



A Photogrammetric Method for Spatial Data Extraction from Google Earth and Improvement with Precision Analysis

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Received 05 January 2018; Accepted 17 April 2018

Abstract

Topography maps are crucial for civil engineering projects, such as road construction, water channel construction, urban construction, and mining. Here we present a method which enables us to extract topographical map via modeling Google Earth and some field works. In this method, first, we model Google Earth as an object with closed-range photogrammetric method in the Agisoft Photoscan. Through some field works, we measured twenty-two points including twelve ground control points (GCP) and ten independent check points (ICP). Due to these GCPs, we were able to transform our model to real world with global polynomial and multi-quadratic equations and ICPs were used for precision analysis. This method is easy and cheap to obtain spatial data and the accuracy is sufficient for research requirements.

Keywords: Photogrammetric Method; Data Extraction; Google Earth; Modelling; Agisoft Photoscan; Data Processing; Multi-quadratic Transformation.

1. Introduction

Google Earth is used widely among researchers as a virtual globe which provides many free satellite images and three-dimensional views of Earth [1]. The most prevalent use of Google Earth by researchers is to put their own collected data on the background images and observe the geographical context [2]. The use of Google Earth is classified into some main objectives, namely visualization, data collecting, data exploration, data integration, modelling and simulation, validation and decision support by Goodchild and Stensgaard [3-4]. The quality of images varies from place to place and the accuracy may not be suitable for some research purposes at certain locations in which case image processing is necessary for accurate data collection [5-8]. Use of single coordinate system which is WGS84, easy visualization and accessible data, and freely accessible remotely sensed images are the advantages of Google Earth, but the inconsistency in the accuracy of its data is one of its disadvantages [1]. A way to solve this problem is to integrate a database collected during field works and the data produced by the digital map which needs some further processing [9] and conversions [2, 10].

In this article, a novel method is presented to extract data from google earth with higher accuracy. First, Google-Earth is remodeled using a photogrammetric method. Furthermore, transformation from model coordinate system to ground coordinate system is done by global polynomial and multi-quadric equations. Finally, the topography of a region is created in UTM coordinate system. The flowchart of research is shown in Figure 1.

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 <http://dx.doi.org/10.28991/cej-0309141>

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