A PIPELINE FOR MODELING URBAN STREET FACADES FROM TERRESTRIAL LASER AND IMAGE DATA

K., Hammoudi [1], F., Dornaika [2,3], B., Soheilian [1], N., Paparoditis [1]

[1] Université Paris-Est, Institut Geographique National, MATIS Laboratory, France
[2] Ikerbasque & [3] University of the Basque Country, Dpt. of Computer Science and A.I., Spain

{karim.hammoudi,bahman.soheilian,nicolas.paparoditis}@ign.fr,fadi_dornaika@ehu.es

Abstract

This poster presents researches dealing with the 3D modeling of urban street facades. In the last decade, the mapping field has strongly evolved due to the needs of civil and military applications. At the French National Mapping Agency, approaches have been developed in order to model street facades from laser and image data collected by terrestrial mobile mapping systems (i.e., vehicle of acquisition). One of the objectives is the generation of a realistic 3D viewer of street facades.

1. Fields of application

- Generating virtual scenes for navigation (tourism)
- Increasing the realism of models for simulators (video games)
- Object recognition for machine guidance (autonomous car navigation)
- Digitizing architectural works (cultural heritage)
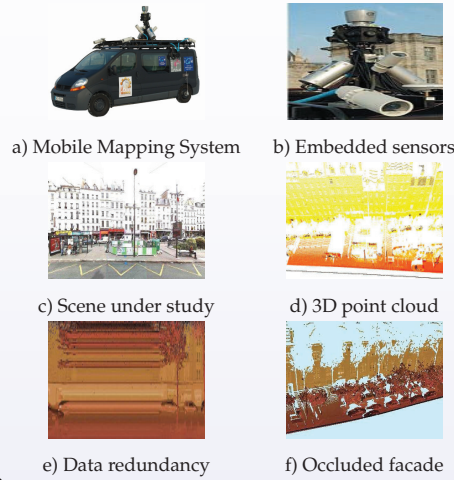
2. Difficulties and challenges

Complexity in reconstruction

- Diversity of shapes
- Dense urban areas (Occlusions)
- Data heterogeneity
- Data registration
- Resolution, angle and scale of view
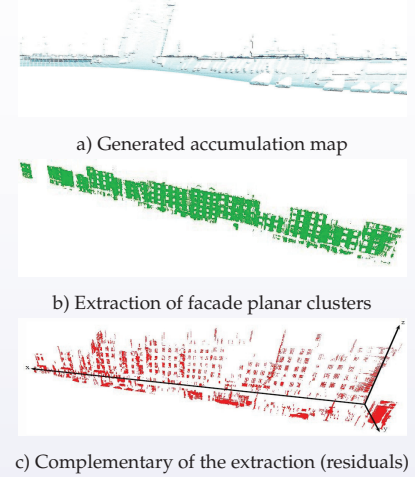- Mobile and real acquisition
- Required level of details
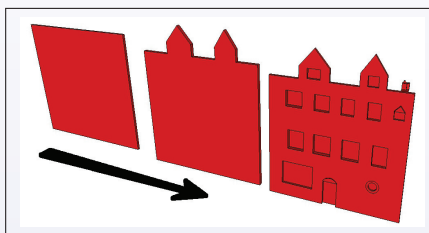
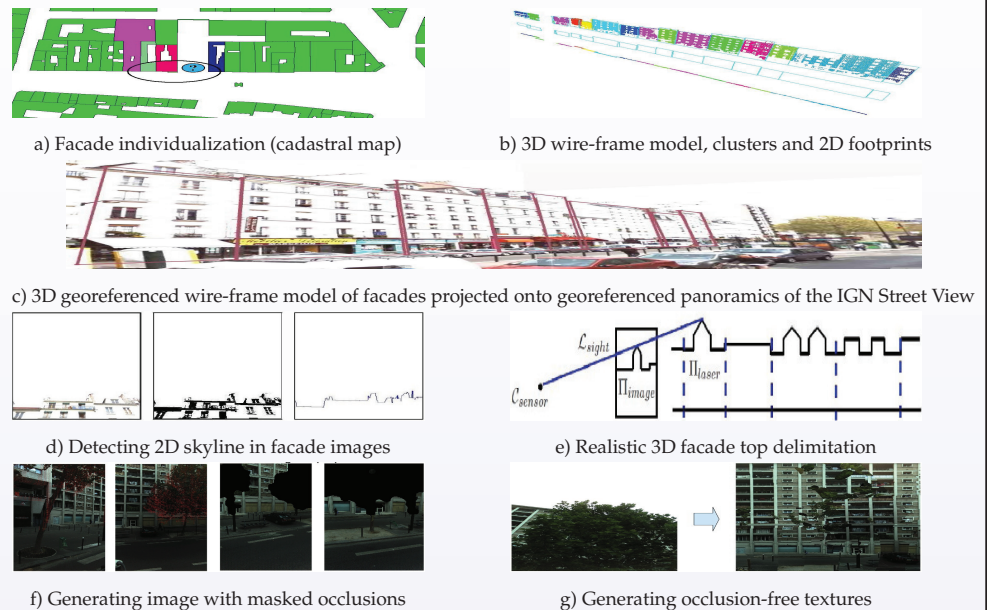Various types of detailed facades according with targeted applications

3. Acquisition system and collected data

a) Mobile Mapping System

b) Embedded sensors

c) Scene under study

d) 3D point cloud

e) Data redundancy

f) Occluded facade

4. Street point cloud segmentation

a) Generated accumulation map

b) Extraction of facade planar clusters

c) Complementary of the extraction (residuals)

5. 3D modeling and texturing of urban street facades

a) Facade individualization (cadastral map)

b) 3D wire-frame model, clusters and 2D footprints

c) 3D georeferenced wire-frame model of facades projected onto georeferenced panoramics of the IGN Street View

d) Detecting 2D skyline in facade images

e) Realistic 3D facade top delimitation

f) Generating image with masked occlusions

g) Generating occlusion-free textures

Conclusion: This poster presents a set of modules designed to be combined together towards generating pipeline for 3D urban street facades modeling.

Recent publications *1st author candidature for a Post-doctoral position*

[1] K., Hammoudi, F., Dornaika, N., Paparoditis, Extracting Building Footprints from 3D Point Clouds using a Terrestrial Laser Scanning at Street Level, *In Proc. ISPRS International Archives of Photogrammetry, Remote Sensing and Spatial Information Sciences*, Paris, France, 2009.
[2] K., Hammoudi, F., Dornaika, B., Soheilian, N., Paparoditis, Extracting Outlined Planar Clusters of Street Facades from 3D Point Clouds, *In Proc. IEEE Canadian Conference on Computer and Robot Vision*, Ottawa, Canada, 2010.
[3] K. Hammoudi, F. Dornaika, B. Soheilian, N. Paparoditis. Generating Raw Polygons of Street Facades from a 2D Urban Map and Terrestrial Laser Range Data. *In Proc. Australasian Remote Sensing and Photogrammetry Conference*, Alice Springs, Australia, 2010.
[4] K. Hammoudi, F. Dornaika, B. Soheilian, N. Paparoditis. Extracting Wire-frame Models of Street Facades from 3D Point Clouds and the Corresponding Cadastral Map. *In Proc. ISPRS International Archives of Photogrammetry, Remote Sensing and Spatial Information Sciences*, Saint-Mandé, France, 2010.