Overview, evaluation and testing of digital photogrammetric stations

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Overview, Evaluation and Testing of Digital Photogrammetric Stations

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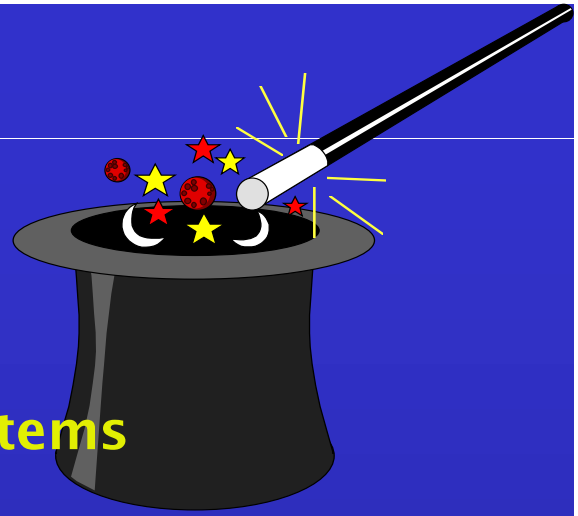
Outline of Tutorial



Session 1
- Introduction and overview of commercial systems

Session 2
- Overview of commercial systems (cont.)
- Evaluation of DPS and scanners
- Tests and comparisons of DPS and scanners

Session 3
- Tests and comparisons of DPS and scanners (cont.)
- Logistics for production environments

Session 4
- Experiences from large production environments & projects
- Final and critical remarks

Time table

- Session 1: 9:00 - 10:35
- Coffee Break: 10:35 - 11:05
- Session 2: 11:05 - 12:35
- Lunch Break: 12:35 - 13:30
- Session 3: 13:30 - 14:50
- Coffee Break: 14:50 - 15:20
- Session 4: 15:20 - 17:00

Introduction & overview of commercial systems

- Background review
- Overview of Intergraph Imagestation
- Overview of LHS DPW
- Overview of Zeiss PHODIS
- Overview of Erdas Orthomax
- Overview of VirtuoZo

Introduction

- Historical Review
- Classification of Scanners
- Classification of DPWs
- Major Functionality
- Existing Systems

Historical Review

- **First DPW**
  - First commercially marketed Digital Photogrammetric Workstation introduced at 16th ISPRS Congress in 1988
  - Kern DSP1, no system sold, cost about 1 million SFr.
- **Development**
  - Initially slow development of photogrammetric scanners and DPWs (many promises, low performance, high cost)
  - Since 18th ISPRS Congress in 1996 digital systems more widely accepted and used in professional practice
  - Until then analytical plotters often the instrument of choice in practical use, esp. for mapping
  - Now: competitive market, lower prices, improved functionality

Classification of Scanners

- **Historical development**
  - First scanners at the end of the 80s, many problems
  - Now improved performance (2nd generation scanners), 6 systems to choose from (low, medium, high cost)
- **Current market**
  - High geometric resolution and accuracy, radiometric/colour performance needs improvement
  - Improved software (image processing, set of scan parameters etc.)
  - Automatic scanning of roll film, since 1996
  - Lower precision A3 size scanners from DTP and graphics industries
  - No roll film, lower geometric accuracy, and often lower resolution
  - Used for lower accuracy specification projects

Classification of DPWs

- **Components of a Digital Photogrammetric Workstation**
  - Software based systems on Sun/SGi Unix or PC/Windows
  - Some specialised equipment such as input devices (3D mouse, pedals etc.), stereo viewing, special graphics boards and monitor, mass storage devices, I/O (scanning, plotting etc.)
- **Current market**
  - Many mature systems in competitive market place
  - Some complete systems from scanning to end products (major firms: Z/I Imaging, LH Systems)
  - Some limited to photogrammetric functionality (or part of it) only
  - Some low-cost on PC, mainly for teaching and research
  - Some developed from image processing/RS systems (Erdas, PCI)
  - Many automated/streamlined components in workflow today

