Procedural Modelling of Monumental Buildings from Textual Descriptions

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Abstract

The generation of three-dimensional models of urban environments using procedural modelling is presented as being a solution which allows financial and temporal gains, maintaining an acceptable visual fidelity level. Nevertheless, the modelling of anchor buildings (or monumental), identifying certain urban areas, needs a more careful modelling due to the high level of detail necessary, using, generally, manual modelling. We present an automation proposal of the building modelling process through the introduction of additional knowledge from textual descriptions in a procedural modelling system. The results show that the data model is flexible enough to build distinct models of churches. The data model can also provide an initial structure for high level modelling, providing the global shape for the building and the location of doors, windows or other structures. High detailed models can be built from this initial structure. The results demonstrate also that it is possible to create a 3D model from a text and thus permitting that non-specialised users may increase effectiveness using a procedural modelling system.

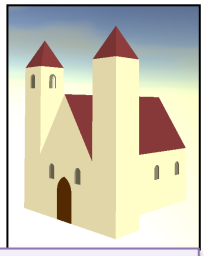
"The church of XYZ has a main body and 2 towers.
The bell tower is on the right and front.
The tower is on the left and front."

Typical text describing a church. This text indicates the type of building being analyzed, describing its constitution in terms of buildings or towers. The text should also indicate the relative position of the towers.

"The church of XY has a main body and 2 towers.
The bell tower is on the right and front.
The tower is on the left and back."

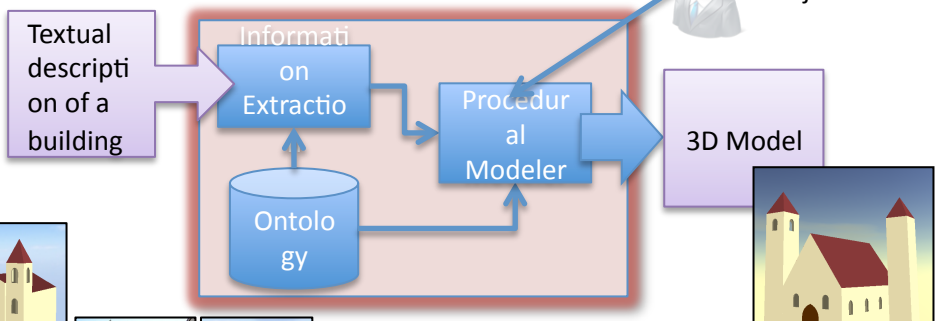
```
<main ID="XYZ">
    <location>
        <x>0</x>
        <y>0</y>
        <z>0</z>
    </location>
    <features />
    <doors />
    <windows />
</main>
<towers>
  <tower ID="A">
    <position>
      <posX deviation="-1.0">right</posX>
      <posY deviation="1.0">front</posY>
    </position>
    <features />
    <bell />
  </tower> <tower ID="B">
    <position>
      <posX deviation="-1.0”>left</posX>
      <posY deviation="1.0">front</posY>
    </position>
    <features />
  </tower>
</towers>
```

Information Extraction of the model's characteristics, contained in the text file written in natural language, for an interoperable format and stored as a XML file



Cconversion of the data model to a 3D representation. We choose cityGML because it is possible to combine semantic and geometric information and has several levels of detail.

User adjustments



Examples


Saint Ildefonso Church


S.José Taipas Church


Trindade Church


Carmo Church

Conclusions

- Flexible data model -> multiple church models
- Acceptable level of realism in LOD3
- It is possible to create a 3D model from simple text

Future work

- Increase the level of detail
- Add textures to increase visual fidelity
- Add more architecture styles
- Include users interaction