Concordia University

COMP 371 - Computer Graphics

Course Project Guidelines

1. COMP 371 Project Objectives

The goal of this course project is to allow students to work in teams in order to implement a variety of Graphics related tasks all integrated within a unified Framework. This will prepare students to contribute to real life industry and research projects.

Students will mainly be evaluated on the Graphics tasks implemented and their understanding of the problem and solution demonstrated in the Final Project Presentation.

2. Team Composition

Team Size: Between 5 and 7 Members

Teams will be proposed by the students themselves. The Course Instructor has the power to modify teams, or assign extra members to a team. Each team must delegate a Team Coordinator who will submit deliverables on behalf of the team. Other roles can be assigned to team members such as Producer, Lead Programmer, Rendering Programmer, Shader Programmer, Physics Programmer, QA Manager, etc. These roles can help in order to divide the work across the team.

When your team is complete, email your instructor with all the members of the team (bergeron@encs.concordia.ca). If you don't have a team, or if you have a team smaller than 5 members, let the instructor know.

3. Project Proposal

The project proposal document should be short and concise. It should give a good idea of what the project is all about. It can be a game, a software for home renovation preview, a serious application, a realistic renderer, or any graphics related project. It should contain the following sections:

- Project Overview
- Project Schedule
- External Code base / Data
- Source Control

Project Overview

Explain the project idea, and list all the main features for the project. You can provide Pictures, Screenshots, Mock-Up and/or Flow Charts to illustrate what the project will do and look like. List and explain the main features of the application.

Project Schedule

Break down all the tasks required for the project. For each task, assign a team member responsible to do it, and provide an. You can use the Project Tracking Spreadsheet provided on Moodle to do this.

You can pick tasks from the Project Task Ideas (see last page), or come up with your own. Completing a couple of easy tasks, or a medium/hard difficulty task is expected for each student. Be careful with the dependencies between tasks and the scope of what you are committing to do. It is recommended to prioritize your features (High priority, Medium Priority, Stretch Goals).

External Code base / Data

You should specify if you are starting the project from Scratch or if you start with an existing code base or use any libraries. Also, mention how you will get any required data (3d models, textures, etc).

Source Control

If you are using Source Control (you should), please provide a read-only link to your repository.

Submission

The Team Coordinator must submit the Project Proposal Document in PDF or Word DOCX format on Moodle by the date specified in the *Milestone Schedule* section below**.** The course instructor will provide feedback in the week following the proposal submission.

4. Mid Project Report

The Mid Project Report is a Work-in-Progress update highlighting the status of the project, including any changes from the original proposal. It should be about 1-page long and have the following sections:

- Project Name and Status
  - Green (On track), Yellow (Behind), Red (Stuck)
- Changes from Original Proposal, if any.
- For Each Team Members: Tasks Done, In-Progress, Not Started

5. Final Project Implementation

The project source code and assets (textures, models, etc) should be submitted in ZIP format on Moodle. You may include a README file to explain how to build and run the project, required libraries, etc.

6. Final Project Presentation

Each team will have approximately 20 minutes to present their project. Each team member should present its contribution to the project and explain the technique implemented, challenges, and what was learnt from implementing this feature.

7. Final Project Report

Each team will produce a 10- to 15-page written final report about the work done. Be sure that your final report includes a small section detailing how to get your code compiled and running (including detailing any special libraries or packages that were used and that must be installed first).

Essentially, the report is a document outlining your project in terms of the project design and implementation (including what external resources you used), what you learned while doing the project, what your project is capable of (from the user's perspective) and how you made sure it works (i.e., testing). It's not meant to be an extremely detailed document, but if you planned to write something trivial for any aspect, it would be better to just skip that aspect.