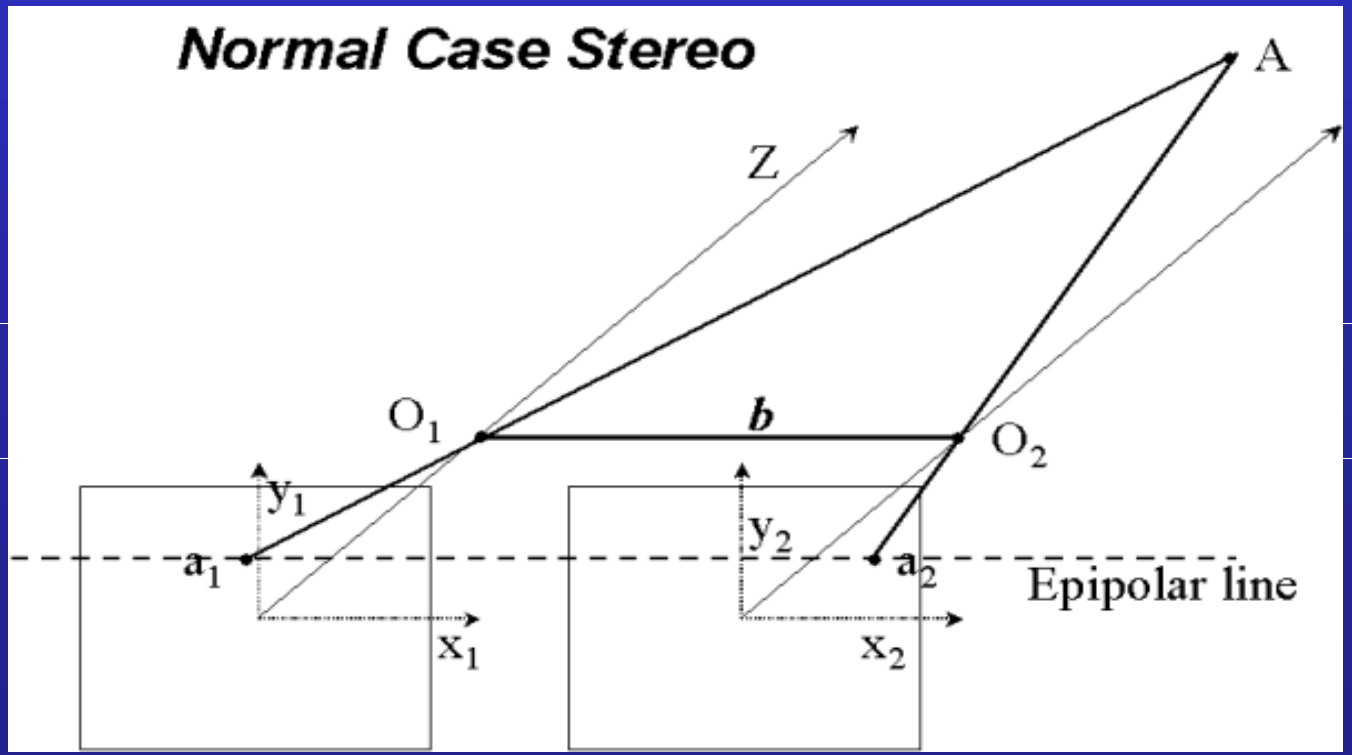
Major Functionality

Functionality

- Scanning & image processing software
- Data management, import and export of data
- Inner orientation (manual, semi automatic or automated)
- Relative orientation / Tie points for AT (manual, semi-automatic or automated)
- Absolute orientation (manual, semi-automatic)
- Bundle adjustment/AT (some support GPS)
- DTM generation
- Orthoimage production/Mosaicking/Monoplotting
- Feature extraction/Mapping
- Visualisation (perspective view, fly-through)
- Other (CAD/GIS interfaces or functionality, hardcopy output etc.)
- Focus on aerial imagery (little support of close-range/satellite sensors)

