



## ANALYSIS THE GRAPH-BASED SURFACE RECONSTRUCTION USING STRUCTURES IN SCATTERED POINT

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### Abstract

Surface reconstruction means that retrieve the data by scanning an object using a device such as laser scanner and construct it using the computer to gain back the soft copy of data on that particular object. Surface reconstruction is a reverse method. It is very useful when in a particular object original data is missing without doing any backup. Hence, by doing so, the data can be recollected and can be stored for future purposes.

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### Introduction

At present, most of conventional education forms are becoming not being suitable for requirements of social progress, educational development and not being able to catch up with changes of learning demand in time, thus computer networks have brought opportunities for it. However, in traditional web-based e-learning mode, system construction and maintenance are located in interior of educational institutions or enterprises, which results in a lot of problems existed, such as a lot of investment needed, but without capital gains to return, without development potential and staying power. Cloud computing is becoming an attractive technology due to its dynamic scalability and effective usage of the resources; it can be utilized under circumstances where the availability of resources is limited. As cloud computing has become a research hotspot among modern technologies, researchers pay more attentions to its applications. As concerned as cloud computing applied in the field of education, a lot of problems had been studied, such as the technology for future distance education cloud teaching information system the integration of teaching resources teaching systems development. In integration of e-learning and network, emphasis is placed on building of software and hardware platform of e-learning system, functional structure, network security management and training, information technology integration to teaching campus network environment online education semantic web technologies-based multi-agent system. From the above we can see that until now, scholars have made a lot of researches on the following two aspects: cloud computing used in the field of education, and integration of network and e-learning. The former places the emphasis on distance education, information system application, instructional system design, information resource development, online course-building, etc.

### Algorithms efficiency

The basic algorithms work by projecting the points to a carrier surface creating triangles in the parametric domain of the carrier surface. These methods have limited scope for disconnected surface portions & objects with positive Genus [9]. Other methods start from various subsets of the 3D Delaunay tessellation of the sampling points and try to choose a proper subset of the faces. Another leading idea is to define implicit surfaces containing the given sampling points and extract these surfaces. Following fig show the time used by each algorithm to compute the surface is directly proportional to the number of input points. More time is needed to estimate the surface when the number of point clouds is increasing Delaunay/Voronoi based algorithm using more time to calculate surface



compare with other algorithm. This is because the estimations of voronoi diagram or Delaunay triangulation is time consuming .The interpolated method, for example, the computation of moving least square surface, involve the use of matrix in the algorithm. The BPA algorithm not involved any computation in voronoi diagram or Delaunay triangulation .Hence, this algorithm is faster than other algorithm. When the number of point clouds increase, the dimension of matrix will also increase, the high memory storage is required. Obliquely the complexity time for an algorithm will also increase.

## Cloud computing

The cloud computing as a new kind of advanced technology accelerates the innovation for the computer industry. Cloud computing is a computing model based on networks, especially based on the Internet, whose task is to ensure that users can simply use the computing resources on demand and pay money according to their usage by a metering pattern similar to water and electricity consumption. Therefore, it brings a new business model, where the services it provides are becoming computing resources. Cloud computing is highly scalable and creates virtualized resources that can be made available to users. Users do not require any special knowledge about the concept of Cloud computing to connect their computers to the server where applications have been installed and use them. Users can communicate through Internet with remote servers. These servers can exchange their computing slots themselves .Cloud computing is one of the new technology trends likely to have a significant impact on the teaching and learning environment .In Cloud computing, resources can be either externally owned or internally owned. Public Clouds offer access to external users who are typically billed on a pay as you use basis. The private Cloud is built for the access within the enterprise where the users can utilize the facility without any charge. The methods of meeting challenges such as user interface; task distribution and coordination are explained and evaluated. Described the application of Cloud assessed the current state of enterprise knowledge management and how it would turn into a more global, dependable and efficient infrastructure with Cloud computing. They have discussed architecture as well as applications. Cloud computing attributes can be visualized from the following comparison.

