DMC – PPS and new Features

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Presentation Outline

- Introduction
- Air Borne Sensor Management
- Post Processing
- Outlook
- Summary
Mission Planning

- Transform contract items into most economical mission plan

- Typically requirements defined for:
  - Image Scale or resolution on ground (GSD) or altitude above ground
  - Resulting mapping accuracy
  - Shadow length or sun angle
  - Maximum length of flight line
  - ...

- Typical input:
  - Topographic maps
  - Vector information of project boundaries or infrastructure
  - Elevation information (3D)
  - ...

ISPRS Hannover Workshop 2005
Mission Planning
Mission Planning

- What makes a good mission plan?
  - Full project area coverage
    - Checked for overlap between images and strips (3D)
    - Restricted areas?
    - ...
  - Considers sensors and aircraft specifics
    - Min / max aircraft speed
    - Minimum sensor release cycles
    - ...
  - Considers geometric block stability
    - Cross strip layout or/and IMU
    - Control information needed
    - ...
  - In general
    - Best economical choice
    - Start point for overall Project plan / tracking / accounting …
Photo Flight

- Ready, steady, go …?

- Prepare Mission
  - Define final flight route
  - Load planned mission onto Sensor Control System (ASMS)
  - …

- A closer look into the Aircraft
  - Camera and Navigation Control (ASMS / Pilot Display / Telescope)
  - Imaging Sensor(s) (DMC / RMK-Top)
  - Positioning Sensors (Trimble GPS / Applanix IMU)
  - Stabilized sensor mount (T-AS)
  - …

- The crew

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<th>Navigation</th>
<th>Select next strip</th>
<th>Start/stop exposure</th>
<th>Change altitude</th>
<th>Monitor sensor</th>
<th>Invalidate strips/photos</th>
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Photo Flight

- In the Aircraft
  - Quality Check in the Air
    - Invalidate function based on video Thumbnails (ASMS-QC)
    - Check image histograms / exposure settings (FDSV)
    - Mission overview based on Thumbnails (AOPV)

- New ASMS Functionality
  - Exposure Range
  - Serial mode
  - Video Contrast
  - Store mission files onto FDS

- ... External Drift control
  - ... Feed T-AS angular position into POS (Gimbal information)
Exposure Range

- Maintain Mission Plan right in the air
- Split planned flight lines

- Define:
  - Number of exposures to cut off
  - Number of strips to correct

- Features:
  - Easy to operate
  - Pilot guided to new line start/end
Serial Mode

- Free serial exposure controlled by v/h

- Define:
  - Overlap
  - Number of images

- Support for:
  - Unplanned exposures
  - Re-fly parts of a strip
  - Usefull for RMK-A
External Drift Control

- Use POS IMU trajectory for drift control
- Image alignment adjustable to track direction

True Track

Desired Track
Mission Report

- Mission successful …?

- First Mission Quality Report
  - Check planned vs. actual situation
  - Mosaik of mission area
  - Project overview based on Video thumbnails

- Prepare Shipping (outbound mission)
  - ASMS Mission information has been copied to FDS already!
  - Field data copy process (Copy data to less expensive disk drives)
**What’s the Idea?**

- Bulk Processing

- Create 1 distortion free virtual, central perspective image out of the 8 camera heads

**Flexible output:**

- Various image products (Format, Compression, Pixel resolution, …)
- Rescue original sensitivity measurements (LUT optional)

**How does that work?**

- Calibration of all Camera Heads mandatory:
  - Geometry
  - Radiometry

- Defined relative position of the 8 cameras in the mount

**BUT:**

- Camera housing is not stable
- Sensor sensitivity depends on environmental conditions
For each exposure

- Tie point measurements and computation of platform geometry
- Adjustment of sensor sensitivity based on environmental measures and patches along seam line

Tie point measurements
- x,y coordinates in images space

Camera position
- x,y,z and κ are fix for each camera (mechanical design)

Online Calibration (Geometry)
- Adjustment models x,y movement into φ,ω

Online Calibration (Radiometry)
- gain/offset adjustment for each camera
Usage of DMC virtual images

- Central perspective images
- Fixed interior orientation
  - 13768 x 7680 pixel (row, column)
  - 12 µm pixel size (quadratic)
  - Nominal focal length
    - PAN 120.0000 mm
    - MS 25.2632 mm (120/4.75)
- Distortion free images
- For direct use in all photogrammetric standard software
Summarize DMC Post Processing

- Central perspective images for direct use in standard photogrammetric software suites
- DIA to generate LUT
- Final Processing:
  - Run sample images
  - Generate LUT
  - Run sample image with LUT
  - Check images
  - Bulk process images

- BUT
- Processing is still time consuming
  - 2000 images a 2.5 min per image → 5500 min ~ 91h
Sample Configuration
PPS Next Version

PPS Version 4.5.0

Key – Features

- 4 Band High Resolution images
  (no JPEG 2000 compression possible)
- Distributed Processing
- Advanced Settings

... and some more “minor” changes