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A Rule Based Model for 3D surface Transformation

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ABSTRACT

An object in the real time environment can be presented on the 3D plane or the environment by applying the transformation method. When the surface is not defined with relative structural features, then the generation and projection process becomes more critical. In this paper, a rule specific model is provided to generate the 3D surface and project it on 2D environment or device. The paper has explored the features of 3D surface with inclusive elements. The object projection and representation attributes are also explored in this paper. The objective of paper is to generate the rule based model for surface construction and transformation.

Keywords: Rule Based, Surface Generation, Transformation, Wireframe

1. INTRODUCTION

A surface is the object or the symmetric structure created in the rigid in an open environment. Each surface is constructed over the raw points connected on certain rules with specific focal point. Various symmetric structure or shape can be generated to generate the surface. The algorithmic formulations with controlled rules are defined to generate the optimized surface. Various triangulation methods and mesh based functions are available to generate such surface. In a generalized form, each surface is described with three components given as S={V,E,P}. Al the elements of structured surface formation are shown in figure 1. Each of these components are defined in integrated and connected form from discrete to the organized form. At the lowest form, n vertices are defined in the global environment given by V={v1,v2....vn). The connectivity between two vertices is identified as an edge and represented by the edge set with m elements given as E={e1, e2....em). The multiple edges which generated a closed structure is called polygon. A polygon can be formed from 3 or more edges. The polygon set with q elements is given by P={p1,p2....pq}. While forming the surface, these polygons, edges and vertices are processed in collective way with rule specification and algorithmic mapping.

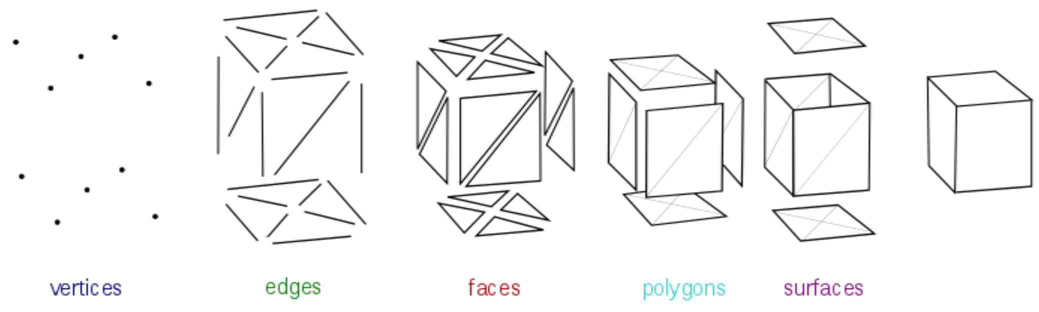
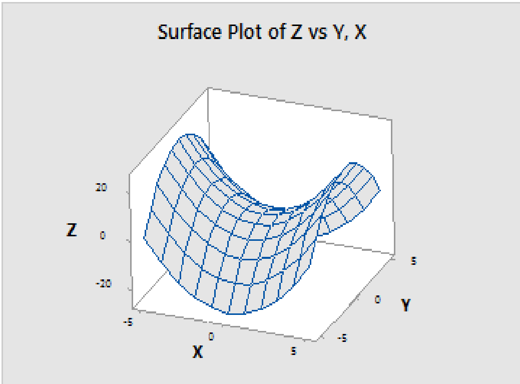


Figure 1: Elements of Surface Generation

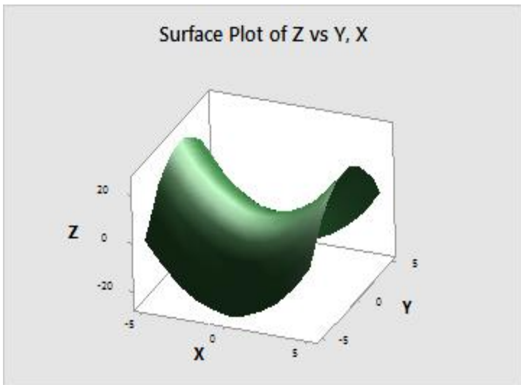
After generating the structured dataset, the algorithmic and semantic map is applied to verify the components eligibility and to generate the structure. The vertex based, edge based and polygon based methods are available to generate the effective and adaptive surface. The major requirement of surface is to generate the flawless structure without overlapping the component, sharing the edges and avoiding the hidden surfaces. Various mathematical rules can be applied at mesh level and respective to the vision processing to design the adaptive surface. The segmentation based structured formation is applied to identify the meaningful components and prune the false elements from the pool. The feature level processing based on degree and other statistical measures can be applied to generate the surface. The distance and visibility constraints are also applied to map the domain requirement, topological existence and the viewpoint derivation. The characterization also map the refined and dynamic rule specification which can be altered based on the requirement. The separation of regular and irregular elements, surface or the region is done to recognize the critical surface elements. Once such elements are located, the next work is recover the valuable surface components and avoid the impurities. In this paper, a rule based surface reconstruction method is provided to generate and effective 3D surface.

