CEng 491 Proposal:
Design and Develop in Cloud
3D Mesh Editing Tool

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1. Motivation

Computer aided engineering (CAE) is the use of computer software to aid in engineering problems for a wide range of industries. Software tools that have been developed to assist these engineering activities are CAE tools. One of the most important branches of CAE tool is mesh editing tools.

To use these tools high performance computers are needed and sometimes, multiple of these computers do parallel programming. However, in a company for each department the need of new computers emerges with the developing technology. Improving the performances of all computers as new tools are developed is highly costly.

Another problem that occurs in this area is the license problem. The programs that in use are required license for every usage. And again this results in high costs when applied to all departments and all computers. Besides, the prices of the CAE tools are significantly elevated.

In this project, a 3D mesh editing tool that will allow viewing and editing of three dimensional surface and volume meshes for computer aided design is to be implemented on a cloud computing system.

2. Background

There are numerous CAE programs that has been using by engineering companies and research groups because designing and analyzing of big objects such as airplane, rockets cannot be done by hard work.

Some of the CAE programs [1,2] have more features about analyzing the object while some CAE programs have more features about designing the object [3,4]. Therefore, big project may not be finished by using one CAE program. And also standalone CAE programs depend on the computer specification that it's working. In order to achieve high performance, all the PCs should cover at least the minimum hardware requirements of that program which is also quite costly.

It is also possible to use some of these CAE programs in servers which reduce the amount of time for rendering or analyzing. But users cannot design objects in servers.

Cloud computing allows users to work with a remote computer with their data and their software. Designers and engineers may design big objects and systems in cloud servers with any possible devices, even cell-phones. The time spend in product testing of systems can drastically reduced by using cloud computing. Also using CAE cloud programs help companies to reduce the budget they spent in licensing since Cloud e-business model suggests different payment methods such as membership for month or year, CPU usage [5]. Even though it has advantages, CAE in cloud isn't popular right now. There are some anti-cloud arguments such as security [6], reliability and licensing control. Security is a must for some projects and using cloud may bring security issues but this problem can be solved by using private cloud servers that can't be reached without permission. Reliability is another issue since cloud servers may be down just like computer may crash. And also big companies don't want to reduce their license sale and revenue incomes.

3. Proposal

In this project, our aim is creating a 3D mesh editing tool which will work on browsers using a cloud computing system. The editing tool in servers can be used from multiple remote users when the project is completed. Users will be able to create, modify and view

meshes in their browser and they can store the results both on the cloud and their computers. To achieve this goal, a web application which uses modern day technologies as HTML5, WebGL will be created and connected to a cloud computing system. All the computation intensive job will be handled in main servers. Hence, without investing expensive CAE programs and its required hardware, companies can use this tool effectively. Besides, if a company is not willing to use remote server because of privacy reasons, by constructing cloud computing system in the local server, each departments can work from one remote computer. Thus, there will be no need to purchase expensive license or hardware for each department of the company. Also the system will create easy way to share the projects between different groups.

References

[1] Ansys web site, http://www.ansys.com/,

[2] OpenFOAM (CFD program) web site, http://www.openfoam.com/

[3] Catia in Wikipedia, http://en.wikipedia.org/wiki/CATIA,

[4] Autocad in Wikipedia, http://en.wikipedia.org/wiki/AutoCAD

[5] CAE on the cloud, http://www.designworldonline.com/cae-on-the-cloud/#_

[6] Cloud security, http://en.wikipedia.org/wiki/Cloud_computing_security