Orthopotho and DSM production from UAV based remote sensing images

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Introduction

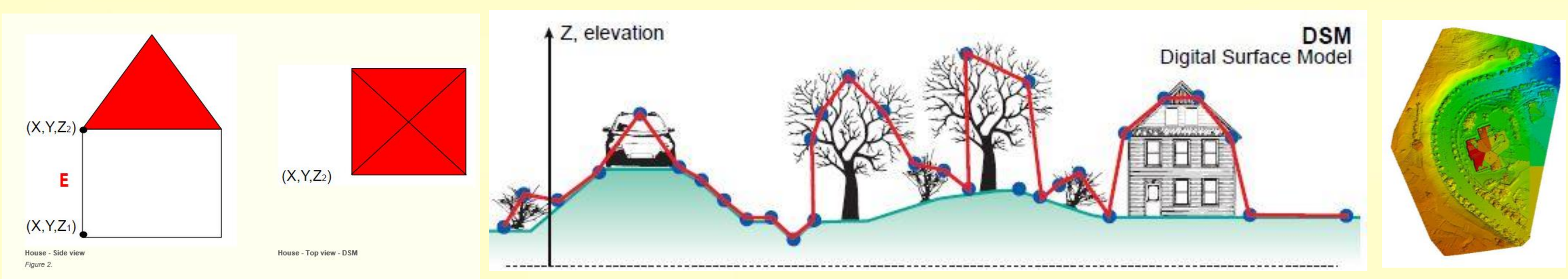
Remote sensing refers to the technique of capturing information at a distance (remotely) by specific instruments (sensors). Traditionally, the term remote sensing was used for satellite and airborne platforms, acquiring data typically by optical and radar sensors. Recently, the Unmanned Arial Vehicles based remote sensing technology has been widely used for acquiring high resolution topographic data in remote sensing that is known as UAV (Hackney et al., 2015). The abbreviation of UAV is "Unmanned Aerial Vehicle", which is an aircraft with no pilot on board (Colomina et al. 2014). It was used in the military context at **1933**, For the mapping potential, it also was used by research groups in the late nineteen-seventies . Now-a-days, it gets more popularity for low cost, high resolution images, quickly accusable and no cloud cover between earth surface and sensor.

Aim and objects

The broader aim is to produce Orthophoto and Digital Surface Modeling of a small area (0.17 km2) of Fuling District in Chongqing Municipality based on Unmanned Aerial Vehicles (UAVs) images. And also to evaluate the geometric accuracy of the study area. The absolute location of my study area is 107°22' – 107°22.66' East, 29°42.25'– 29°42.37' North.

Digital surface model (DSM)

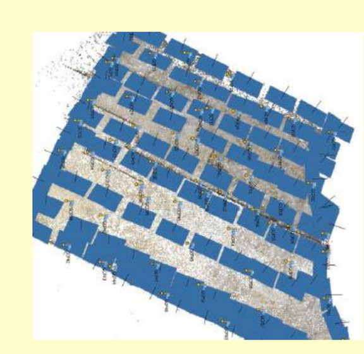
Digital surface model (DSM) is a digital or 3D model which contains elevations of natural terrain in addition to top of buildings, trees and any other objects. Example: The edge E in the following image (left) has 2 vertices with different altitude values (Z2>Z1). In the DSM this edge will only be shown as the point (X,Y,Z2).



Orthophoto

An Orthophoto is a geometrically correct 2D image with all the geometric characteristics of a map or image. These orthophotos can be used as excavation map. The DSM represents the topography of the uppermost surface of the Orthophoto. It provides the height information for the excavation map.

By the reprojecting the GCP along a predefined x-axis, vertical ortho-images and vertical DSMs can be created. These can be used to map and represent the vertical geometry of features.



