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CSCI 4110 Advanced Graphics

Project Suggestions

Due: December 10, 2024

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Introduction

The final project is worth the same as the three assignments in the course, which should give you some indication of the amount of work involved. It should be approximately the same amount of work as three assignments, give or take a bit. The project could be a programming project or it could be a written project, both of these project types are described below.

This document contains a list of suggested project topics, but you don't need to select a project from the list. If you would like to do a different topic please discuss it with me first.

Programming Projects

A programming project involves implementing algorithms or techniques related to computer graphics. The bulk of this type of project is programming. There is a written report that describes the work that you have done and how to use your program, and it should be approximately 5 pages in length. Your project should be packaged in a professional way with the source code, libraries required to build the project, the complete build system along with a description of how to build the software. Possible project topics include:

1. Implement one of the more advanced modeling techniques discussed in the modeling section of the course. Some possibilities include subdivision surfaces or one of the machine learning approaches such as DreamFusion.
2. A classic programming project is to implement a ray tracing program. There are many variations on this, including reducing computation time, different light effects, and different modeling primitives.
3. Related to the previous suggestion is to extend assignment two to be a more complete path tracer using some of the techniques that we discussed in class.
4. Mitsuba 3 is one of the most sophisticated rendering programs and its source code is readily available on the net. The binary distribution of Mitsuba supports a limited number of variants. For this project re-compile Mitsuba to support the more advanced variants and construct several examples of how they can be used.
5. Implement the Boids algorithm for flocking animation. Consider how this technique could be extended to other types of objects.
6. Sensor-Actuator Networks. Implement the Sensor-Actuator Networks animation technique or a similar learning based technique for computer animation. If you take this approach, I suggest using the ODE dynamics engine, since it is easy to learn.

Written Projects

A written project is largely a written report that explores some aspect of computer graphics. This could involve a survey of a particular topic in computer graphics literature. In this case you would identify the

key research papers in the area, read them, and provide a summary of their results with some insight into the work that has been done in the area. It could also involve installing several software packages for a particular technique or problem, developing an evaluation scheme for them, and performing the evaluation. The evaluation could involve computation time, quality of the result or ease of use. Possible topics for written projects are:

1. Survey the techniques that have been used for crowd animation.
2. Survey some of the research that has been done on light field rendering.
3. Survey point based modeling and rendering techniques.
4. Survey the work that has been done on inverse rendering. A good starting point for this is the Mitsuba renderer. This could be a combination of written and programming project.
5. Pick a recent Siggraph or Siggraph Asia proceedings (they are available in the ACM digital library available through the Ontario Tech library) and select a topic from the papers presented there. Conduct a survey based on this topic.
6. The August 2018 issues of ACM Transactions on Graphics (volume 37, number 3) has several articles on production rendering. Select three of these papers and summarize the key ideas and compare the different approaches.