



EuroSDR project proposal ***Medium Format Digital Cameras***

Summary

This paper gives a short overview on the proposed project on *Medium Resolution Digital Cameras* in the framework of EuroSDR. The steering committee is asked to approve the project plan and to recommend on the given project description and project phases.

Background

Beside the development of digital photogrammetric frame cameras such as the DMC or UltraCAM-D digital medium format cameras are used widely to acquire digital airborne images. The photogrammetric potential of digital medium format cameras is similar to frame cameras. However the potential is not always utilized, due to several reasons, e.g. because it is not necessary for the clients.

There is a big range of applications for medium resolution cameras, starting from rapid response applications for disaster monitoring, joint applications with laser scanners, corridor mapping, small area large scale mapping projects to image acquisition for 3D-city models.

Current trends in medium digital cameras include a movement towards rapid processing (online orthophoto generation), e.g. for disaster management, security applications etc. On the other hand we see multi camera head developments, which will provide a similar coverage of a standard digital frame camera, but for a much lower price. Additionally forward motion compensation will come, not by time delayed integration (TDI) but mechanically. Last but not least we also see a trend towards a combination of oblique and vertical imagery acquisition.

One of the main differences between digital medium format cameras and frame cameras is the vertical range of manufacture. While in frame cameras all components are developed, optimized and tested for airborne applications, medium camera systems, including the processing software are often a composition of several of the shelf products combined with special features for the airborne environment. This makes comparisons between different systems and calibration efforts even more difficult.

Geometric calibration issues are crucial for mapping applications, change detection and modern geodata infrastructures. This is true for mapping agencies, public and private agencies in Europe as well as in the US, by the USGS. Equivalent to the developments for frame cameras similar geometric and (radiometric) standards have to be developed which shall apply on both sides of the Atlantic.

The need for the development of a generally accepted calibration procedure is evident. Such procedures will not only support suppliers and producers of digital camera systems but also provide additional means for potential digital camera users to investigate their features. Radiometric calibration of medium format cameras is a very complex issue, because the

digital backs often do not provide raw values but a radiometric black box. A first step will be to describe and analyze the radiometric workflow of different systems.

EuroSDR as a scientific organization has already established a key researchers network with the goal to derive the technical background for digital camera procedures based on scientific theory and empirical research. Within informal talks representatives of several medium format camera producers already signaled their willingness to support this EuroSDR initiative.

Objective

The objective of this *Medium Format Digital Camera* project is two-fold:

- Collection of publicly available material on medium format digital camera systems to compile an extensive report describing the currently used practice and methods (Phase 1).
- Empirical testing of 4 – 6 professional camera systems with focus on the adoption of commonly accepted procedure(s) for camera calibration and testing, based on the experiences from the frame cameras (EuroDAC²). Radiometric tests in addition to the investigations in the EuroSDR project Radiometric Aspects of Digital Photogrammetric Images (Phase 2).

As a result of Phase 1 it is expected to present a report which will be compiled with the help of all project participants, i.e. camera producers and users. We would like to invite all delegates to contribute with their experiences. Such a summary will help to create a common knowledge base for the formulation on future strategies and later experimental work in Phase 2. Such status report could be helpful for system users to gain their experience with medium format digital cameras. This aspect was not covered on the former Digital Camera Calibration network activity. Furthermore this report should list open problems which need to be solved.

The second phase should focus on the adoption and adjustment of commonly accepted procedure(s) for camera calibration and testing. This has to be aligned with the works done in the EuroDAC² project. It seems to be necessary to concentrate on some of the technical aspects in a sequential order, possibly starting with geometrical aspects and verification in a limited number of test flights by different camera producers and discussion on radiometric and image quality aspects. One aspect is the design for optimal calibration flight procedures to be tested then empirically. It has to be checked whether appropriate flight data can be made available for the project. Another aspect is a collection of recommendations of producers on how customers should calibrate and do the processing. Since medium format cameras are portable, radiometric tests may be performed in a lab, e.g. at German Research Centre DLR. Alternatively lab facilities of journals for professional photographers may be used. The definition of goals and the design of empirical tests has to be discussed based on the report compiled in Phase 1.

Timetable

With the acceptance of this project proposal Phase 1 will start immediately. The report will be compiled within 4 months based on the submitted and officially available material and recommendations from camera producers and other experts. After distribution of this report (January 2008) general concepts of camera calibration should be discussed with project participants preferably by email. An additional 1 day meeting for that purpose might be necessary in Spring 2008. The road map for Phase 2 should be fixed in the discussion after analyzing the outcome of Phase 1. It is aspired to finish experimental test investigations, data analysis and documentation within one year from Summer 2008 till Summer 2009.

Management

G. Grenzdörffer is prepared to be the project leader. Active links will be established to the EuroSDR project "Radiometric Aspects of Digital Photogrammetric Images" headed by E. Honkavaara, L. Markelin and R. Arbiol from FGI and ICC and the EuroDAC² initiative.

Budget and financing

Phase 1

- Travel support for project leader to participate in 111th meeting in Brussels and 112th meeting in Oslo, Mai 2008 to present results of Phase 1. TBC.

Phase 2

- Travel support for project leader to participate in 113th and 114th meeting to present results of Phase 2.
- Camera shipping for tests. Travel support for project leader to camera manufacturers or test facilities.

Deliverables

Phase 1

- Report and evaluation of results by core group and network.
- Paper based on preliminary results of Phase 1 will be submitted to the ISPRS 2008 congress by the project leader G. Grenzdörffer.

Phase 2:

- TBD (contents open, depends on results of Phase1)

Financial contribution of organizations

Support by national mapping agencies and companies is welcome.