Primary data collection

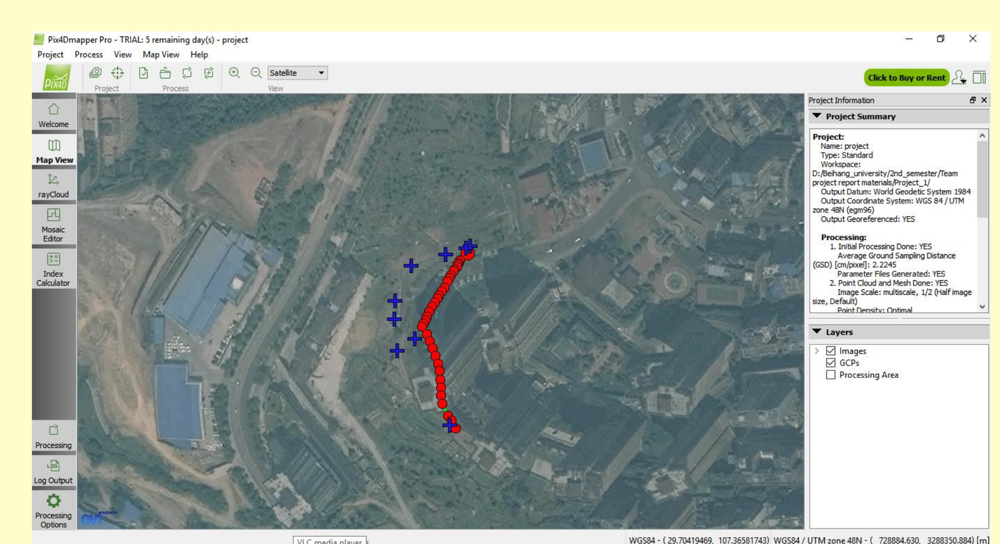
- The UAV data (152 Images) of Fuling district (Part), Date: 6th may 2016. For my research, I used fixed wings UAV..

- Ground control point data, Date: 6th may 2016.

GCP No.	Lat.	Long.	Elevation
67	729030.221	3288560.325	286.447
68	729027.135	3288558.69	287.638
69	729011.883	3288553.665	292.464
70	728986.839	3288544.804	299.293
71	728975.641	3288519.037	296.678
72	728975.19	3288505.627	296.607
73	728977.594	3288482.326	296.761
74	729017.652	3288428.221	301.582
75	728990.554	3288491.248	280.378

Secondary data collection

- Image analysis software collection
  - ERDAS LPS
  - Socet Set
  - Agisoft PhotoScan
  - **Pix4D Mapper**
- From GoogleEarth
- Report, thesis, journal

