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*

First Release

This month we made the first public release of Open Scene Graph source code with the dynamic terrain feature. The source code is kept under a configuration management tool called the Concurrent Version System (CVS). This allows public access and modification of the code while preserving the original version.

CVS users access the code using

```
cvs -d :pserver:cvsguest@openscenegraph.net:/cvs/osg co osgTDS
```

The file builds and runs against current versions (or even version 1.0) of OSG with no problems on Linux.

There are currently two bugs in the Windows release. Windows does not have native support for regular expressions so the work around is to use explicit names for terrain files. There is a GNU package for implementing regular expressions underWindows, and that will be used, ultimately, to remove the limitation.

Also, the Windows source code builds fine, but when run it produces a vague message about it not being able to load the TDS loader. If all worked correctly, the instructions to make things work would be these:

1. Install OSG (1.0 or later)
(http://www.openscenegraph.org/downloads/binaries/osg1.0_setup_2005-12-09.exe)

2. Download osgTDS software from CVS:
```
cvs -d :pserver:cvsguest@openscenegraph.net:/cvs/osg co osgTDS
```

3. In VisualStudio 7, navigate to osgTDS/VC++7 and open the 'osgTDS' solution.

4. Build in release mode.

Open Scene Graph, including our dynamic terrain plug-in, is designed to be compatible with UNIX (LINUX on PCs), Microsoft Windows, and the Apple Macintosh. In general, this means that the code must be written to accommodate the least capable of the three systems with respect to each particular feature.

The released version only supports adjustment of the terrain to fit discrete three-dimension objects like buildings. It does not support areal features, linear features, or the preservation of ridge lines. Despite the limitations, there has been enough interest in the Open Scene Graph community to justify the present release. Also, the current release does not guarantee that lakes will remain level. Future releases will incorporate these features.

Documentation Project

As planned, we recorded Don Burns three-day lecture series on Open Scene Graph. He gave the lectures in Monterey mid-month, and had fifteen attendees for the course. (Only one of them was local, from the Naval Postgraduate School).

Despite our best efforts, about a third of the lectures failed to record properly. Don will have to repeat those lectures in an office environment. The recording quality of the remaining lectures is not great, but is usable. We tried running a voice recognition program, Dragon Naturally Speaking, on the files. The results are not encouraging, as the system makes lots of errors. Not

surprising, voice recognition technology has a ways to go. We will probably end up having them manually transcribed.

We will edit the transcripts to provide the system documentation.

• 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	80%
Task 4	Develop a web site for the release of open source code	75%
Task 5	Examine the compatibility of the open source code with the existing IG hardware	55%
Task 6	Demonstrate the prototype	30%
Task 7	Write Interim Report(s)	56%
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

The first public release of the code was made, as described above.

• Recommendations and Proposals

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

• Summary of Future Plans

OSG reads databases in the OpenFLIGHT format originated by Multigen. The FLIGHT loader needs some modifications for use with dynamic terrain, and for compatibility with the latest revisions of the format. That is planned for completion during the coming month.

The problems in the Windows version of the first release are planned to be addressed in the coming month. The documentation effort will continue.