A. Wireframe Model

Wireframe model is called the constructive form of surface considered in design time to view all the visible and hidden points. It is called the architectural form of surface and able to represent the core components and potential information of the surface. The predictor variables are defined with response z axies. The wireframe model is shown in figure 2(a) and corresponding realistic view is shown in figure 2(b)



2(a): Wireframe Model



2(b): Realistic 3D Surface View

Figure 2: Constructive and Real view of 3D Surface

The wireframe model shown in figure represents the geometric framework with all information exploration from the surface. The construction relative information can be used, rectified and modify according to the requirement for surface. In this paper, the information components of wireframe model are used, transformed and reconstruct the 3D structure or the surface.

In this paper, a rule based method is defined to generate the 3D surface with relative rectifications and transformation. In this section, an exploration to the 3D surface modeling, its components and the architectural form is described. The section has identified the requirement and characteristics of 3D surface generation. In section II, the work provided by the earlier researchers for surface generation is defined. In section III, the rule based surface reconstruction model is defined. In section IV, the conclusion obtained from work is provided.

2. RELATED WORK

Lot of work is already provided by the researchers for surface regeneration and reconstruction. In this section, the work provided by the earlier researchers is discussed in this section. Wei Shengli et al.[1] has defined a pentagon segment based model to generate smaller triangulations. The sequence surface processing with point tracing and bounded region characterization. The featured and relative analysis was provided to represent the surface more effectively. The shape control model is also presented by the author. Kagehiro Nagao et al.[2] has provided a point driven model for surface formation under continuity and smoothness observation. The control point specific rules were defined by the author with volume specific evaluation. Author also applied the morphological operators to observe the surface under computational evaluation and region specific angulated triangulations. The distance specific feature map was also provided by the author to generate the surface under computation. Roberto Pinho et al.[3] graphical segmentation based surface structure generation. The surface mesh was processed under the visible attribute observation. The projected data points were computed with closer view point specific to populate the feature points. Author applied the voronoi algorithm to generate the surface under statistical evaluation.

Theodor Borangiu et al. [4] used the architectural vectors and observation to generate the relative inclinations to the surface. Multiople axes were processed by the author in controlled and programmed controlled manner to generate for effective surface. The degree direction and relational observations were processed to generate the control points. The capability driven construction given more smooth and accurate surface. Andrew E. Johnson et al.[5] has used the distributed point evaluation with sensing processing to generate the structural surface. The space utilization and the gain vector specification was processed in motion driven manner. The impurities reduction and the volume specific ridge extraction was provided by the author for surface formation. The convex specific information was processed to derive the architectural surface formulation. Kimiya Aoki et al.[6] has used the data point specific connective point processing with voxel value integration. The interactive modeling based segmented algorithm was defined to process the connected features. The integrated surface generation algorithm is defined for interactive modeling of the surface features. The polygonal information can be processed on each segment separately to generate effective surface.

Once the surface is generated, to project the surface on 2D environment, it is required to convert the 3D surface elements to 2D. Chen Hua et al.[7] has defined a visual characterization based method for such conversion. Author applied work on depth images and 3D surces with specification of view point. The segmented object modeling with fusion map was defined by the author to evaluate the gravity map. The optimized discrete features were processed under semi-automatic structure to generate the synthesized view of the image. Azlan et al.[8] has used the heuristic construction method with connectivity evaluation at node level. The computation and instance specific solution was provided by the author to analyze the distance of nodes. Author generated the slots based on the degree, weight and large enrollment parameters. The constructive algorithm was defined by the author to transform surface more adaptively. Author[9] applied view point analysis based on the invariant feature evaluation.

