Impediments to Vertical Data Capture from Aerial LiDAR for Three-dimensional Building Extraction

Tommy HINKS
Doctoral Candidate
University College Dublin
Dublin, Ireland
tommy.hinks@gmail.com

Tommy Paul Hinks, born 1981, received a M.Sc in Media Technology from the University of Linköping in 2006. Currently he is a PhD student at the School of Computer Science and Informatics at UCD, Dublin.

Hamish CARR
Lecturer
University College Dublin
Dublin, Ireland
hamish.carr@ucd.ie

Hamish Carr received a PhD from the University of British Columbia in 2004. His research interests include the applications of computational geometry and topology in computer graphics and scientific, engineering and medical visualization.

Debra LAEFER
Lecturer
University College Dublin
Dublin, Ireland
debra.laefer@ucd.ie

Debra Laefer, received her doctorate in Civil Engineering from the Univ. of Illinois Urbana-Champaign, USA. She is an expert in the protection of heritage structures from natural events, construction activities, and blasting.

Summary

Aerial Light Detection and Ranging (LiDAR) offers the potential to generate detailed, three-dimensional models of the built environment in urban settings. Such models would offer distinct advantages for a wide range of applications from improved noise and pollution prediction to disaster mitigation modelling. Presently, some impediments to such important data capture are a function of the current technology and an outgrowth of the geometry of dense urban development. This paper outlines the difficulties related to effective vertical data capture in an urban environment and recommends specific approaches toward a geometric optimization of this problem.

Keywords: Aerial surveys; remote sensing; urban studies; three-dimensional models; geographic information systems; LiDAR.

1. Introduction

Urban Planners and Civil Engineers are desirous to acquire large-scale three-dimensional (3D) geometric models of urban areas for a wide range of applications. These can include such seemingly disparate applications predictive noise and pollution models to disaster mitigation in the event of sudden infrastructure changes. Such applications require accurate geometric models, and in a post-disaster scenario, the models must be acquired rapidly, as well. The future of aerial Light Detection and Ranging (LiDAR) holds the potential for the rapid auto-generation of such models. This paper presents a discussion of the geometric impediments to an aerial LiDAR flight plan to maximize the vertical building data capture needed for such 3D building model generation.

2. Background

LiDAR is an active remote sensing technology that is used to collect topographic data [1]. The data are collected with aircraft-mounted lasers capable of recording elevation measurements at a rate of 5,000 to 50,000 pulses per second. The difference in time is measured from when a laser pulse is

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