



A shipwreck research project funded by the European Union Culture 2000 Programme

Theme: The Darss Cog Site

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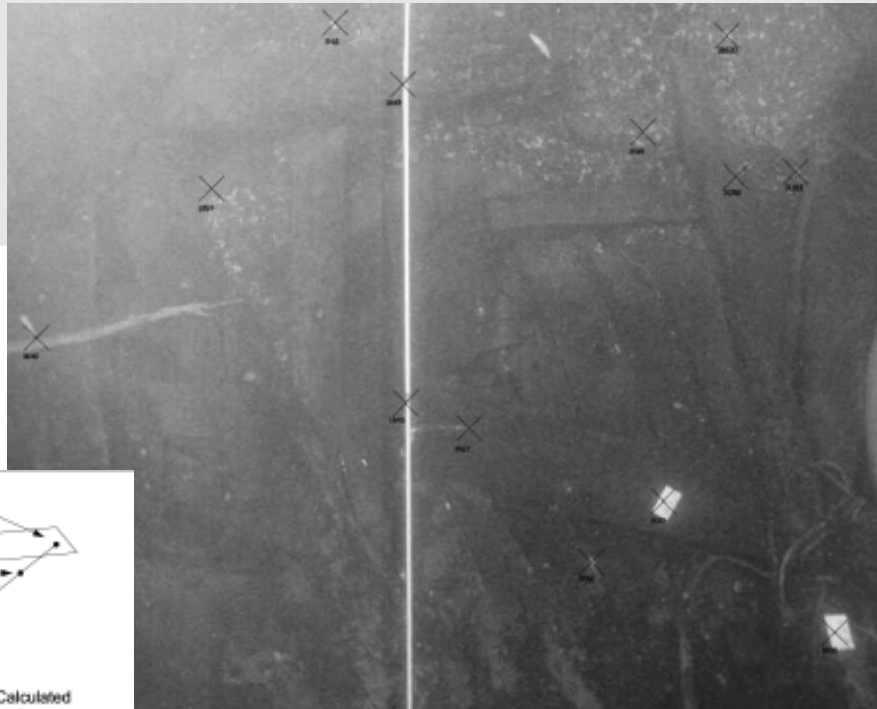
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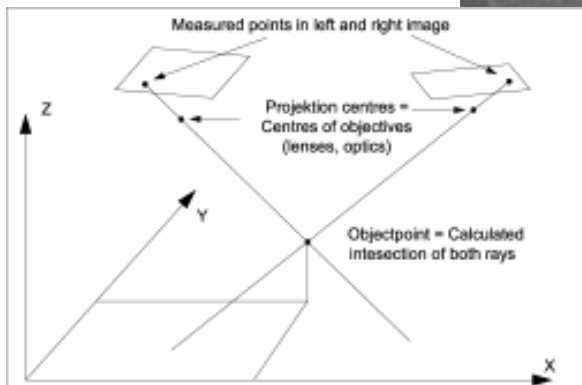


The Darss Cog: Surveyed by Photogrammetry – Principles, Data Processing and Future plans

Photogrammetry allows for the precise three-dimensional survey of objects using geometrically well-defined images. The following two sketches explain the basic measurement principles. The first sketch shows the geometric method by which the spatial intersection of the two rays ranging from two measured image-points is calculated. This intersection is one of many object points measured with



Photographic mosaic of the Darss cog.
Photographer: Roland Obst, Erfurt.



Principles of Photogrammetry Model: Frank Wehden, FH Neubrandenburg.

an accuracy of a few centimetres. The second sketch shows the footprints of a subset of the photographed images. In the lower section the

image geometry is shown from the side.