## Problem identification

Various algorithms like crust algorithm and Delaunay algorithm will be implemented and compared for time taken by the algorithm for surface reconstruction. Matlab has been used for developing the simulation model. Delaunay triangulation for a set  $P$  of points in the plane is a triangulation  $DT(P)$  such that no point in  $P$  is inside the circum circle of any triangle in  $DT(P)$  will be implemented. Delaunay triangulations maximize the minimum angle of all the angles of the triangles in the triangulation; they tend to avoid skinny triangles. The circum circle of a triangle formed by three points from the original point set is empty if it does not contain vertices other than the three that define it. For a set  $P$  of points in the ( $d$ -dimensional) Euclidean space, a Delaunay triangulation is a triangulation  $DT(P)$  such that no point in  $P$  is inside the circum-hyper sphere of any simplex in  $DT(P)$ . It is known that there exists a unique Delaunay triangulation for  $P$ , if  $P$  is a set of points in general position; that is, no three points are on the same line and no four are on the same circle, for a two dimensional set of points, or no  $n + 1$  points are on the same hyper plane and no  $n + 2$  points are on the same hyper sphere, for an  $n$ -dimensional set of points.

## Simulation results

This section represents the optimization of surface reconstruction system from scattered cloud points. The graph below shows the trace for the Delaunay algorithm.

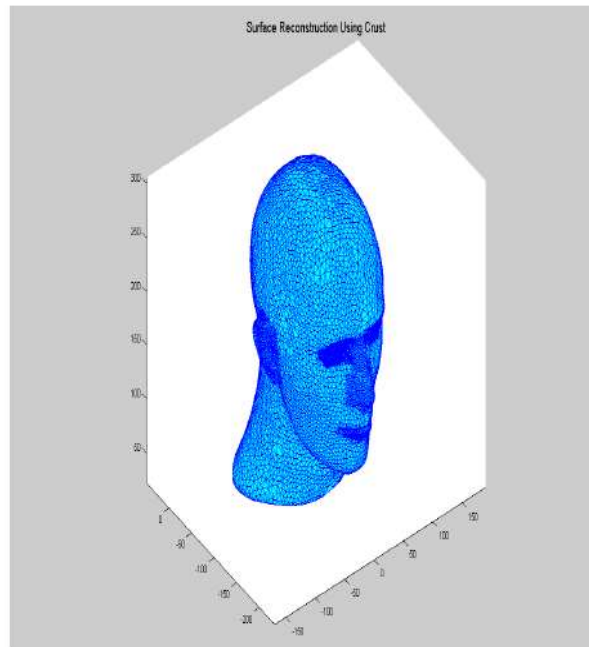


## **Delaunay algorithm**

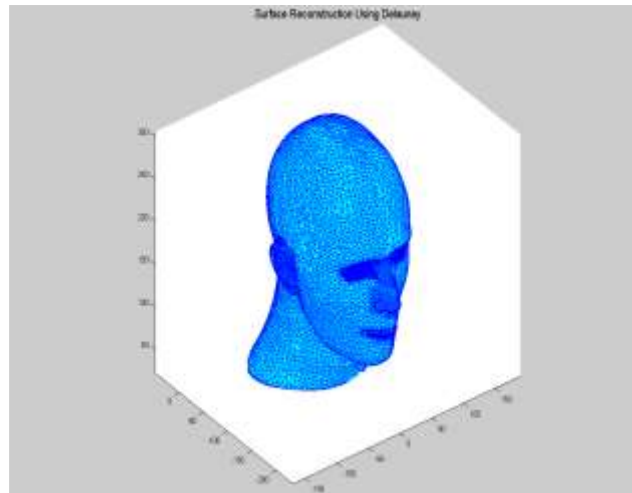
Added Shield: 0.0097 s, Triangulation Time: 3.3673 s, Connectivity Time: 1.5157 s, Circumcenters Tetraedroms Time: 0.1685 s, Intersection factor Time: 0.1191 s, Walking Time: 9.2955 s, Total Time using Delaunay: 14.5000 s.

## **Crust algorithm**

Added Shield: 0.0086 s, Triangulation Time: 3.1603 s, Connectivity Time: 0.8623 s, Circumcenters Tetraedroms Time: 0.1568 s, Walking Time: 0.7339 s, Total Time using Crust: 4.9540 s. The output using Crust algorithm.



