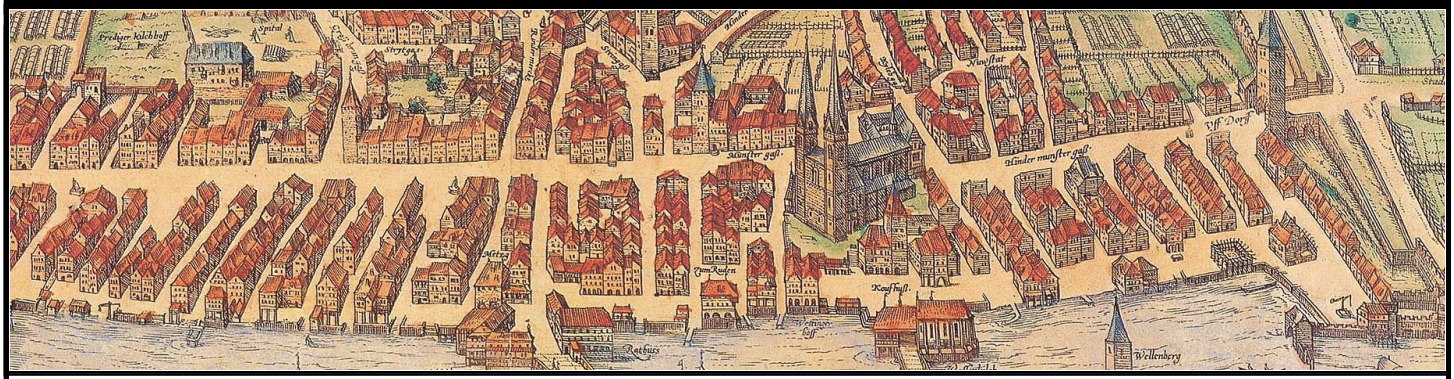
# Project: Vector-based 3D Building Visualization and Generalization

University of Zurich[UZH]

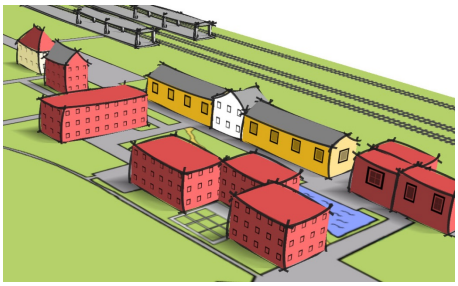


## Introduction

Buildings and settlement areas are among dominant data types in geographic maps. Buildings can be represented by points, footprint areas or 3D models. The precision and availability of buildings data are improving and they are being used in different applications such as 3D maps, virtual cities and simulations. Therefore, expressive and efficient methods of rendering buildings are required.

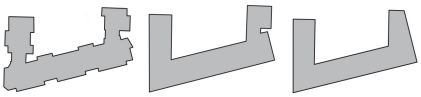
*Flat vs. 3D rendering of buildings*

Two primary challenges should be addressed when visualizing buildings in a large area such as a city in real-time: (1) transforming vector data into a renderable 3D presentation, and (2) handling the large number of buildings. When a 3D model of a building is not available, an approximate model can be generated by using its footprint and the additional information about the building, e.g., height, usage and age. After having the 3D model, based on the application an appropriate style and effects should be selected for rendering [1].



*Expressive Visualization of Buildings*

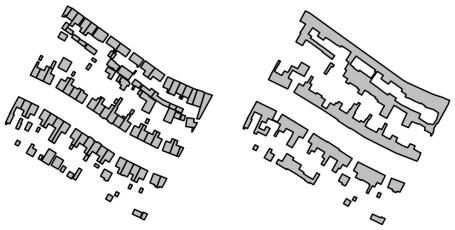
In a 3D environment, it is not efficient to render all objects with the highest level of detail. In a specific view of a 3D scene, there are objects that are far from the camera and their details are not recognizable by the user. Therefore, a mechanism for managing the level of detail is needed. In cartography, reducing the amount of information is called generalization. We can generalize the buildings by simplifying and/or merging them [2]. Generalization is done for different purposes. It can help us in rendering large urban areas in real-time by reducing the amount of information.



*Simplification of a building footprint*

## Assignments

The goal of this project is to implement a tool for visualizing scenes with high numbers of buildings. The models of the buildings should be generalized and prepared in different levels of detail. The visualization algorithm should quickly load the necessary data with an appropriate amount of detail as the camera moves. A suitable lighting mechanism and style for shading the buildings and projecting shadows should also be implemented.



*Simplification and merging of building blocks*

## Project Type

This project can be a master group project or a bachelor thesis.

## Requirements

C++ and OpenGL is required. The CG lab is also required if the project is intended to be a master project.

## Work Load

- 30% Theory
- 50% Implementation
- 20% Test

## Supervision

- Prof. Dr. Renato Pajarola
- Alireza Amiraghdam (assistant)

## Contact

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## References


[1] Jurgen Dollner and Maike Walther. Real-time expressive rendering of city models. pages 245–250, 2003.

[2] Liqiu Meng and Andrea Forberg. 3d building generalisation. In *Generalisation of Geographic Information*, pages 211–231. Elsevier, 2007.


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