Feature Data Collection with Stereo Imagery

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Overview

http://www.virgiadiot.org/business/locdes/photogrammetry.asp
Feature Data Collection with Stereo Imagery

Outline

• Objective
• Workflow
• Principles of data collection with stereo imagery
• Hardware configuration
• Demo
Objective

- Digital photogrammetric stereo imagery to collect 3D features
  
  - Collection: Feature collection from aerial frame, satellite, UAV/close-range in stereo mode
  - Editing: Superimpose collected or imported vector data directly onto stereo models for effective and efficient interactive mapping, change detection and GIS updates
Applications

- With ArcGIS Pro Stereo Mapping, user can collect 3D features (Point, Polyline, Polygon) which support the following typical applications
  - Topographic mapping
  - Parcel editing
  - Simple 3D building
  - Height measurement

- Surveying, mapping, farming, forestry, utilities…
Workflow

Large Image Collections → Mosaic Dataset → Desktop

Products → Feature Collection in Stereo imagery
Workflow

- Raw images
- Adjust using Ortho Mapping tools
- Mxds, Pro project, layers
- Mosaic dataset image service
- Adjusted images
- Pro Stereo Mapping
- Feature classes
Supporting Data

- Pre-processed Mosaic Dataset to manage digital frame camera data and satellite data
- Frame Aerial, UAV/UAS, Satellite Imagery Data
  - UAV/UAS, DMC, Vexcel
  - Ikonos
  - WorldView
  - …
- Required information:
  - Interior orientation (camera parameters)
  - Exterior orientation (unique frame parameters)
Pre-processing

• Create Mosaic Dataset
• Data processing
  - Adjustment
  - Metadata
    - Sensor location (x,y,z) and orientation (o,p,k)
    - RPC (Rational Polynomial Coefficient) parameters
    - Sensor parameters (camera distortion, camera calibration)
  - Image enhancement (stretching,…)
• Generate stereo images (Image rectification)
Principles of Stereo Imagery

Image rectification

- Image rectification
  - Image orientation parameters
  - Camera calibration parameters
  - Image resampling

- One object has same vertical coordinates in stereo images
Rectified Images

• One object must have same Y coordinate in stereo for accurate data collection.
• If offset exists in Y coordinate, adjustment is not done well.
Principle of Feature Data Collection with Stereo Imageries

- A virtual 3D point triggered by mouse moves in 3D map space
- 3D point projected on to stereo images as two cursors always of same Y coordinate
- With help of stereo glasses, operator adjust the elevation of 3D point to determine if cursor is fitting at the correct object that is going to be collected
  - In separated views, two cursors should on the same image points
  - In stereo view
    - Only one cursor visible in stereo glasses
    - Cursor is fitting on the ground surface at the object
Principle of Feature Data Collection with Stereo Imageries

3D Cursor moves along the light of ray by adjusting elevation

Correct Position to be collected

Left image

Right image
Hardware Configuration

• Anaglyph Stereo
  - Anaglyph Stereo Glasses

• Shutter Glass Stereo
  - Graphic card supporting stereo display
  - Monitor supporting 120 Hz
  - Shutter glasses

• Optional: 3D mouse
Photogrammetric Workstation

Image Source:
Remarks

- Data collection with stereo imagery is a operation in 3D space. Stereo comes from 2 rectified images.
- Movement of cursor is in a 3D map space. This virtual cursor is projected to stereo images on flight.
- Exercise of stereo is necessary. In order to get accurate result, operator should be proficient at place cursor at correct elevation so that “stereo cursor” fits at the object surface.
Demos

Feature Data Collection with Stereo Imagery
Demo with Frame Camera
Supporting Text
Demo with Satellite Images

Supporting Text
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