

Modeling Process of a Three Dimension Environment for Railway Transportation Simulation

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Mots-clés : Univers virtuel, Processus de modélisation, Génération Automatisée, Transport ferroviaire.

Keywords: Virtual Universe, Modeling Process, Automatic Generation, Railway Transportation.

Abstract.

In the past few years, city 3D models have been used in several applications such as urban planning, simulation and design [HTP07]. The 3D models provide a support to assist a wide variety of stakeholders in making decision. From engineering point of view, they may play a significant role in the design of new cities, and also in transforming existing ones or urban spaces to make them smarter. The 3D modeling process of a city or urban space as well as its input data depend on the purpose of the model. For example, a simple virtual visit of a city, with an aerial perspective, can use a low precision 3D model. On the other hand, if the application offers the ability to visit the virtual city, with a pedestrian point of view, more details are required, such as photograph of building's facade, roads' details, urban infrastructure. The rule that says "who can do more can do less" isn't a good strategy against the economical budget that is needed to create a very precise model, especially for using it only in a degraded mode. Additionally to this detail level issue, several actors work cooperatively in a 3D modeling project including engineers, stakeholders, and citizens. The design process of 3D model becomes mandatory and must be clearly defined to support the coordination of their work. This process will benefit to new 3D modeling projects to build up on the experiences of its predecessors. The definition of a 3D modeling process is still difficult to be found from the scientific literature. The proposed processes are still suffering from drawbacks and incomplete coverage.

Starting from the fact that a 3D virtual city is a product, this work studies the overall process for virtual 3D world creation, according to their usages, in order to create the 3D models that best meet the needs while optimizing the production methods. Indeed, like the others products, a 3D virtual city may be created with different processes: manually, by human operators with processes that lets think to the hand-worker; with the help of specific software tools, created only for this purpose; or

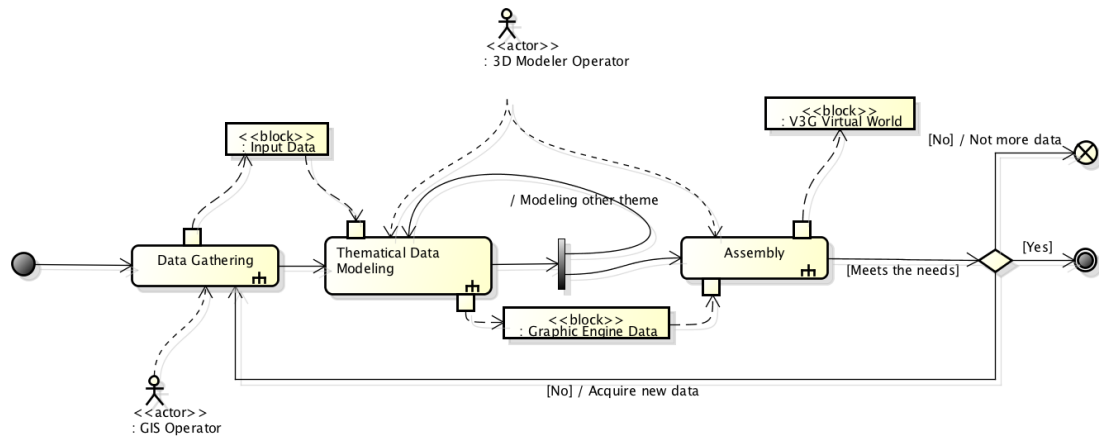


Figure 1: Global Modeling Process of a 3D Virtual Environment Model

automatically, by procedural methods that lets think to industrial processes give the products in a production line. Each of them has advantages and disadvantages in general, but also according to the searched end use. However all follow the same general scheme, described by the diagram of activity in Figure 1. Thus, the choice of the method used must necessarily take into account the final use that will be made of the virtual universe. This diagram shows that there are three main phases in the process of creating city 3D models. The data gathering phase, the modeling phase and the assembly phase. What makes the difference between the different approaches is thus at a more infra level, inside each of these phases.

We argue that the study and analysis of these processes, as is done in other areas for more traditional product types, can be helpful in providing support for several tasks such as automation and reuse.

To facilitate the exchange and reuse of this work, our study is based on a standard data model, CityGML. Our contribution allow to extends standards proposed modules by adding specialized packages for simulation oriented universes.

The next step of this work is the definition of the algorithms that will be used for optimize the virtual universe creation by adding automatized generating methods [SGK⁺11, STKR10].

Acknowledgements: Part of this work carried out under the FLO and ASTRES projects supported by the Alstom Transport company. The views and conclusions contained within this document are those of the authors, and should not be interpreted as representing the official policies, either expressed or implied, of the Alstom Transport company.

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