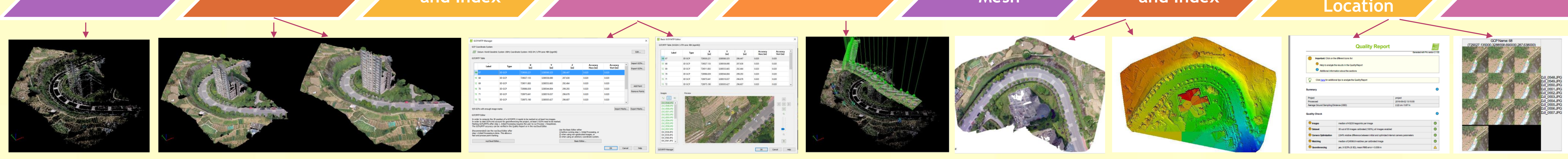


Pix4D

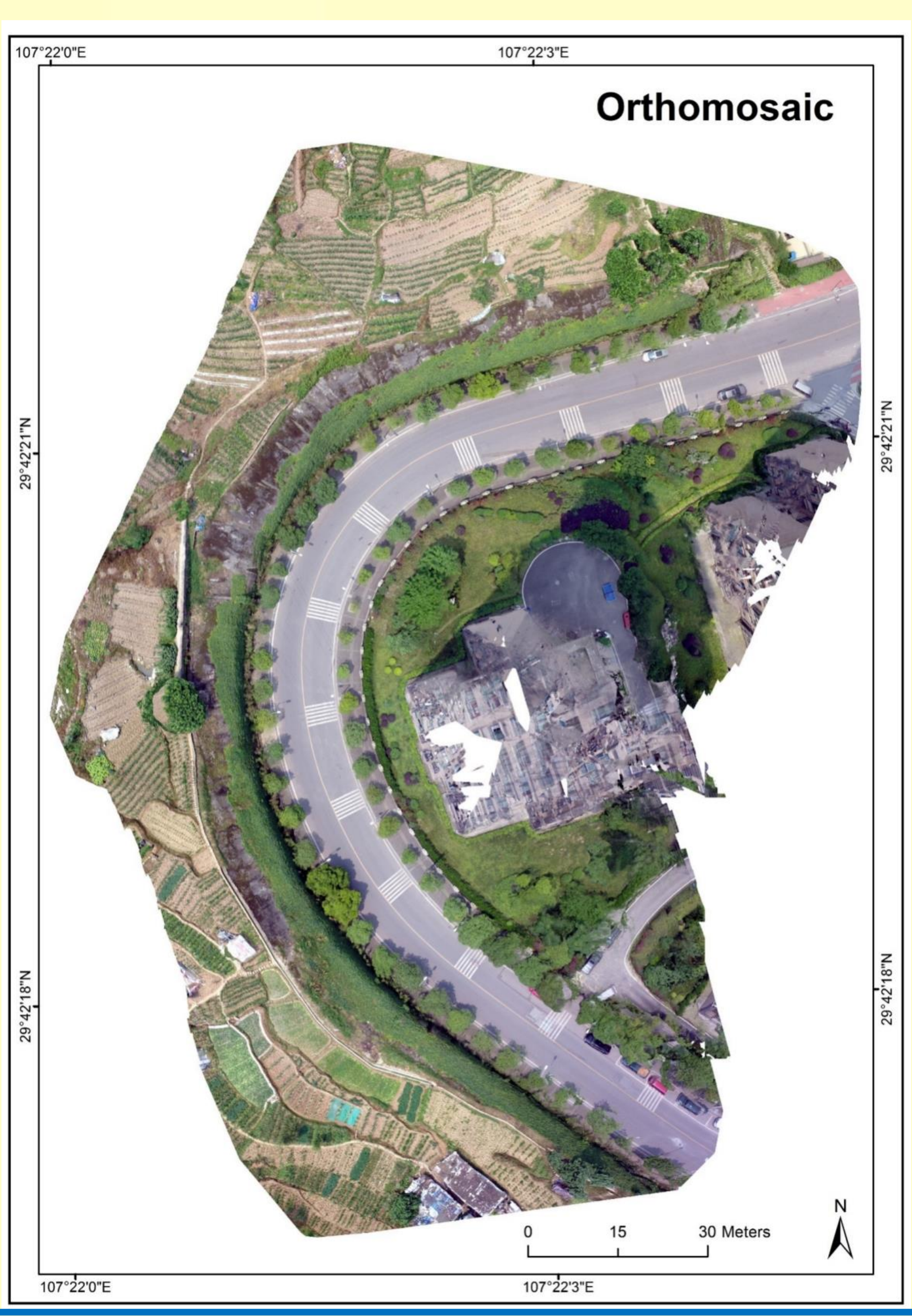
Pix4D Software for professional drone-based mapping. It automatically converts images taken by hand, by drone, or by plane, and delivers highly precise, georeferenced 2D maps and 3D models. It is also customizable, timely, and compliment a wide range of applications and software.

