Navegador3D: An Internet Based Flight Simulator of Urban Centers

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Abstract. Nowadays several areas of application need a precise 3D cartographic model, specially in the urban domain: telecommunications, urbanism, tourism and other ludicrous applications. The analysis of aerial stereoscopic photos provides a fast method to obtain a faithful relief of the observed scene, including its superstructures. This work presents the Navegador3D developed by NPDI/UFMG, ETIS/ENSEA and Vist@erea/INFOSTRATA.

Keywords: Flight Simulator, Stereoscopic Photography, 3D Reconstruction.

Introduction

The interest of interactive visualization of great urban centers is growing very fast, principally for Internet based virtual simulators. The objective is to provide for the general public a 3D model of the cities that allows a virtual flight over them. On the other side, the today Internet situation imposes severe restrictions for such applications. Firstly, the transmission rates are yet very low in most homes. The model must thus be adapted to avoid the user to wait too long for the images to appear in his monitor. The size of the window should also be taken in consideration because the quantity of information necessary to present a big city like Belo Horizonte is enormous.

The Navegador3D

The analysis of aerial stereoscopic photos provides a fast method to obtain a faithful relief of the observed scene, including its superstructures. However, there is a classical number of difficulties to implement it due to the great variety of the urban scenes: natural inclinations, some times very pronounced, and principally artificial structures with different forms and structures like buildings, streets, roads, green spaces, etc. Besides that these scenes are subject of fast evolutions and changes.

The Navegador3D (Figure 1) implements an automatic calculation of the relief from B&W or color aerial stereoscopic photo pairs at high resolution (one pixel represents 10 to 40 cm ground resolution). The used 3D model presents a resolution comparable to that of the aerial images and is particularly well adapted to the representation of ground and different size of buildings that form the urban tissue.

The synthesis algorithm is a very important aspect to be considered. To give the impression of a flight is not a complex computational task. To keep compatibility to the available browsers, the program must be implemented in the Java environment. Nowadays it is possible to have good performance in the Java environment, but the choice of the synthesis model is crucial.

The Navegador3D is a simple solution for the simulation of Internet based flights over cities, if you use any browser supporting Java. The model transmission is very fast and depends on the flight trajectory. With an algorithm optimized to these mentioned conditions it is possible to realize a flight with quality even in a simple 200 Hz Pentium.

Figure 1: A flight over a city.