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Isabel Navazo and Gustavo Patow (Editors)

METHOD OF 3D RECONSTRUCTION USING SILHOUETTES

J. D. Gomez Villen[1]

[1]University of Jaen

Abstract

The present work has the aim of obtain the 3D model of simple objects by means of computer vision techniques. The method employed photographs taken around the object, then the silhouette is extracted and it is used to determine the 3D model in CAD software. Finally the 3D representation of the object is obtained.

1. Introduction

Creating a 3D model of an object is a very common practice nowadays. It can be done by means of measuring the object and modeling it in CAD software, it's a difficult process very prone to errors, therefore, 3D modeling is used to be done using several methods. Commercial 3D scanners sometimes are quite expensive depending of the purpose of use. Moreover 3D laser scanner provides an excessive amount of data that is not always useful. After scanning, a mesh treatment is required in order to obtain the 3D model of the object.

2. Objectives

The aim of the present work is to obtain the 3D model of simple objects by means of computer vision techniques. The method must be simple, cheap and fast, it can be used as an alternative to a commercial 3D scanner.

2.1. Materials and Methods

To apply the method, we provided an enclosed space with a rotating platform (where the object is placed) equipped with lighting and image acquisition systems. The method is performed taking a sequence of photographs from all the faces of the object around itself. Each photo is analyzed using MATLAB software. An edge filter is applied, the edges of each image are stored in an Excel sheet. The Excel sheet is open and read by an AutoCAD macro, each silhouette is extrude and all of them intersects in the shape of the object. The user only has to locate the object in the device and run the MATLAB program, all is totally automated.

2.2. Results

With the method, concavities of the objects cannot be detected, but a through-hole can. The results were acceptable and the 3D models were so good based on the number of photographs taken for each object and its complexity.

2.3. Conclusions

The number of photographs of each object changes how accuracy is the method. More than 3 photographs are required to get an acceptable 3D shape. Using 5 or more, the results are close to reality as it is shown in Figure 1.It takes aproximately 3 minutes to obtain the model shown. In conclusion, the method is valid and it is an alternative way to commercial 3D scanners, but it is limited detecting concavities.

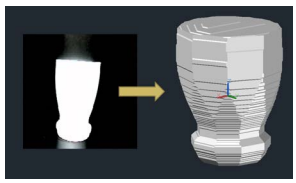

Figure 1: *3D modeling using 5 photographs of the object.*

2.4. References

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