Caricaturing 3D Buildings for Pictorial Maps

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Introduction and Motivation

3D interactive visualizations of built environments are very useful for a large variety of applications. They can show well known landmarks and architectural heritages of cities. They can help the public understand the cultural influences and history that makes a city unique.

Environmental visualizations require the development of 3D computer graphics representations of most of the existing built structures in the modeled environment. In practical applications these representations must be extremely simplified versions of actual buildings; the interactive speed of computer visualizations greatly depends on reducing the complexity of modeled environments. In other words, the designers must not try to model every detail present on the built structures existing in reality. However, this is not an easy job. They cannot simply design "a box", by ignoring all the characteristic features. Thus, the important question is: how do we identify characteristic features of a built structure that makes a particular structure unique?

Unfortunately, current visualization practices do not provide a satisfactory answer to this problem. The common practice is to emphasize photo-realism in both modeling and rendering. Although none of the 3D computer representations can be truly accurate, the concept of photo-realism forces the designers to create reconstructions as detailed as possible.

Such unrealistic expectations never existed in traditional arts. No painter will draw every visible detail in a still life. Artists frequently ignore unnecessary details and focus on the characteristic features of their subjects. Such selective representations are most noticeable in the works of caricaturists and cartoonists. They not only ignore unimportant details, but also selectively exaggerate the features that makes their subjects unique. They do not only exaggerate faces of the people. They exaggerate and simplify all of their subjects. For instance, a building in a Mordillo cartoon is always extremely simple but still instantly recognizable.

The concept of simplification and exaggeration which is very common in caricature and cartoon art can directly be applied to the 3D modeling process. Such simplifications and exaggerations can provide the means to create public-friendly interactive visualizations of built environments.

Methodology

In this paper, we present an expressive modeling approach based on techniques of caricature and cartoon art. This approach can be used by virtual designers to recreate simplified computer generated models of existing buildings using available 3D modeling software. It can also help to limit modeling time and helps to easily reconstruct recognizable landmark buildings for pictorial maps of college campuses, cities, and regions. Such pictorial maps can be very helpful in route finding, travel planning and public presentations.

Our approach begins with a determination of the minimum, acceptable number of architectural details that must be represented in 3D computer generated models. This process relies on caricature drawing techniques to choose which architectural details should be
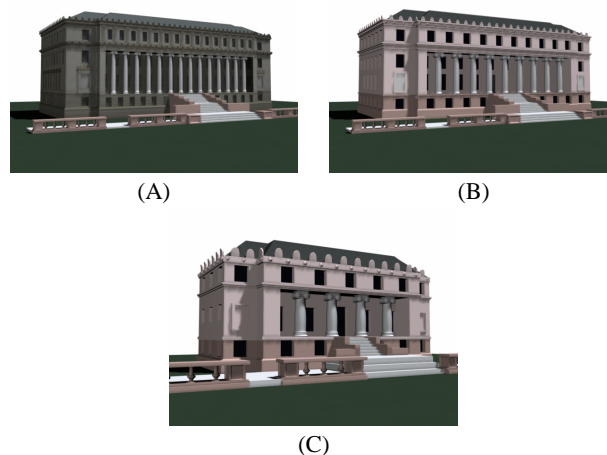

Figure 1: Building caricatures.

added or subtracted to limit the amount of time and data in the modeling process. We include a number of examples, some by students, that demonstrate the results of this process.

Summary

Our 3D caricature modeling approach will allow virtual designers to recreate built structures more quickly and efficiently, saving time, money and data resources in the early stages of the design process. Similarly, cartographers and geographers will be able to use our caricature process to rapidly populate pictorial maps, large city plans, college campus maps, and 3D computer visualizations with recognizable built structures. Our building caricature process can be used for early design development and rough 3D sketches to explore ideas. Professional designers will be able to use available 3D software to explore design ideas rather than just using it for the final design presentation.

Our approach allows modeled structures to be rapidly updated and replaced in 2D or 3D mapping environments with many built structures. These 3D representation can also be used to create large city maps, college campuses, pictorial maps, and other computer generated visualizations of built environments. Since our caricature-modeled buildings are closer to the actual mental image of the structures, they are more easily recognized. Our process will allow design professionals to use 3D software in the early stages of development rather than just for the final presentation.