Ph.D. Topic 2015

Interactive Reconstruction and Navigation in 3D Cities Models

Supervisor

Wei Tsang Ooi, weitsang@nus.edu.sg

Vincent Charvillat, vincent.charvillat@enseeiht.fr

Co-supervisor(s)

Name

Presentation of the Ph.D. topic

We are interested in the modeling, exploration, and understanding of large visual datasets. In the context of Smart Cities, one such interesting dataset is 3D models of buildings and cities. Such models have interesting applications at various levels. For example, having a 3D representation of a building, or at least a 2,5D reconstruction, augmented with semantic annotations can be use to, along with thermal modeling, estimate the energetic consumption of the building. 3D models of streets, districts, or entire cities would allow for innovative applications in tourism, city planning, or gaming.

We propose to follow these two avenues and to study how to build and explore 3D models of cities.

We aim to design an interactive algorithm for building reconstruction, which would involve a step of facade parsing [1] in order to bring the semantic information necessary for some applications. The whole process would follow the human-in-the-loop paradigm [2]. We want to minimize the required interactions as well as the expected level of expertise from the user. This method should run on a mobile device, like a tablet, and with some more interaction should allow to go from facade parsing of each wall of a building to a 3D (or alternatively a 2,5D) reconstruction of the building. As a second step, we want

Image & Pervasive Access Lab
1 Fusionopolis Way
#21-01 Connexis, South Tower
Singapore 138632

Tel. (65) 6408 2542
Director. (65) 6408 2536
Fax. (65) 6776 1378

secretariat@ipal.cnrs.fr
www.ipal.cnrs.fr

to apply this 3D reconstruction algorithm to reconstruct entire streets or blocks in a city.

As a result, we would obtain heavy and complex 3D models that open several avenues for research. We are particularly interested in studying how to ease navigation for a non-expert user in such a model accessed through a network. 3D navigation is not very intuitive for a non-expert user. We wish to design easy-to-use recommendations to help exploring such 3D models. The recommendations should take into account the current state of downloaded data, in order to avoid recommending non-available data to users.

Expected deliverables

The candidate is expected to extend existing techniques or propose new ones that would allow almost any user to be able to reconstruct a building with a mobile device. Our team is keen to drive high-quality research with rigorous evaluation. Proposed techniques should be implemented and evaluated through user studies, and written up for publications at reputable conferences and journals. We also value open research with publishable data sets.

Keywords

Interactive facade parsing; Building reconstruction; Human-in-the-loop; 3D models streaming and navigation

Applicant profile

Applicant should demonstrate strong computer science and mathematical background; strong critical thinking, analytical thinking, and out-of-the-box thinking ability; independent, self-discipline and organized; enjoy working with a team; good English communication skills in both oral and writing.

Gratification: Compliant to French Regulation on Ph.D. students (Doctoral contract / contrat doctoral)

Image & Pervasive Access Lab

1 Fusionopolis Way

#21-01 Connexis, South Tower

Singapore 138632

Tel. (65) 6408 2542

Director. (65) 6408 2536

Fax. (65) 6776 1378

secretariat@ipal.cnrs.fr

www.ipal.cnrs.fr

References

[1] Sawsan AlHalawani, Yong-Liang Yang, Han Liu, Niloy Mitra: Interactive Facades Analysis and Syntheses of Semi-Regular Facades. Computer Graphics Forum 2013: 215-224

[2] Steve Branson, Grant Van Horn, Catherine Wah, Pietro Perona, Serge Belongie: The Ignorant Led by the Blind: A Hybrid Human-Machine Vision System for Fine-Grained Categorization. International Journal of Computer Vision, 108(1-2): 3-29