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Automatic generation of medium-detailed 3D models of buildings based on CAD data

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Abstract We present the preliminary results of a work in progress which aims to obtain a software system able to automatically generate a set of diverse 3D building models with a medium level of detail, that is, more detailed that a mere parallelepiped, but not as detailed as a complete geometric representation of the building. Each building model is automatically created from a CAD file containing the top, front and side views of the building.

Keywords 3D building model · CAD data processing

1 Introduction

Virtual city models are necessary for a series of application fields which require representing, visualizing and interacting with urban elements. In this context, each application requires a higher or lower level of detail, depending of the model usage; for instance: a car driving game has very different detail requirements from an escape route planning software.

Buildings are major elements when designing city models, and a huge amount of different building models is necessary to make up a more or less realistic urban model. Therefore, it is very convenient to have a system able to automatically generate these building models [1]. Methods to produce building models include procedural methods that can be parameterized (commercial applications like Esri CityEngine [2] apply this approach), processing data obtained with LIDAR scanners or extruding the floor contours of the buildings and using textures to add details.

Here we present the initial results obtained with a tool that is currently under development. We pretend to obtain medium-detailed building models that provide more geometric information that an extrusion of the floor contour; these models could also be then enhanced as needed by adding geometry of balconies, windows, etcetera.

The main advantages of the algorithm are its simplicity and the fact that the input data is a single CAD file containing the top, front and side views of the building; this file can be easily created, and does not imply a big work overload for a designer or an architect. The generation of the 3D volume is fully automatic.

The outline of the algorithm is as follows:

1. Take as input a DXF file with the three views, aligned as shown in Figure 1
2. Find the contours of the three views, and the correspondences amid the points in the contours
3. Create an extruded volume from each contour (Figures 2, 3 and 4)
4. Compute the intersection amid the extruded volumes (Figure 5) [3]
5. Apply textures to the generated volume (if available)

This algorithm can be used for batch creation of building models, using as input a list of CAD files.

2 Conclusions

We have presented the outline of a system to automatically generate 3D medium-detailed 3D building mod-

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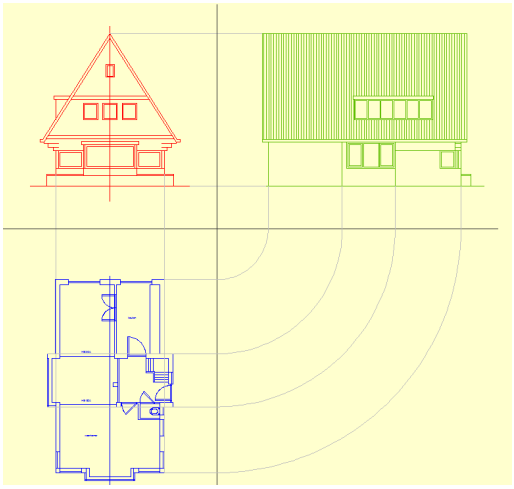

Fig. 1 DXF used as input

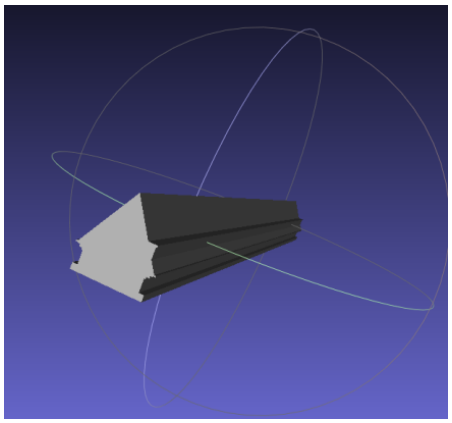

Fig. 2 Extrusion of the front view contour

els that works automatically from CAD files containing the top, front and side views of a building. This models could be used to create urban models richer than the parallelepiped-based models, with less geometric detail than a full geometric representation of the buildings.

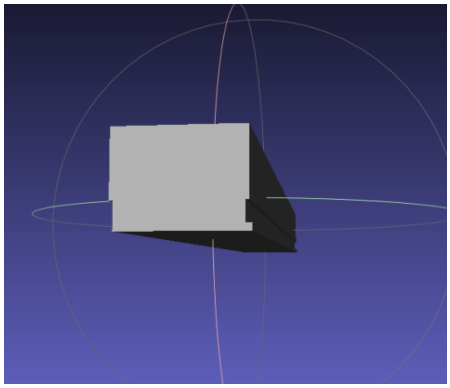

Fig. 3 Extrusion of the side view contour

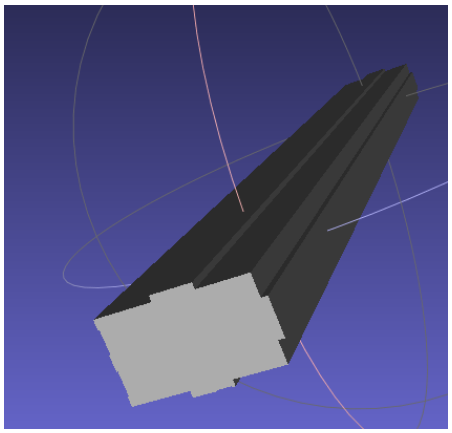

Fig. 4 Extrusion of the top view contour

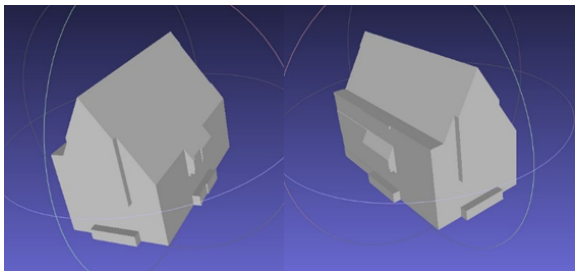

Fig. 5 3D volume obtained as the intersection of the three extruded contours

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