3D Graphics Project – Winter Sports!

This worksheet describes the project assignment you will present at the end of the semester. You will work on this project during the remaining practical sessions and on your free time. You are asked to provide rendering and modelling solutions arising for the proposed project scenario, and to show and explain your solution and results during your project presentations. Please check the course webpage periodically for additional guidelines.

1. Practicalities

Grading Criteria. Pertinence of proposed choices and solutions, elegance and efficiency of the proposed code, the number and difficulty of implemented techniques, the quality of the presented results. The grade for this project counts for 50% of the total 3D Graphics grade.

Teamwork. Projects are in groups of 2. A very small number of 3 person groups will be tolerated for parity reasons. Keep in mind that grades of groups of 3 may be downweighted for fairness with 2-person groups. Projects should be teamwork; one person shouldn't be doing everything. If a difficulty arises in the group, be sure to notify your professor as soon as possible (not two days before the presentation). Start working early on, so as to leave yourself time for other semester projects. Don't wait until the last minute.

Project deposit. You will deposit an archive of your project code on Teide at a later specified date. This code ***must*** easily compile and run on Ensimag E301 or E103 machines as reference platform (You can still code at home but should ensure compatibility). Your deposited archive name should be **G3D-NAME1-NAME2.tgz** where NAME* are group member last names. It should decompress ***as a folder*** named **G3D-NAME1-NAME2/**. Provide a ***README.txt*** file at the root of your folder explaining how to compile and run, directory organisation and any practical information.

2. Subject Description: Winter Sports!

2.1. General Guidelines

The goal of the project is to propose a graphical, interactive rendition of a winter sports scene. A winter scene is assumed to contain some snowy mountains, vegetation, sky, a person or group of persons and some winter-sport specific objects, all of which you will need to model. You can add any number of objects to this list for your needs (rocks, buildings, skilifts, etc). A skier (or surfer, depending on your personal religion) should be present in the scene. You will need to model the skier body as an articulated, animatable body. Follow advice given in the practicals, in particular TP4 Hierarchical modeling.

Your scene should contain a real-time animation, with a script of your choice. You may trigger one or several animations on the press of some keystrokes for demonstrative purposes. In this case, include those keystrokes in the QGLViewer help menu showing up when 'H' is pressed. Your scene should contain snow, you can try various effects to render snow, and also to animate snow (snowfall, snow displaced by the skier as he goes downslope).

A set of more detailed project guidelines is presented below.

2.2. Minimal Project Content & Challenges

Modelling you must use in your project (implement all of the following):

1. **Procedural modelling**. Use procedural modelling for at least one object in the scene (mountain, trees, clouds…)
2. **Animated skier**. Model and animate a partial or complete articulated skier in your scene. Depending on the animation envisioned in your project, you may not need to model all skier articulations: start with simple animations before trying anything tricky.

List of rendering effects you must implement in your project (all of the following):

3. **Light scattering**. Winter scenes are often foggy, implement this effect.
4. **Texture**. Mountains are rocky, the sky is cloudy, ski resorts often have flags, the skier's suit or equipment could also be of non-uniform appearance. Use at least one occurrence of texture mapping to render some surface details of your choice.

List of animation effects to implement in your project (implement at least 2):

5. **Particle / non-rigid effect**. The skier will project snow as he goes downslope, animate this using a particle effect.
6. **Flexible cable**. Ski resorts have ski lifts and cable cars. Propose a representation and physical model to animate the cars and ropes.
7. **Flags and flagpoles**. Propose a descriptive or physical animation to animate some flags or banners in your winter scene.

List of advanced effects (implement at least one of the following):

8. **Flocking.** Propose a layered model to represent and animate a group of people skiing together and loosely following a leader. For each layer, define its goal and explain your choice of model among those studied in class. The last layer should be a geometric model of your choice (a mesh, a spline surface or an implicit surface), animated over time.
9. **Collision avoidance**. Skiers in your scene simultaneously want to ski and stay alive. Implement intelligent skiiers who change their trajectories when nearing another skier.
10. **Fire.** Your scene can be at the winter Olympics. Your skier carries the Olympic flame. Use a transparency / particle effect or any effect of your choosing to model and animate fire.
11. **Reflection/Transparence.** Skiers like to wear shiny, semi-transparent masks. Cable cars have reflective, semi-transparent windows. Implement alpha-blending and/or reflection.
12. **Acrobatics.** Your skier might be in an acrobatic ski-jumping competition. Model jumps or stunts in a physically plausible way.
13. **Shadows.** Your skier (or other) may cast shadows on the rest of the scene.
14. **Other ideas.** You may think of other intersecting ideas to include (discuss and validate them with your professor before implementing).