Hacettepe University
Computer Engineering Department
BBM 414 Computer Graphics Lab.
Experiment 2

Subject: OpenGL shape drawing and basic shading
Submission Deadline: 16.11.2016 – 23:59
Advisors: Asst. Prof. Ufuk ÇELİKCAN, R. A. Öner BARUT, R.A. Cumhur Yiğit ÖZCAN

Tasks

Part 1 (15%):

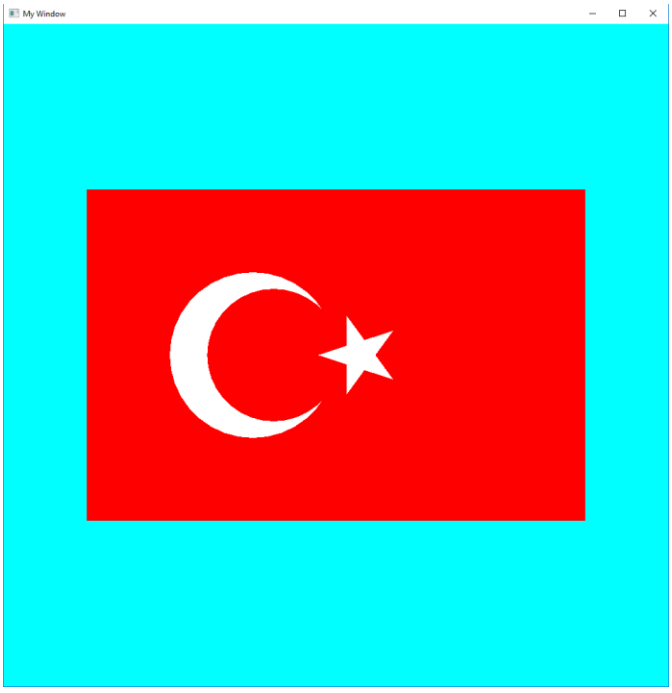
- Download the book source code from the book website: http://www.cs.unm.edu/~angel/BOOK/INTERACTIVE_COMPUTER_GRAPHICS/SIXTH_EDITION/CODE
- Compile the examples from Chapter 2. Run example2 and example4b.
- Take screenshots of what you get from those programs (take the screenshot of entire desktop instead of the program window alone).

Part 2 (85%):

- Try to complete as many of the following steps as you can.
- To switch between the steps use the following keyboard keys:
  - Use '1' key to switch to Step 1.
  - Use '2' key to switch to Step 2.
  - Use '3' key to switch to Step 3.

Step 1 (45%):

- Using the measurements given at : https://tr.wikipedia.org/wiki/T%C3%BCrk_bayra%C4%9F%C4%B1 create the scene given in the following picture:



- Image you create should follow the design rules of Turkish Flag (notice the orientation of the 5-point star).
- Grading of the second part:
    - the crescent: 25%, the star: 20%

Step 2 (20%):

- Change the vertex shader code to create waving animation given below:

Step 3 (20%):

- Change the fragment shader code to create shading effect of the waving animation given below:

Hints

- Use the variable “vPosition” to pass the vertex information to the vertex shader.
- The shapes should be drawn as GL_TRIANGLES or GL_TRIANGLE_FAN or GL_TRIANGLE_STRIP s.

The Crescent:

- To draw the crescent you will draw 2 circles. Use the parametric equation of a circle to create multiple vertexes in a polygon. The parametric equations is:
  y=sin(angle)
  x=cos(angle)
- You will need to increment the angle between 0 and 2*pi to draw the circle.

The Star:

- To draw the star you can draw a pentagon and five triangles.
- Drawing a pentagon is similar to drawing circle (try drawing a circle in five steps).

The Wave Effect:

- You can use sine or cosine function to determine the translation amount of each vertex in “y” axis (in vertex shader code).
- You can use sine or cosine function to determine the brightness of each pixel (in fragment shader code).

Notes and Restrictions

- Implement your homework using OpenGL 3.1 version or higher. All programming assignments must use the shader-based functionality of OpenGL: 1) no immediate mode 2) at least one vertex shader and one fragment shader. Therefore, you should not use any of the deprecated features of the API, e.g. glBegin, glEnd, glVertex3f, glTranslate etc. Otherwise the corresponding parts of your homework will not be graded.
- The assignment must be original work. Duplicate or very similar assignments will be regarded as cheating and are both going to be punished. General discussion of the problem is allowed, but do not share answers, algorithms or source codes. Using other resources (example source codes, books, webpages etc.) is allowed as long as they are properly referenced.
- All rules and restrictions stated in the BBM414 syllabus apply.
- Style and appropriately commented code matter.

Submission

- You should submit entire Visual C++ project directory including source files, header files and the compiled executable in a zip file.
- You should also submit a report explaining your algorithm, description of your functions, and any other implementation details that explain your code in Part 2. The report constitutes 25% grade of each corresponding section (e.g. The Report on Part 2 Step 2 is 20% * 25% = 5% of the whole experiment grade).
- Submission file structure must conform the template given below:
- <student_number>.zip
  |--- project.zip
  |--- report.pdf
- You should upload your files via “Online Experiment Submission System” which is at http://submit.cs.hacettepe.edu.tr
- Do not submit any file via e-mail.
- No submission will be accepted after deadlines.