PHOTOGRAMMETRIC CONSIDERATIONS FOR THE ULTIMATE UAV

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OBJECTIVE

• Videography for wildlife and habitat assessment
• Georeference video frames

Relate to maps and other imagery

Field visits using GPS
GEOREFERENCING

• Image in arbitrary coordinates
• Select control points
  • Image identifiable
  • Map coordinates
  • Field measured (accessible)
FEATURELESS AREA
(NO IDENTIFIABLE CONTROL POINTS)
PHOTOGRAMMETRY
(Videogrammetry)

• 3D solution
• Perspective geometry
• Stereo images (Viewmaster)
• Control
IMAGE GEOMETRY
ANGULAR ORIENTATION
COLLINEARITY CONDITION
DATA COLLECTION HARDWARE

- Progressive scan video camera
- Inertial navigation system (INS)
- Global positioning system (GPS) receiver
- Time synchronization
PROGRESSIVE SCAN VIDEO CAMERA

- Non-interlaced picture
- Digital download
- Break into individual frames
INERTIAL NAVIGATION SYSTEM

• Heading
• Pitch
• Roll
GPS RECEIVER

• Code phase - navigation
• Accuracy: 10-20 m
• Measures latitude, longitude, and height
TIME SYNCHRONIZATION

• Need video, INS, and GPS data to be consistent
• Present system - INS and GPS synchronized
• Video - 30 frames per second
• Video time offset
BORE SIGHT CALIBRATION

• Alignment of INS and video camera
• Optical axis not necessarily parallel to Z-axis of INS
• Angular offsets can be calibrated
• Test flight over ground targets
DIGITAL IMAGE MATCHING

• Find common “points” between images
• Correlate subarrays of brightness values
• High correlation coefficient indicates match
TEST IMAGE
Flying Height: 110 meters
ACCURACY TESTS

• Surveyed ground targets
• Computed photo positions within 2 m
• Computed ground points within 0.5 m
SUMMARY

• Need time synchronized data inputs
• Substantial computer processing power and memory
• Bore sight calibration
• Consistent, rigid mount
• Accuracy primarily a function of GPS accuracy (10-20m)