ALGORITHMS FOR RUN TIME TERRAIN DEFORMATION

STATUS REPORT

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Project Abstract

The goals of Phase II are to develop and implement algorithms for a real time mission rehearsal simulation which will deform the terrain database to match target data. A correction function c(x,y) that is added to every vertex in view. The correction function must (1) adjust the terrain surface to meet the specified features, (2) appear smooth and continuous so that the adjustments appear natural, and (3) do not distort aspects of the database that must be preserved. The implementation is to be in C++ and compatible with Open Scene Graph. The code will be placed in the public domain in keeping with an open source philosophy.

• *Previously Completed Work*

The Phase II contract was signed on April 8, 2005 and work started immediately. ▪ A kickoff meeting was held in May '05, and the program plans were reviewed. ▪ Don Burns, one of the originators of Open Scene Graph was added to the project team. ▪ Completed the first draft PDL that links to OSG and deals with database layers and tiles. ▪ The SHAPE file input software was written and debugged. An algorithm to find the shape of the object contact to the terrain was devised and programmed, with the terrain modified abruptly. ▪ The comprehensive algorithm for real time terrain modification was completed and documented. ▪ The correction function and recursive subdivision algorithms have been implemented and demonstrated.

• *Work Accomplished This Reporting Period*

Update of the OpenFLIGHT Loader

To be usable, our dynamic terrain software must be compatible with standard databases, in the OpenFLIGHT format. OSG 1.0 was released in 2005 with an OpenFLIGHT loader plug-in for OpenFlight v15.8. That plugin suffered from many problems, including cases of incorrect rendering and a cumbersome implementation that inhibited enhancements and bug fixes.

In early 2006, a new OpenFlight plug-in was added to OSG to replace the old plugin. The new plugin has a much cleaner implementation to easily allow enhancements and bug fixes. Nonetheless, it had too many bugs for production use.

Work during this reporting period has been focused on increasing the robustness and usability of this new OpenFlight plugin. Accomplishments include:

- OpenFlight plugin testing and evaluation. Gathered data on functionality and performance to make a solid decision on the best OpenFLIGHT plug-in solution for this project.

- Addition of texture wrap and environment modes**.** This allows the plugin to support models using the v16.0/v16.1 OpenFLIGHT specification.

- Enhanced the OpenFLIGHT plugin for OpenGL Shading Language shader usage. This allows the plugin to support models using the OpenFlight v16.1 specification.

- Enhanced OSG and the OpenFLIGHT plug-in to render light points using texture maps (point sprites). This allows the plugin to support models using the OpenFlight v16.1 specification.

- Modified the plug-in to fully support external reference records. This is required to conform to OpenFLIGHT specifications, and the change allows hierarchical models to save disk space by sharing palettes (color, material, shader, etc).

The new plug-in, previously limited to supporting OpenFlight v15.8 and part of v16.0, now fully supports v16.0 and the majority of v16.1. The new plug-in now features improved support for external model references. Testing has shown that the new plugin is robust enough to accurately display a wide variety of OpenFlight model.

The new plug-in is slated for inclusion in the upcoming OSG 1.1 release (currently planned for late July 2006).

Documentation Project

There are audio quality problems with the lectures to be used as the basis for the documentation. We are going to have to record the material again in a controlled environment with better equipment. We have straightened out the equipment problems, so we are ready to do that.

IMAGE 2006

Roy will be presenting the paper on the dynamic terrain algorithm at the IMAGE Conference in Scottsdale, July 9-13. The slides for the presentation have been prepared. We are looking forward to comments from the audience of visual simulation professionals. Dynamic terrain has traditionally been viewed as a difficult subject.

• ***Summary of Status***

The project is on schedule. The status of tasks is summarized below:

ID	Description	04/06
Task 1	Research & verify the timeliness of the full-scale Algorithm/technique	100 %
Task 2	Verify the accuracy of the full-scale algorithm or technique	100 %
Task 3	Design, code and test the full-scale algorithm	85%
Task 4	Develop a web site for the release of open source code	80%
Task 5	Examine the compatibility of the open source code with the existing IG hardware	60%
Task 6	Demonstrate the prototype	36%
Task 7	Write Interim Report(s)	60%
Task 8	Write Final Report and Summary Report 0%	0%

• *Problems*

No significant problems or information that might impact schedule have been encountered in this reporting period.

• *Interim Results*

There were no new interim results to report.

• *Recommendations and Proposals*

There are no recommendations or proposals as a result of efforts in this reporting period.

• *Summary of Future Plans*

The OpenFLIGHT loader needs some further testing, support for cubemap textures, features for backwards compatibility with the old plugin, such as the ability to obtain geographic positioning information from the OpenFLIGHT model header record.

The documentation effort will continue.