Some Common Characteristics

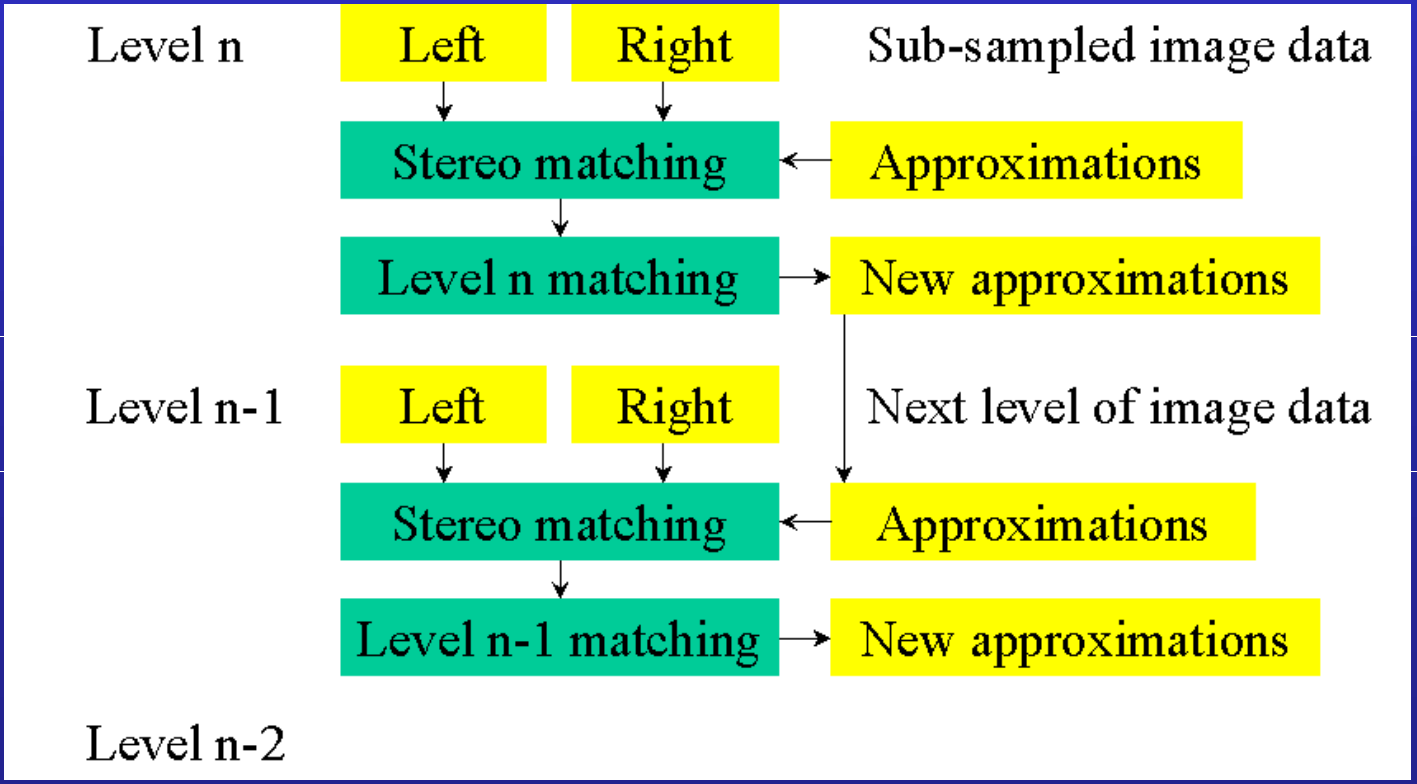
- **Epipolar imagery**
  - Most systems assume normal case stereo and generate epipolar images before proceeding with feature extraction or DTM generation. Used also for stereo-viewing.



Some Common Characteristics

Image pyramids

- Most systems have some form of pyramidal/hierarchical matching for DTM generation
- Pyramids used also for fast image overviews



Considerations

Data Storage

- Data management issues (large data, integration of hybrid data (raster, vector, attribute), metadata management) and archiving
- Single colour image scanned at 15µm requires about 700 MB without compression. With compression typically about 250MB, a block could require 25 GB or more
- Data transfer issues, need fast network facilities
- Data format issues (no standards)

Data Display

- Large, high resolution and very high refresh rate, 24-bit monitor (e.g. 120Hz at 1280 x 1024) needed (some have double ones)
- Special 3D viewing equipment - suitable graphics card and stereo viewing glasses (passive or active)

Existing Commercial Systems

- **Basic comparison of systems regarding automation**

	Platform	*Inner*	*Rel*	*AirTrig*	*DEM*	*DEM Editing*
Intergraph Imagestation	Windows	**Y**	**Y**	Match-AT	Match-T	**Y**
LH Systems Socet Set	Unix, Windows	**Y**	**Y**	HATS/Orima	ATE/AATE/IOR	**Y**
Zeiss PHODIS	SGI Unix	**Y**	**Y**	Match-AT	Match-T	**Y**
VirtuoZo	SGI Unix, Windows	**Y**	**Y**	**Y**	**Y**	**Y**
Erdas OrthoMAX/ OrthoBASE	Unix/Windows	**S**	**S**	**S/Y**	**Y**	**Y**