

# CSC 3260 Principles of Computer Graphics

## Course Project: My Town (20%)

Due Time: 11:59pm, Nov 27, 2011

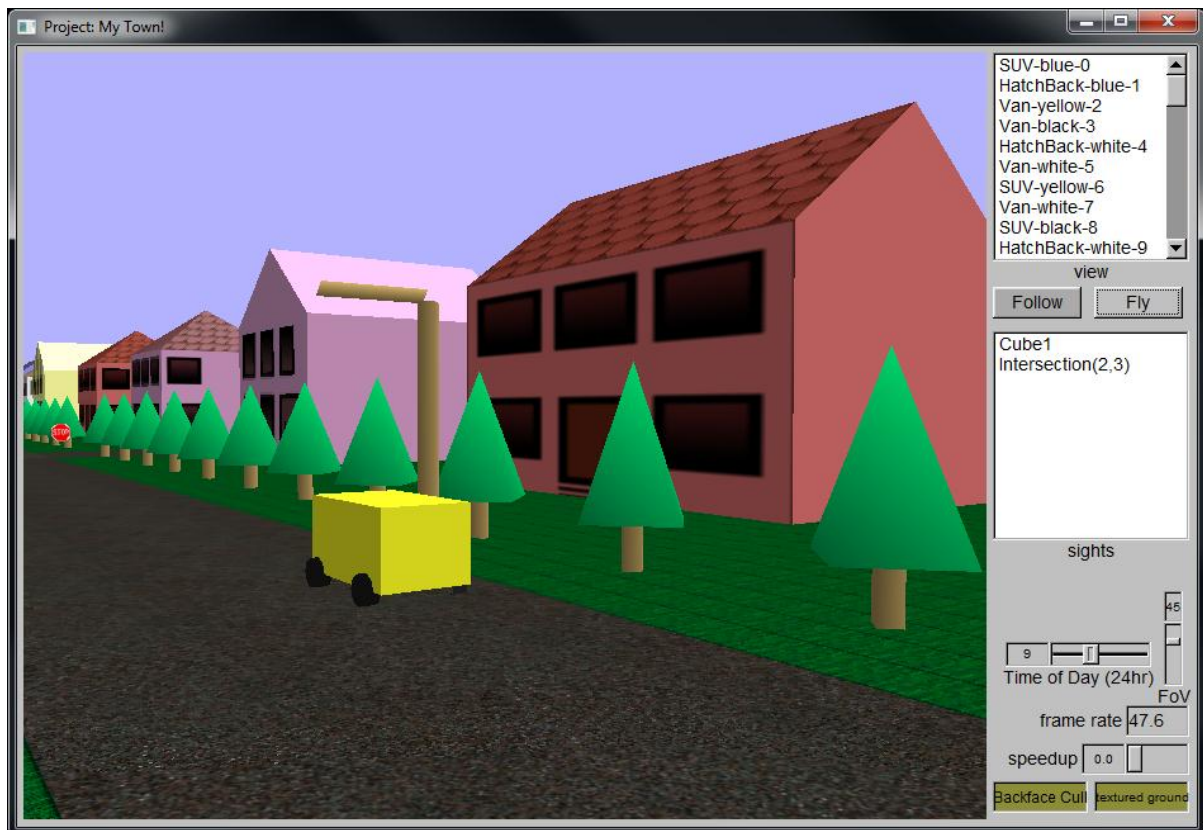
Demonstration Date: TBA

Late penalty: 20% per day

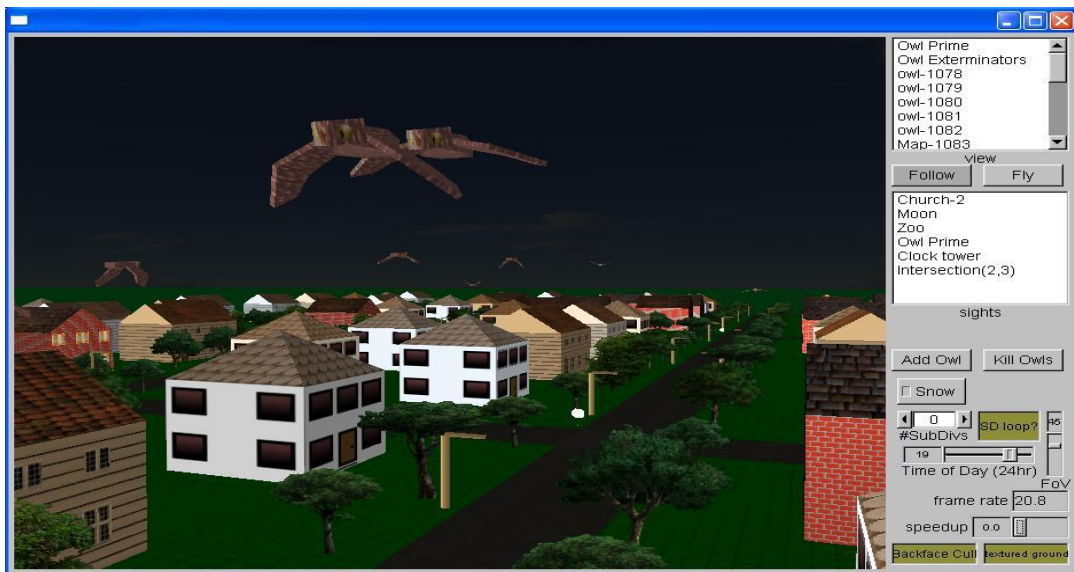
*Fail the course if any plagiarism is found*

## 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.



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 (you need to pick interesting objects to make and good textures/... to look nice), 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 three) 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. (3 pts)

Associate moving objects with different behaviors (at least three new behaviors such as flying, jumping, hand waving etc.).

3 Multiple types of buildings/scenery. (2 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. 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). (2 pt)

## III. Bonus Features

You can use all the techniques learned from the course to decorate your town. Here are several suggestions. 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.

- Incorporate animation techniques, such as Particle Systems, to realize smoke, fountain, firework, fluid etc.
- Use "advanced" texture mappings: multi-texturing, projective (slide projector) 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.

## 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/B-spline 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 (40%)
- Late Submission (-20% per day)

## 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 and bring it to QIN Zenglu in SHB 1026 during office time.
4. An acknowledgement email will be sent to you once your assignment is received.
5. In case of multiple submissions, only the latest one will be considered.
6. *Fail the course if any plagiarism is found.*