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REVIEW ARTICLE

TRENDS OF COMPUTER AIDED DESIGN IN DIFFERENT TYPES OF INDUSTRY

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Trends of Computer Aided Design in Different Types of Industry

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INTRODUCTION

Computer Aided design is closely related to creativity and logical thinking. Now days every product designers, manufacturers and inventers designed their products by using the modern technologies of computer aided drafting & design. AutoCAD is the most popular and common platform for CAD drafting & design services among all other platforms. Due to the emerging growth of CAD, the architects are becoming more sophisticated by lessening their dependency upon excessive paper drawings. This is resulting enough time saving to concentrate on their core activities and business.

CAD is not only important in the field of architecture or mechanical engineering sector, but also very crucial in the area of graphic design, fashion design, toy design, packaging, computer gaming and movies. In most of the above highly sophisticated and fashionable sectors, CAD has been proven its vitality as an integrated part of digitisation with high clarity as well as output. CAD is a true asset for architects who are interested to have a robust career in any domain. The CAD system capable of making your work more easier and faster by removing the repetitive works, which not only faster the speed of the work, but also mitigate the stress upon the designer to lot extent due to repetitive works. Furthermore CAD system is the effective way for reducing the errors in design & drawings with high accuracy and quick turnaround time. Now days many CAD design & drafting companies are providing complete project management to serve the entire residential and commercial design need of the architects and engineers.
Advantages of CAD

THE FRACTAL GEOMETRY

The word "fractal" was coined less than twenty years ago by one of history's most creative mathematicians, Benoit Mandelbrot, whose seminal work, *The Fractal Geometry of Nature*, first introduced and explained concepts underlying this new vision. A Fractal is generally "a rough or fragmented geometric shape that can be split into parts, each of which is (at least approximately) a reduced-size copy of the whole," a property called self-similarity. A mathematical fractal is based on an equation that undergoes iteration, a form of feedback based on recursion. This definition covers several geometries that are self-similar under several scales. Two main types of fractals are more popular d including iterative function system (IFS) fractals (e.g., self-intersecting fractal objects, simply connected fractal objects, multiply connected fractal objects, natural objects, area filling fractal objects, etc.) and complex fractals (e.g., quaternion Mandelbrot set,quaternion Julia set, filled-in Julia set, contour Julia set, dust Julia set, Dendrite Julia set, etc.) Barnsley and Demko [4] first propose the iterative algorithm method called IFS. Minkowski, Hilbert, Peano curves, Sierpinski gasket, the Sierpinski carpet and the Koch Island are typical examples that could be found in the literature of fractals. All these intricate geometries are built using an IFS method which can be expressed mathematically with Eq.(1), Eq.(2)and Eq.(3).

i i 1 A =W[A] i =0 ,1,....., (1) Where *W* is the Hutchinson"s geometrical transformation Algorithm

MATERIAL AND METHOD

Stretch-Formed

Stretch-formed jewelry is created on thin sheet metal on top of which an ornamental pattern is raised with forming tools by stretching the sheet metal beyond elastic limit. The sheet metal is put under combined bending and tension stresses at the same time by clamping at edges and stretching over forming tools. The surface of sheet metal is plastically deformed to rise permanently into the jewelry pattern on the forming tools. The process is illustrated in Fig.1.The raised surface of sheet metal is reflected by light imposed on it and helps in visualization of the pattern. This form of jewelry can be applied to various types of jewelry such as pendants, rings, earrings, bracelets, etc.

The forming tools used to produce stretch-formed are dies and punches having different styles of patterns. A 3D jewelry pattern is removed and glued from stock solids (rectangular block) to model dies and punches respectively as shown in Fig. 2. These die and punch models are converted to STL format and transferred

to LM machine to produce master forming components.

Alphanumeric jewelry patterns have been generated by combining parametric voxel elements in a meaningful manner. Voxel, elements are building blocks of the pattern and defined by parameterized geometry and attributes. Universally, eight voxels are defined to model any alphanumeric jewelry pattern. These voxels are grouped in a set with same geometrical and dimensional constraints as shown in Fig. 3. The pattern is created by knowing which voxel elements are required from a set and in what order they have to be placed in a 2D matrix of size 5x4. After placing the voxels at their appropriate positions in correct order, these are concatenate Die forming tool Punch forming tool

3 CARVED JEWELRY

Carved jewelry is a form of jewelry having small internal cavities as the surface of sheet metal. This form of jewelry Computer-Aided Design & Applications, 6(1), 2009, 27-42 concatenated together to produce a pattern [13].

Sheet metal

Movable gripper

: Stretch-forming process [13].

