Instructors: Alex Richard (arichard6@georgebrown.ca)
Hooman Salamat (Hooman.Salamat@georgebrown.ca)

Due: See D2L for due date

1   Introduction

In this assignment you need to use introduce lights to make 3D objects look much better.

2   Logistics

This assignment is to be completed individually. All submissions for this assignment are electronic via D2L. This assignment is worth 10% of the course grade. You must use Hooman's template as normal. You cannot use any sprites in Alex's or Hooman's examples.

3   Instructions

There are two main parts to this assignment. In the first part, you will need to setup the project. In the second part, you need to render a couple of cubes. And animate the cubes along with the camera!

4   Deliverables

Submit your **entire project** zipped through the Assignment link on D2L, make sure that your project includes the following:
    a. The sources file: .cpp/.h files (including those that load shaders)
    b. Your shader files
    c. Your screenshots as per below
    d. Name it: GAME2012_A4_YourlastnameYourfirstname.zip

You will also need to submit **3 screenshots** of your running application from different angles. You can submit them separately over D2L or include them in a folder in your zip.

5   **What you need to do**

Part 1 (0 marks)

1. Use any project as a starting point.

2. Change the title of the window to: GAME2012_A4_LastnameFirstname

3. Change the main .cpp to the following format:
   GAME2012_A4_LastnameFirstname.cpp

4. Add the following comment header in your file and make sure to change my name to your name and add your ID. Also, make sure to add some useful description to your file.

```
//****************************************************************************
// GAME2012_A4_LastFirst.cpp by Your Name (C) 2020 All Rights Reserved.
//
// Assignment 4 submission.
//
// Description:
//    Click run to see the results.
//
//****************************************************************************
```

5. Customize the project according to your taste:
   a. Change the background color from black to a different color.
   b. Change the window size to a different size.

6. If you fail to do any of the above steps, you will be penalized 1 mark.

*Part 2 (**10 marks**)*

Follow these steps one by one and make sure that at the end of every step your work is complete.

1. Create a plane divided into squares with their normal vectors. Make the plane at least 5x5 and at most 10x10. The length of the plane can be as many units as the number of squares, so I'll let you use my grid from my shape generator. Make sure you render it solid. (3%)

a. Note: if you use a plane of only four vertices, you won't get this 3%.
2. Apply a single texture to the full plane (UV mapping). Texture cannot be a blank texture. (3%)
   a. Note: you will have to figure out how to add UVs to my grid, because right now, all the UVs are set to 0. What, you think this was a gift? Just use a bit of thought and you can figure it out. Right?
3. Create a point light on top of the plane and perform the calculations in the shaders. NOTE: Your light must light up the texture applied to the plane. (2%)
4. Animate the light source (its position) using IJKL keys, because you can keep any camera movement code in. (2%)
5. Take any three screenshots from different camera angles and make sure the lighting of the texture is visible.

6 Penalties

- You don't name your .cpp and .zip properly: 1 mark off each
- Late penalty: -10% per day up to -50% and then not accepted
- Missing screenshots: ½ mark off for each missing screenshot
- Handing in code from an example without significant changes: 0% and a plagiarism report. Adding a few changes to comments or title text is not significant.
- Old OpenGL used: If you used the fixed function pipeline (legacy OpenGL) with functions like glBegin() and glEnd() to draw, you get 0. We teach modern OpenGL in this course and if you're using FFP, then I know you're plagiarizing from another source.
- You don't use Hooman's template: 0% for assignment
- You forgot to delete the hidden .vs directory: 1 mark off
- I must fix your project and/or put your files in a working project: 2 marks off