Each team member should be responsible to write the part of the report about the work they accomplished. Below is a breakdown of the sections expected:

- Project Overview
  - Summary of what the Project is
  - Expected Results vs. Actual Results
- Methodology
  - Explain how each major features was implemented
    - Were there alternatives?
    - Pros and Cons of each alternative
    - Why was the feature implemented this way
- Results (For each major features)
  - Explain the results in terms of Quality and Performance
  - Provide Screenshots

- Discussion
  - Overall, is the approach taken promising?
  - What different approach might have been better?
  - Future Work if you had time
  - What did you learn doing this project
- User Manual
  - Briefly, how would a user compile (what unusual libraries or packages are needed, and where did you get them?), run the project?
  - Describe how the user is to interact with your project? E.g., what buttons should be pressed to perform certain actions? You may have help screens outlining this information, but still include it in your report.

8. Milestone Schedule

Deliverable	Due Date	Worth
Team Composition	Monday, July 21st	1%
Project Proposal	Friday, July 25th	2%
Mid Project Report	Monday, August 4th	2%
Final Project Implementation	Monday, August 18th	30%
Final Project Presentation	Monday, August 18th	
Final Project Report	Wednesday, August 20th	5%

9. Grading

Team Grades:

An overall grade will be given for each project. This grade is the starting point to calculate the student's individual grade.

Individual Grade:

Based on the Team Grade, a student's grade will be adjusted based on the Quality and Quantity of work delivered, as well as how well the student can explain what he did during the presentation.

If a student doesn't contribute at all, he will be assigned the grade *0*. In most cases, individual grades should be adjusted within $\pm 15\%$ of the Team Grade.

Project Task Ideas

2D Graphics

- Implement Original UI framework (Buttons, Animated Panels, ...)	Medium
- Image Morphing Tool	Medium
- Image Compositing Tool (eg: Basic Photoshop)	Medium
- Video Compositing Tool	Medium
- Texture Tuning Tool (Compression format, Resolution, Color Format)	Medium
- 2D Rigid Body Physics	Hard
- 2D Physics Engine Integration (eg Box2D)	Easy

Real-time Graphics Projects

- Texture Support	Easy
- Cloth Simulation	Hard
- Physics Engine (Collision detection, Collision Response)	Med/Hard
- Skeletal Animation (Skinning)	Medium
- Rag doll Animation	Medium
- Vertex Animation (Morph Targets)	Medium
- L-System for Building Generation	Hard
- L-System for Plant Generation	Hard
- Particle Systems	Medium
- Object Editor with Rotation, Translation, Scaling Gizmos	Medium
- WebGL Framework	Medium
- Decals (Spray paint on 3D geometry, Decoration tool within World Editor)	Easy
- FFT Water Simulation	Hard
- View Frustum Culling (for Rendering Acceleration)	Easy
- Spatial Subdivision Data Structure for Culling	Easy
- Mirrors	Medium

Camera

- Cinematic Camera Animation on BSplines	Easy
- Third Person Camera	Easy
- Procedural Camera Shake	Easy
- Follow Cam aware of the Geometry	Medium

Shader-based project

- Full Screen Post-processing effects (Bloom, DOF, Ambient Occlusion, …)	Medium
- General Purpose GPU Applications	Medium
- Blob Shadows	Easy
- Shadow Mapping	Medium
- Shadow Volumes	Medium
- Spherical Harmonics Lighting	Hard
- Color Correction	Medium
- Defered Shading	Hard
- Team Fortress 2 Toon Shading (Nice paper by Valve NPAR 2007)	Medium
- Normal / Parallax / Relief Mapping	Medium

Realistic Rendering Projects

- Ray Tracer	
- Basic Framework	Medium
- Soft Shadows (Area lights)	Easy
- Reflection / Refraction	Easy
- Global Illumination (eg: Photon Mapping, Path Tracing)	Medium
- Ray Tracing on GPU	Medium

Research Paper Based Tasks

- Siggraph / Siggraph Asia / Eurographics / NPAR / etc…	Med/Hard
(Ke-Sen Huang's Home Page: http://kesen.realtimerendering.com/)	