Digital Landscape Documentation -
a Case Study on how to Create
Useful Geographic Information

Hartmut Müller

Urban-Rural Inter-relationship for Sustainable Environment -
2nd FIG Regional Conference
Marrakech, Morocco, December 2-5, 2003
TS 18 – GIS Tools for Applications

Who are we?
University of Applied Sciences, Mainz, Germany
i3mainz, Institute for Spatial Information and Surveying Technology

Digital image processing
Photogrammetric Imaging
Remote Sensing
Digital Cartography
Surveying
Databases
Geographic Information Systems
Software Development
Internet Development
Multimedia
3D Visualization

Study Area
Tavium - Capital of the Ancient Hittite Empire
2nd millennium BC

Tavium Research Project
Project Partners

Department of Ancient History and Antiquities,
University of Klagenfurt, Austria,

Department of Prehistory and Near Eastern Archaeology,
University of Heidelberg, Germany,

Institute for Spatial Information and Surveying Technology,
University of Applied Sciences, Mainz, Germany,

Turkish local heritage conservation authorities

and others

The Archaeological Area (1)
Today's Landscape Appearance
Overview

The Archaeological Area (2)
Today's Landscape Appearance
Overview

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The Archaeological Area (3)

Today's Landscape Appearance
Former Settled Area

The Archaeological Area (4)

Today's Landscape Appearance
Part of area seen from another viewpoint

The Archaeological Area (5)

Today's Landscape Appearance
View from top of the former city

Aims of Presentation

- use of GPS positioning technology
- local horizontal and vertical reference system
- fusion of spatial data obtained from different sources
- benefits achievable from a digital terrain model
- design and implementation of an Internet presentation

Local Reference Framework

GPS measurements
Local reference point co-ordinates

Framework of Map Sheets

Large Scale Maps, scale 1:500
Layout Definition and Scheme of Numbering
Contents of Large Scale Maps

Metadata

Orientation data (surrounding map sheets)

Large Scale Map Application

Overlay map sheet / geomagnetic measurement

Turkish Cadastral Maps

Scale 1/5000

Basic data for digital terrain model production

Data Fusion

Large Scale Maps 1/500 <-> Cadastral Maps 1/5000

Areas with concurrent information:
- plane
- height

Data Fusion

1/500 Large Scale Maps <-> 1/5000 Scale Maps

Geometrical Transformation with Control Points

Quality Check of Data Fusion

1/500 Large Scale Maps <-> 1/5000 Scale Maps

Calculation of DHM Height Differences
DHM Applications (1)
Volume Calculation, Historical Theatre

**Volume Calculation**

**Question:** Earth mass removal when building the theatre?

**Solution:**
- Remove points inside bounding polygon
- Interpolate surface from surrounding terrain
- Calculate difference between measured and interpolated surface

DHM Applications (2)
Line of Sight Analysis at the Historical Theatre

**Line of Sight**

**Question:** Maximum height of theatre scenery to keep the panoramic view which includes the temple on top of the hillock?

DHM Applications (3)
Visibility Analysis at the Historical Theatre

**Visibility Analysis**

Internet Presentation

**Current only available in German**

Website Design (1)
Tavium Research Project

**Website Design**

**Research**
- Field campaigns
- Surveying and Geoinformatics
- Field research
- Excavations
- Findings
- Results

**Links**
- Related websites
- Tips

**Images**
- Region
- Büyükknefes
- Tavium
- Findings
- Measurements
- Models
- Maps

**Contact**
- E-mail
Conclusions

- synthesis of spatial data of many kind needs well observed spatial data properties (geometric accuracy, spatial reference system, etc.)
- benefits from state-of-the-art spatial analysis functionality depend on requirements of application
- WWW technology provides a platform for easy information exchange within the community of all involved persons