The moment driven observation at algebraic point and fourier descriptor for feature point specification. The identical pair based scale change analysis was defined to utilize the descriptive feature map. Author[10] optimized the design process of 3D surface generation and construction using specialist features. Author reduced the chances of failure and achieved the domain modeling of structural elements. The hypermedia analysis, research and feature promotion was provided in an integrated form by the author. Wang et al.[11] has used the range data feature processing with fusion features to transform the 3D surface to 2D. The location specific features with regional mapping was provided to analyze the variation in the view point. The stage specific mapping and the neighbor point processing was also provided by the author. The shape context analysis and shape constraint information was processed by the author to generate the effective surface. Author [12] utilized the attribute features under different measures including shape, structure and visibility.

The patch specific triangular patch was defined by the author to explore the surface and reconstruct it. The mesh feature were processed in visualized form and coordinated in complex form by the author. The realistic and constructive features were utilized by the author to preserve the attribute information. A work on 3D to 2D transformation based on transient element processing was provided by Erping et al. [13]. The flux features were processed under graph formation and magnitude evaluation. The integral equation and the non-linear structural information was also traked to measure the realistic and effective features. The frequency driven obserface and the data frame feature processing was also done to process the structural information. Author[14] utilized the integrated coordinate information to generate the image skelton with associated shape and structure. The linear feature processing in real time and under region specific observation was also done to generate the structural surface.

3. RULE BASED SURFACE RECONSTRUCTION MODEL

3D surfaces provides the realistic view of real time objects captured from the environment. When the surface is generated artificially, the raw input is required in the form of construction points or the vertices with relative features. When these points are randomly taken, the more intelligent and rule based observation is required for

- Effective Point Selection
- Connectivity Edge Decision
- Degree specification and evaluation
- Polygonal formation

- Error and impurities reduction
- Hidden surface removal

Once the random points in the environment are defined, various rules are applied in an interactive way to generate and rectify the surface. The election of participation points from the work can be filtered by applying some rules. The ratio specific evaluation can be applied on the points and edges to generate the surface. In this section, such a rule specific model is provided to generate the surface. To generate the surface without impurities in the free space, the error observation method is defined with associated characterization.

The random generated points in the plane are taken as the input to the system. Various geometric parameters and rules are applied for surface generation and rectification. The surface impurities are analyzed with each generation stage and avoid it from occurance. The hybrid rule is defined at vertex and edge level to verify the surface integrity. The vertex level analysis and the collective rule specific feature map can be characterize to the generate the specific inclusive point based surface with criteria specification. The parameter specific promotional analysis is also provided for effective design generation.

The first level rule is defined to perform the vertex level connectivity based on the neighbor observation. The Euler fomla is applied at earlier stage to generate the connectivity specific planner group. The rule for surface generation is shown in equation (1)

$$|Vx| - |Ed| + |Su| = 2 \quad (1)$$

The connected surface generation can be controlled using secondary rules

$$|Vx| <= 2n-5$$
$$|Ed| <= 3n - 6$$
$$n >= 3$$

Where

|Vx| represents Number of Vertices
|Ed| represents Number of Edges
|Su| Represents Number of Surfaces

Here some constraints are defined for graph formation and to generate the 3D surface in an effective form. Different rules framed to control the surface construction process are given below

- The identification of external edges that generates the boundary, respectively to convex hull.

Let each vertex is represented by three coordinates respectively as Vx, Vy, Vz (V for the same polygon defined for surface generation. The coordinator level mapping is defined to identify the existence of the vertex within polygon. If none of the coordinator is within polygon, then the vertex will be considered completely outside the polygon.

The rule is defined to identify the existence of the vertex of the polygon edge if the empty circle center of point touches the edge side's p and q. The polygon edge points are represented by coordinate's p and q, the Ed presents the edge and Vx represents the vertex. The distinct point specific rules can be framed by generating the polygons and respective to the convex hull and with the specification of the polygonal estimation. The distinct vertex for surface generation is also defined with certain associated parameters and range consideration

- Edge Ed will be included in the new generated database if the inclusive points are collinear
- Each edge is generated using two vertices (Vi,Vj) where these vertices must be consecutive generator points.
- The edge specific line segment must be defined respective and relative to the associated edge point or the segment.

Based on these rules, effective vertex selection, edge connectivity is done and a rectified 3D surface is framed.

CONCLUSION

Any object or the structure available in the open environment when placed on 2D environment or device, there is requirement of some transformation. When the structure is not fully available and instead only the raw random points area available, the problem becomes more challenging. In such case, more intelligent method is required to generate and transform the surface. In this paper, a rule based point evaluation method is defined to generate the effective connectivity and 2D transformation of the surface. The proposed model is able to rectify the various impurities in surface construction and provide an effective transformed surface.

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