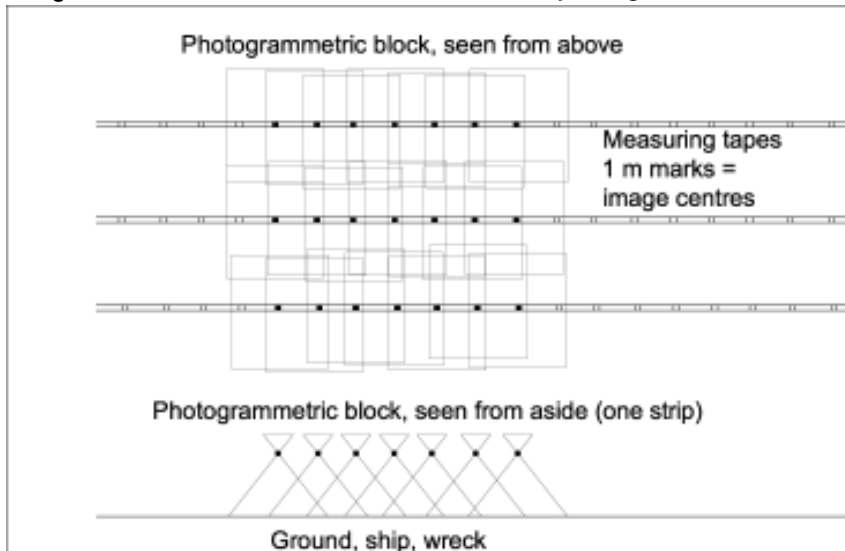
As part of the MOSS-project, the University college of Neubrandenburg

conducted a pilot study, which showed that photogrammetrical techniques could be useful for the recording of the Darss Cog. The results encouraged the use of the same or similar techniques in recording the numerous other endangered wooden wrecks, still lying on the floor of the sea.

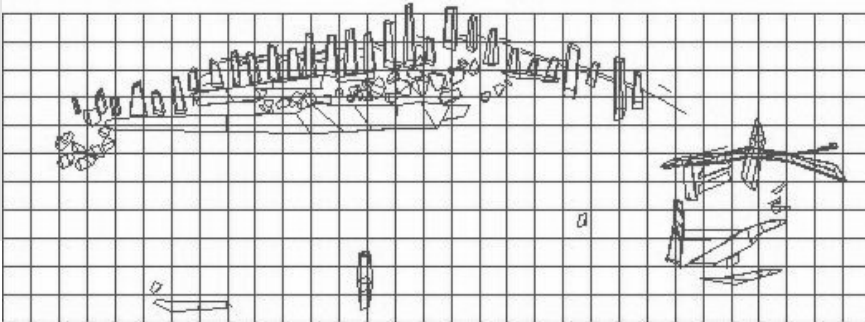
Feasibility study

As a diver had to take the required photos of the Darss Cog under water accurately, the preliminary work included plotting-out the wreck with five metal measuring tapes, which were aligned in parallel along the overall length of the wreck. The tapes provided the photographer with accurate alignment of the images. Black adhesive tape at every meter marked the centre of each image. For later photogrammetrical assembly it was essential to fix the camera settings, particularly, focal length.

The photogrammetrical block was set up using the same geometry as a



Building of photogrammetrical blocks. Model: Frank Wehden, FH Neubrandenburg



Through interpretation of the recording a grid model of the Darss cog can be created.
model: Frank Wehden, FH Neubrandenburg.

block in aerial photogrammetry. The overlap between images along the strip was 60% and across the strips 30%. The images were scanned with a resolution of 15 μ m. The preparation of the data for a stereo model includes measurement of the interior orientation, point measurement for the block triangulation and the block triangulation itself.

A local image coordinating system was established by measuring the four corners of each image, the so-called interior orientation. About 15 points [tie-points] have to be measured in each image in order to combine all of them to a photogrammetrical block. This can be a tedious job, as the current software requires manual point measurement. The third step is a network adjustment calculated with the group of all images.

Having completed the photogrammetrical block the measurement of the three-dimensional structure of the wreck started. The software used was PHODIS-ST, which was composed of a stereo display for the manual measurement of the points and a CAD-package Micro Station, used for the online storage of points and lines. The geometric accuracy was determined by the multiple measurements of single points or whole objects. The accuracy for

points is 0,7cm in the X-Y-plane and 1,3cm in elevation. The accuracy of the measurement of a whole object is 3cm in the X-Y-plane and 5cm in elevation. The result of the photogrammetrical measurement is a wire frame model. It is based on the fully three-dimensional data set of the cog.

