the newly added building/scenery, (3) the object that changes with time, and (4) the most beautiful view of your town.
2. Zip all source code files, the report, and the executable file, in a .zip file. Name it with your own username (e.g. wkchan.zip).
3. Burn your zipped project into a CD/DVD disk. You are required to submit your project with CD-R and a hardcopy of report.
4. There will be an assignment box on the 10/F of SHB about 1 week before the deadline. You can submit your CD/DVD and hardcopy of report into that assignment box.

5. An acknowledgement email will be sent to you once your assignment is received.
6. In case of multiple submissions, only the latest one will be considered.
7. *Fail the course if any plagiarism is found.*