LM Model Boolean STL format

Subtraction/Union

Generated with a thin sharp tool on patterns contains repeated shapes of cavities and is Computer-Aided Design & Applications, 6(1), 2009, 27 designed using voxel based technique. Parametric voxel elements are combined in a wide variety of possibilities to deliver more number of jewelry patterns with higher number of variations. Some of the voxel elements are shown in Fig. 4. By changing the modeling patterns can be produced. Some of jewelry patterns For creating the carved jewelry, a voxel signature is selected for modeling the voxel element. Then, its multiple copies are partially overlapped in a plane one another. The direction and location of the ax jewelry and size of jewelry respectively. Appearance of jewelry voxels to be overlapped about the axis of rotate fabricated (LM) models of carved jewelry are shown in Fig. 4

Fig. 4: Voxels

4. FRET-WORKED JEWELRY

Fret-worked is a form of jewelry, in which different on a solid background, or cut out. This class of jewelry is adorned with patterns which are and symmetrically cut or carved into constructive bangles, rings, earrings, etc. This part of the paper presents modeling of fret based approach [8-9, 15, 22-24].The stock solids and fretwork patterns are two type components produced for fret-worked jewelry bangles. That, instances of fretwork patterns are positioned on the stop volumes to be recurrently removed from the stock solid are parameterized to support customized design process. Obtained either by changing the modeling parameters or by changing the modeling components. designs of fret-worked jewelry bangles are shown in the Fig above.

The stock solids of bangles are undecorated blanks and created by rotational sweep. The shape of stock solids depends on the shape of sweep bases which are to be revolved about an axis by 360, interior surface of stock solids is kept plane to provide comfort to the user as it touches the wrist of arm. Only the exterior surface is shaped with different contour the wrist of arm. Distance between the interior profile of sweep bases and the revolved axis gives the radius or size of the stock solids. The basic dimensions length and breadth of sweep bases gives the thickness and width to stock solids respectively. The exterior profile of sweep bases is defined with 27-42 hanging parameters, a large number of jewelry of pendants and bangles are shown in. about an axis of rotation and are concatenated with axis of rotation decides the type (Pendant or Bangle) of patterns depends on the number of rotation. . The two examples of rendered (CAD) and elements. : Bangles [14]. : of carved jewelry. Ornamental patterns are either carved in low relief recurrently solids in the shapes of jewelry types like pendants, fret-worked jewelry bangles using the parametric feature types of modeling. An instance of a stock solid is created and after stock. The fretwork patterns are viewed as by Boolean operation [12].The jewelry items The variations in the jewelry models can be Some variants which are constrained within the values of the thickness and width of stock solids. Some of the stock solids are shown below in Fig. 8.

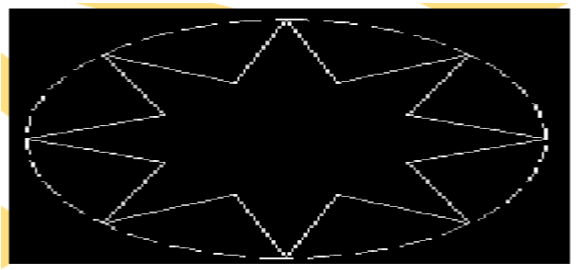

Fig. 8: Stock

The motifs of fretwork pattern correspond to feature motifs are created by translational sweep which is defined specifying the depth and direction of sweep dimension specifying the thickness of stock solid of stock solid and ends at the interior surface perpendicularly. Geometric and floral and some of these are shown in Fig. 9. Definitions in association with the different kinds of sweep bases. The motifs are assumed to be inscribed in a circle or a rectangle. The breadth of circumscribed rectangle or diameter of circumscribed circle should be taken less than the width of stock solid. The arbitrary center point of circum exterior surface of stock solid.

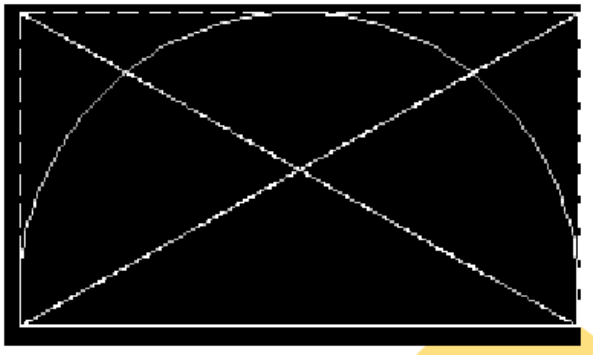

Fig 9: The geometric modeling techniques used in this part of work are simple, yet their results are very beautiful and inspiring. CAD in conjunction with LM technique is used to produce items directly from 3D solid design models. CAD and LM model of a fretwork bangle is shown in the.

Fig. 10: CAD and LM models of Fret