Finally the edges of the wire frame model were combined to create a three-dimensional model of the cog.

Development of a strategy for a mass recording of wooden wrecks:

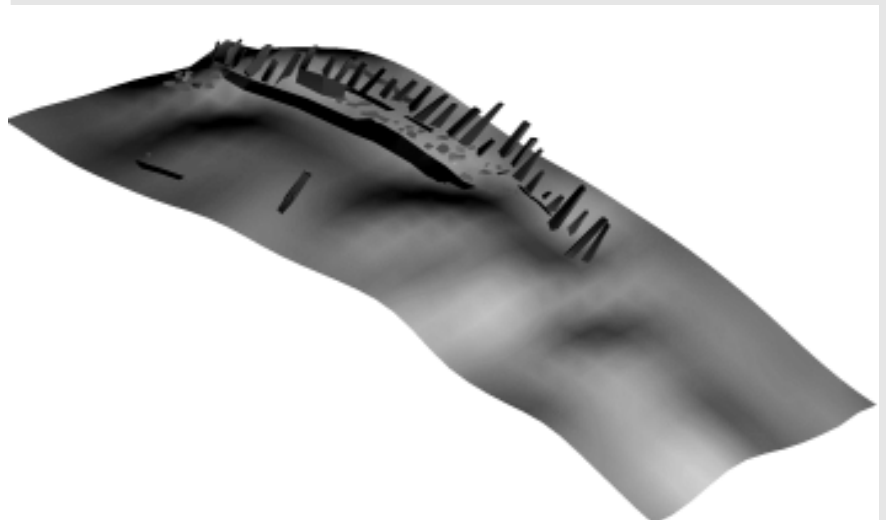
The same procedure used in the pilot study can be used for mass recording. The photogrammetrical measurement logistics are available, but because of the limitations of existing software, full three-

dimensional recording of wrecks will be time consuming. Automatic geometry software packages are becoming available to replace the manual work.

Major challenges:

Manual measurement of the tie-points for image triangulation is very time-consuming. For aerial photogrammetry with simple geometries an automatic measurement is available. But these programmes do not yet work for underwater photogrammetry. Automatic 3D point measurement has only been available for digital surface models but does not include automatic edge detection. Software for edge detection of houses and roads are currently being tested. Methods of automatic object recognition have still to be developed.

Animation of the wreck in situ based on the readings. Animation: Frank Wehden, FH Neubrandenburg.



Meetings:

The project meetings are staged for discussion within the project and are mainly held for and by the representatives of the different nations in the project. At the meetings the partners discuss the project, its general aims, the development and planning of the different themes within the project. The different themes may also be discussed in sub groups. Practical and scientific questions are discussed and the project progress and methodology is evaluated. The aim is to arrange two meetings a year, one in early March and one in November. Extra theme meetings have been held when required. Since the first newsletter was published one meeting has been held in Schwerin in early November 2002 following the open project seminar and two extra monitoring project meetings were held in January 2003 one in Portsmouth and one in Helsinki. A regular meeting was held in March in Stockholm. The next meeting will be held on June 29 following the June 27 and 28 open seminar in Sweden. This meeting was originally scheduled for autumn of 2003.

Seminars:

Maritime archaeological scholars, experts and practitioners from around the world are invited to these open seminars to hear and discuss progress and evaluation of the project themes. Two more seminars are scheduled, one has already been held.

The first open seminar was held in Schwerin on November 10 2002 on the theme of "*Documentation of Shipwreck Sites and Photogrammetry.*"

The second seminar will be held at the Vasa Museum in Stockholm the 27th of June and at Forsvik Shipyard Association, Karlsborg, on June 28 2003. To discuss "Visualization of Shipwrecks and Shipwreck Sites." It is to be arranged by Södertörns högskola (University College), The Maritime Museum of Finland, Helsinki, The Swedish National Maritime Museums / The Vasa Museum, Stockholm, and The Forsvik Industrial Heritage / Forsvik Shipyard Association.

The third seminar will be held in Portsmouth, UK, during June 3rd to 6th 2004, on the theme of: Monitoring, Safeguarding and Management of Ship Wreck Sites. More detailed information will be available in spring 2004.

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