Coordinate Metrology Society
Coordinate Metrology Systems Conference 2005
Austin, Texas | July 18-22, 2005

CMS-2005-014

Advanced Techniques for Photogrammetric 3-D Digitizing

AUTHORS
Werner Bosemann · Juergen Peipe

ORGANIZATION
AICON 3D Systems GmbH, Braunschweig, Germany; Bundeswehr University Munich, Neubiberg, Germany

Published by the Coordinate Metrology Society. Reference number CMS-2005-014.
Copyright remains with the author(s). Redistribution requires permission.

ABSTRACT

Advanced Techniques for Photogrammetric 3-D Digitizing

Optical 3-D measurement systems based on photogrammetric methods are increasingly and successfully being applied to the digitization, inspection and modelling of objects. In the paper, some trends in hardware and software development are reported on. The system used for investigations and application examples is AICON's mobile 3-D industrial measurement system DPA-Pro.

Firstly, a lot of high resolution CCD and CMOS cameras are available on the market at reasonable cost. These off-the-shelf cameras are designed for the mass market, but not with regard to photogrammetric requirements. Therefore, their suitability has to be verified by test measurements. The investigations presented in the paper refer to the German VDI/VDE guideline 2634 "Optical 3-D measuring systems - Imaging systems with point-by-point probing". Following this guideline, the imaging system performance is evaluated by determining the 3-D coordinates of targets attached to several measuring lines of a test body. Distances between the targets are calculated and compared with their calibrated values in order to define the maximum length measurement error which is characteristic for the photogrammetric quality of both the camera used and the measurement system. Results achieved with several SLR cameras are presented.

Another trend relates to the developments in photogrammetric data processing, namely automated image measurement and very fast and robust software for 3-D object restitution, including advanced models for camera calibration. Beyond the measurement of markers attached to the object (e.g., retroreflective and coded targets) also "natural" features such as contour lines, boreholes etc. can be detected and observed.

A third important point is the combination of photogrammetric measurements with other (optical) measurement techniques. In the paper, some examples of the integration of photogrammetry with laser trackers, laser scanning and fringe projection systems are outlined. DPA-Pro is shown to create reference grids for white light scanning systems to increase the measurement volume and also to support and to refine laser tracker measurements in areas with restricted access.

Abstract as submitted to the Coordinate Metrology Society. Reference number CMS-2005-014.