

Computer Graphics exam

2018. 12. 18.

Structure of the exam

Any subsite of cg.elte.hu can be used during the exam, including all [lecture slides](#) and practice programs:

- http://people.inf.elte.hu/puzsaai/eng_cg/
- http://vision.sztaki.hu/~danini/Computer_Graphics/
- <http://iffan.web.elte.hu/eng/>
- http://cg.elte.hu/~agostons/cg_en/

Other usable sites: the [OpenGL reference](#), [GLM's documentation](#) and [Wikipedia](#)

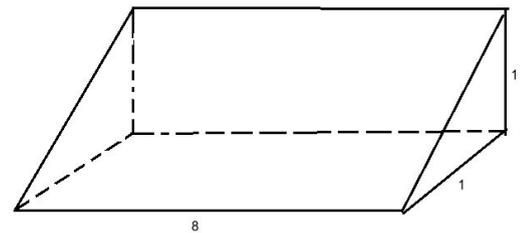
Nothing else can be used (online forums, tutorials, your neighbour, etc.)

Download and set up the [OGL Pack](#) for the exam, open a project of your individual choice in Visual Studio! Should you have any questions, please don't hesitate to ask!

You need to create certain geometric entities, build a virtual scene and respond to user interactions using C++ and OpenGL. You have 4 hours to finish your program adequately! Once you finished the exam, an examiner will discuss and grade your exam with you. Do NOT leave the lab, without getting your grade.

Tasks

Create a triangular [prism](#), where the base triangle is right angled (*see figure*). The legs of the triangle should be 1 unit each, and the height of the prism should be 8 units. **(4 points)**. (Full point only if it looks correct from all directions with backface culling on.) Specify vertex normals (hint: normals can be the perpendicular vectors to each triangle) **(1 point)**, and texture coordinates **(1 point)** for the object.



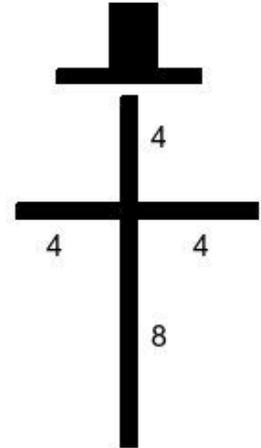
Load the [hat.obj](#) from file **(1 point)** and put [this texture](#) on it **(1 point)**. Don't change the texture of other objects, just the hat's.

Create a planequad (rectangular geometry using VAOs and VBOs or gVertexBuffer) in the $y=0$ plane, of dimensions 30×30 and place it down as the 'ground', the models 'standing' on top of it. **(1 point)** Specify correct texture coordinates **(1 point)** and normals **(1 point)** for the planequad.

Build a scarecrow! The scarecrow should be composed of a vertical prism (body and leg) which should be scaled to 12 unit high **(1 point)**, and a horizontal one (arms), that is at

two-thirds height of the body **(1 point)**, and the hat should be on top of the object. **(1 point)**
See figure for details. If the full scarecrow is correct, **1 more point**.

Put the scarecrow in the middle of the scene, so that it is standing on the plane **(1 point)** Create a "bird" which will be a prism you created, scaled down, so that its height is 1 unit. **(1 point)** Birds should have a fixed color as a texture, set it inside the fragment shader. **(1 point)** Show 7 birds on a circle around the middle, which has radius 8 and is 2 units higher than the plane. **(2 points)** Make the birds fly around the scarecrow with a constant velocity. **(1 point)**



Whenever the user presses one of the arrow keys, the scarecrow should move one unit in that direction, and the middle of the circle should move with it. **(2 points)**

Whenever the user presses the space key, the scarecrow should continuously grow until it has twice its size. **(1 point)** Then the birds disappear **(1 point)** They reappear after 3 seconds, when the scarecrow also changes back to its normal size. **(1 point)**

Change the lighting of the scene to a directional light, where each lightray has the direction $(-1, -1, -1)$ **(1 point)**

Total: 27 points

Grading:

0 - 13 : 1 :(

14 - 16 : 2

17 - 20 : 3

21 - 24 : 4

24+ : 5 :)