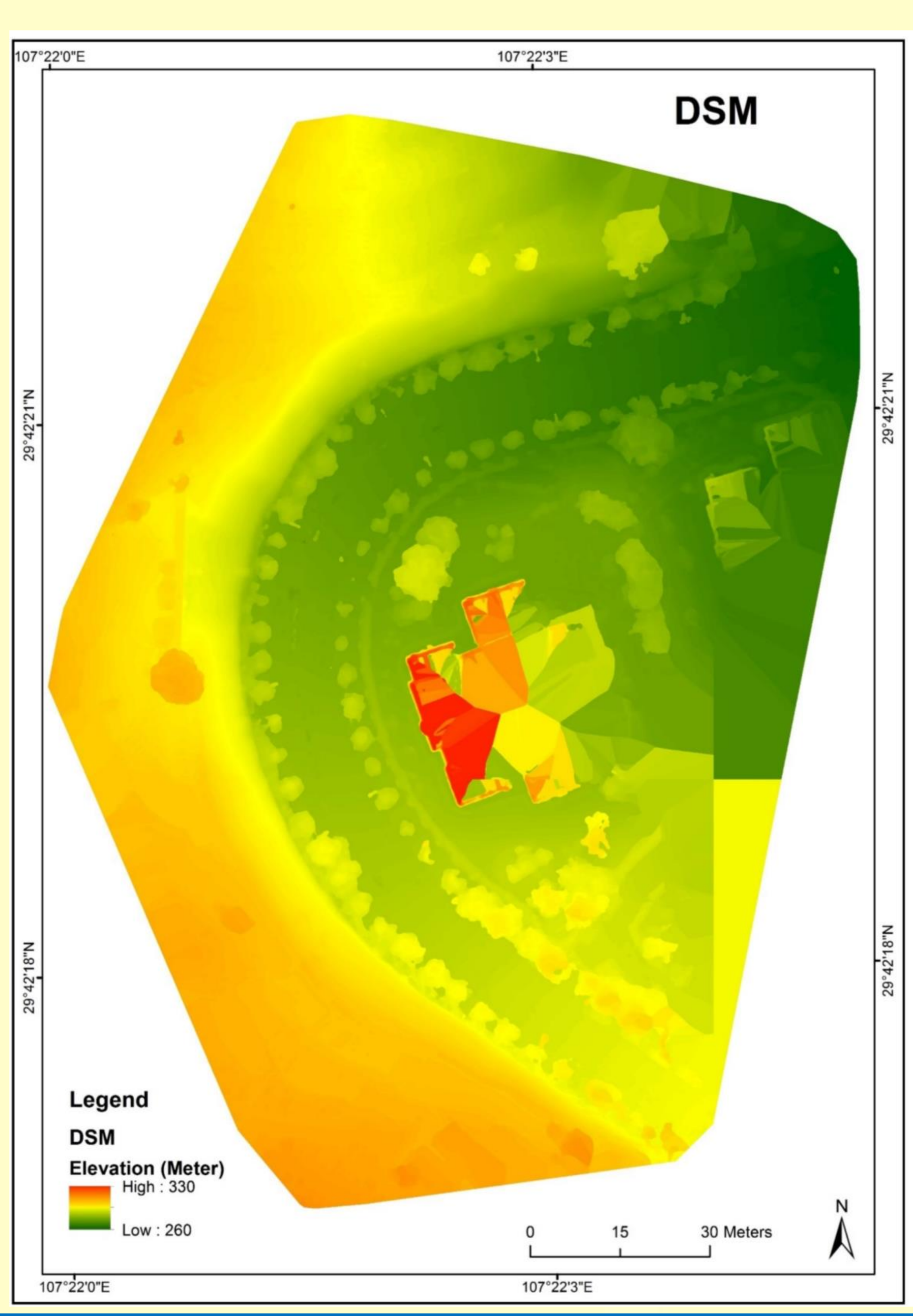
Method

Initial Processing → Point Cloud and Mesh → DSM, Orthomosaic and Index → Add GCP → Again Initial Processing → Again Point Cloud and Mesh → Again DSM, Orthomosaic and Index → Quality report & rectify the Location → Mapping



Result





Before

After

Images in which GCPs have been marked (yellow circle) and in which their computed 3D points have been projected (green circle). A green circle outside of the yellow circle indicates either an accuracy issue or a GCP issue.

From the above two images, we can see that, GCP 70 was not matched on the image DJI_0548. After see the quality report, I adjusted/connected the GCP point with the images. Then again finished the processes. You can see the processed work right side.

Reference

➢Hackney C. & Clayton A. I. 2015. Unmanned Aerial Vehicles (UAVs) and their application in geomorphic mapping. British Society for Geomorphology. Geomorphological Techniques, Chapter 2. Sec. 1.7.

➢Colomina I. & Molina P. 2014. Unmanned aerial systems for photogrammetry and remote sensing: A review. ISPRS Journal of Photogrammetry and Remote Sensing 92 (2014) 79–97.