*Fig 1. Crust algorithm  
The output using Delaunay algorithm*



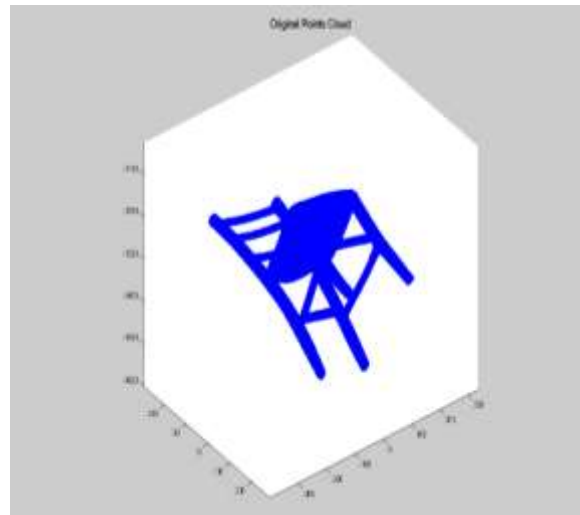
*Fig2. Delaunay algorithm*

### **Delaunay algorithm**

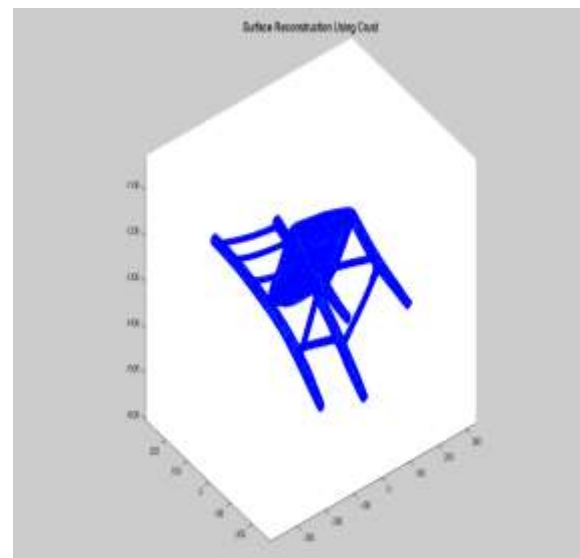
Added Shield: 0.0226 s, Triangulation Time: 13.9127 s, Connectivity Time: 6.2313 s, Circumcenters Tetraedroms Time: 0.7122 s, Intersection factor Time: 0.4393 s, Walking Time: 41.2375 s, Total Time using Delaunay: 62.7350 s.

### **Crust Algorithm**

Added Shield: 0.0240 s, Triangulation Time: 14.0245 s, Connectivity Time: 3.6201 s, Circumcenters Tetraedroms Time: 0.6435 s, Walking Time: 4.0685 s, Total Time using Crust: 22.4370 s. The original cloud point is as shown below.



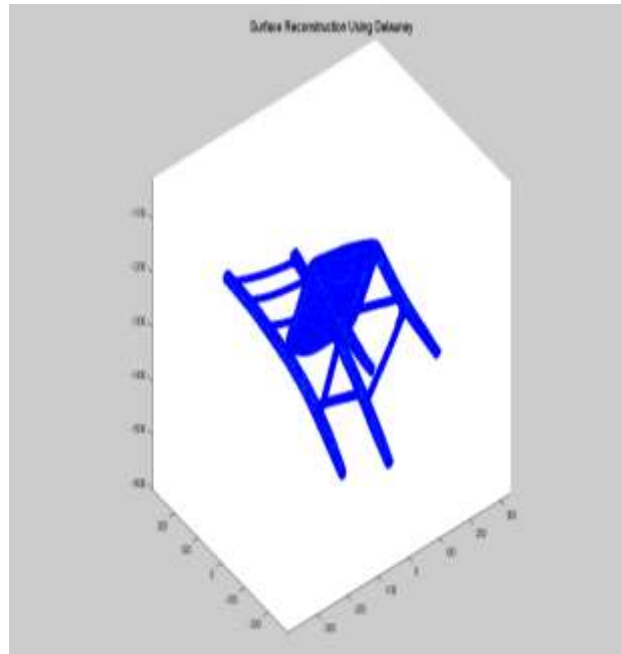
*Fig 3. Crust algorithm*



*Fig 4. Crust algorithm*



The output using Delaunay algorithm is as shown below



*Fig 5. Delaunay algorithm*

## Conclusion

Cloud computing has recently emerged as a compelling paradigm for managing and delivering services over the internet. The rise of cloud computing is rapidly changing landscape of Information technology and ultimately turning to the long-held promise of utility computing into a reality. Cloud computing can help communities and nations, can transform education. An entire world of knowledge can now be made available to teachers and students through cloud based services that can be accessed anytime, anywhere, from any device. In this paper crust algorithm optimizes the surface reconstruction system from scattered cloud points. Crust algorithm plays an important role due to its guaranteed quality of mesh generation. Some applications medical imaging, geographic data processing, and interactive surface sketching, can take advantage of the technology to compute the digital model of a geometric shape with reconstruction algorithms.

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