

영상처리를 통한 생체모사 표면생성을 위한 표면전사방법 Texture Transfer Method for Bio-inspired Surface Fabrication Using Image Processing

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Keywords : Surface Texture, Bio-inspired, Image Processing, Micro-milling

1. Introduction

Surface texture is an important aspect on precision parts fabrication, since it defines the quality of such products. It is also opens the possibility to enhance the product value by adding functional surface texture to the fabricated parts. Various types of surface texture were developed by creating structured shape on the parts surface. Most of the surface texture design was done on CAD (computer aided design) software, this process spent too much time especially to design complex surface texture. In this paper, we develop a rapid and fast technique to acquire complex surface texture data by using image processing technique. A complex surface texture of human skin was selected to transfer to metal surface for micro-mold process also presented on this paper.

2. Image Processing Steps

A real human skin texture was taken from palm area by ink transfer and scanned by digital scanner. The image then converted to grayscale image and filtered by median filter to remove “salt and pepper” noise from the image [1]. In order to get the shape of the geometry, canny edge detection algorithm was performed [2]. Several morphological image operations were applied to the image to remove spur pixels, isolated pixels and H-connected pixels [3]. Image dilatation was performed to connect all lines [4]. Empty regions were filled to form full regions [5]. The last step was to apply distance transform [6]. After that steps the image then plotted based on

image intensity to shape the Z-level. The image processing steps are shown on Figure 1 and the generated surface is shown on Figure 2.

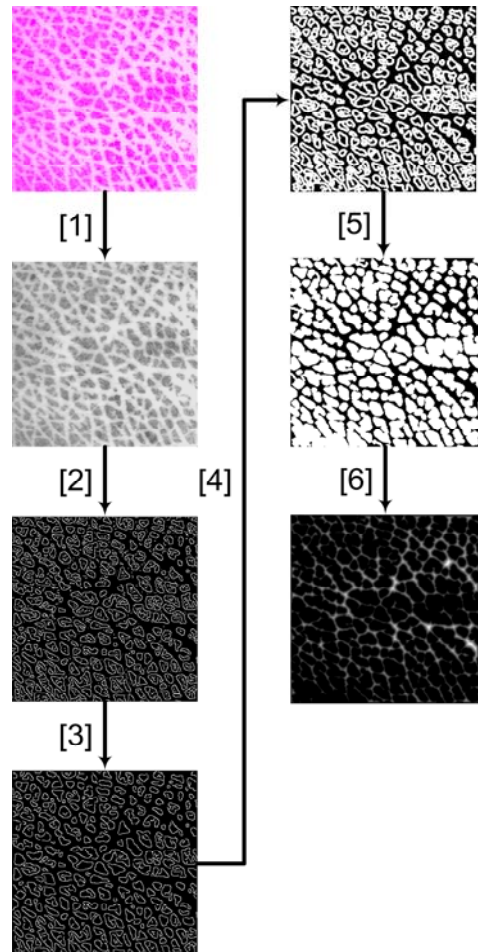


Fig. 1 Image processing steps

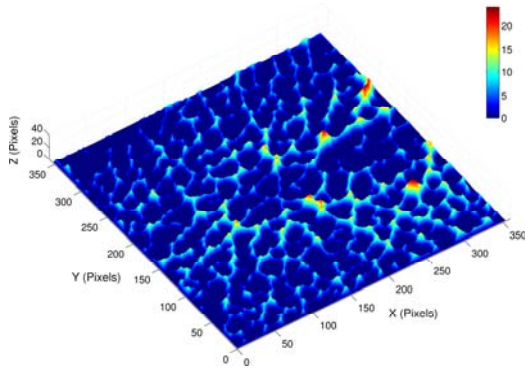


Fig. 2 Generated surface

3. Fabrication of Textured Surface

Micro-milling process was selected to fabricate the surface texture. The data from the generated surface was converted to solid model data format. The solid model can be opened on CAM system to generate toolpath for machining operation. The surface was fabricated on aluminum 6061 rectangular cuboid workpiece. The dimension was 15 mm x 15 mm x 6 mm, so the solid model must be scaled to the same size as the workpiece as shown on Figure 3.

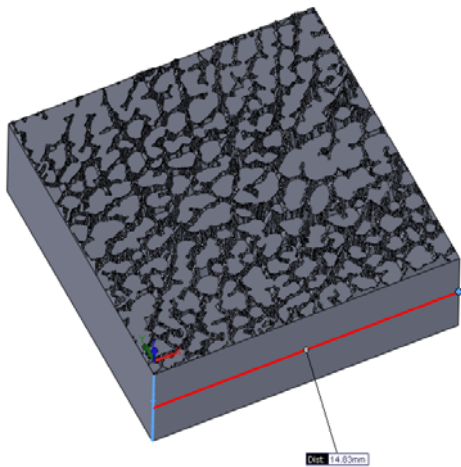


Fig. 3 Surface texture solid model

Machining toolpath for the micro-milling operation was generated on CAM software using cavity milling machining method. The cutting tool diameter was 175 μm micro-end-mill. The machine tool for the milling process was 3-axis micro-milling

machine with high speed air spindle [7]. The result of the machining process is shown on Figure 4.

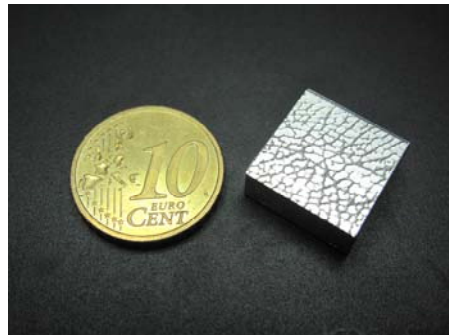


Fig. 4 Machining Result

Conclusions

The texture transfer method has proven to be successful to transfer complex texture. The machining result was intended for micro-mold process using bio-compatible polymer. Further research needs to be done for the molding process.

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