- Towards new concepts for handling geoinformation

Centre for 3D Geoinformation
Aalborg University
Denmark

www.3dgi.dk
Outline

• 1. Introduction
• 2. Digital Northern Jutland – in DK
• 3. Cente for 3D geoinformation
• 4. Drivers on the GI – “FIG” community

Presented by
Prof. Esben Munk Sørensen

www.3dgi.dk
Starting Point:

- Possible to work with 3D in geographical information systems.
- Representation of objects in three dimensions in all processes.
- Challenges the surveying community, which since the development of the trigonometric surveying largely has been working with two-dimensional systems - for many years analogously and during the last few decades digitally.
- International standardization of data and communication triggered by the Internet and related technologies challenges the national communication procedures.
- The challenge is that the profession has to replace large parts of the scientific and theoretical foundation of its professional efforts. The toolbox is going to change its data handling, which places heavy demands on the educational institutions, on research and on practice.
- This requires close co-operation between universities, profession and research.

www.3dgi.dk
The metric system serves today as the common language of high-tech communications, cutting-edge science, machine production and international commerce.

......”The Measure of all things”. About the metric system that transformed the world 200 years ago.
Ken Alder 2002
www.3dgi.dk
GSDI and related standards will serve tomorrow as a common language of high-tech communications, cutting-edge science, and international commerce and create the digital earth.
2. The Digital Northern Jutland

- A county in Denmark – 0.5 mio inhab.
- A wide-range governmental program to raise a digital region using information technology on all levels.
- Partnership between private sector, local and regional authorities and Government.
- Running from 2000 to 2005.
Arial Photos
1960

Satellites
1970

www.3dgi.dk
Digital Elevation Models 1980

www.3dgi.dk
The University Campus in Aalborg
• You´re welcome to visit the Region of Northern Jutland and navigate your selv over a simple 3D visualization covering the entire region
• Take a look at www.3d.nja.dk
To see the model on Internet: www.3d.nja.dk
Planning and Decision Making in VR-MediaLab Aalborg

Local Planning for Suburbs
www.3dgi.dk
Planning and Decision Making in VR-MediaLab Aalborg

MusicHouse on The Harbour Front of Aalborg
www.3dgi.dk
Planning and Decision Making Using the WEB

New high-way passing green areas
www.3dgi.dk
Planning and Decision Making Using the WEB

New high-way passing green areas

www.3dgi.dk
Planning and Decision Making Using the WEB

New high-way passing green areas

www.3dgi.dk
Municipal Landuse plan fully available on the WEB
Municipal Landuseplan fully available on the WEB
Municipal Landuseplan fully available on the WEB
Municipal Landuseplan fully available on the WEB
3. Centre for 3D Geoinformation

- Partnership between University, industry (COWI and Informi GIS) and National Mapping Agency (KMS)
- Focus on "remodelling" spatial information to meet the challenge of working in 3D-spaces in full digital integrated environment
PURPOSE OF THE CENTRE FOR 3D GEOINFORMATION

- knowledge and competence in creating 3D models of cities and landscapes
  This will be done by:
  - Focus on VR and three-dimensional urban and rural models
  - VR user interface for looking for position-fixed information in the northern part of Jutland
  - creating a “geographical model” of North Jutland developing a basis for the use of a geographical communication on realtime monitoring geospatial databases
  - forming the basis for future research and regional knowledge within location-based services and augmented reality

www.3dgi.dk
Futural digital environments for geoinformation

User-oriented devices:
- Mass-market
- Strategic analysis
- Operating level

www.3dgi.dk
Navigating in 3D-Augmented Reality – seeing "non-visible boarder lines"
• alarming complexity
• not only be described through points, lines or polygons with well-defined mutual relations.
• When objects are to be described with a spatial geometry and representation, it does not only require some new thinking, especially when the objects are to be used in connection with a GIS.
• Experienced in spatial models in connection with 3D visualizations, 3D animations and latest virtual reality for several decades.
• Still an enormous jump from simple 3D modeling to a 3D model containing knowledge about itself and relations to its surroundings.
Datamodel 2(3)

• simplify the model, and make a choice about the detail level of the object description.
• it is relatively simple to take a position. If for example we take a building, we have to decide how many details we wish to include. Is every roof window or windbreak to be included?
• existing map products and registers, which among other things contain information about the spatial extent of the objects.
• The problem in using different sources of information may be often be that there is conflicting information – describing the object with different values.
Datamodel 3(3)

- special focus on spatial legal objects.
- This subject is for cadastral surveyors of great importance, because the technology is near to ready for modeling objects in real 3D.
- The 3D technologies based on Virtual Reality will made it possible to describe ownership to spatial legal object as there are understood in reality, where property rights always is related to three dimension. Ownership to land, buildings, easements, rights to pass (road) is all in three dimensions i in the real world.
- The challenge is not only to develop theoretical concepts for describing the model, but also develop procedures for object-oriented updating and real-time visualizations in virtual environments.

www.3dgi.dk
Actual ongoing research in 3DGI

• Organized as a number of projects that cause prototypes, algorithms and documents for the final system structure, system.

The following are ongoing:
– Feature extraction from aerial scanning (LIDAR)
– Organizing 3D object representation using XML-based standards
– Data modeling and queries for 3D geographical data
– 3D cadastre
– Qualification of 3D geovisualization
– Ground laser scanning and modeling 3D objects
– Exchange of data between XML and RDBS
– Landscape visualization in 3D and temporal analysis

• The coming year will give rise to further projects based on partnerships between research and companies in the private sector.
4. Global drivers effecting the GI (and FIG) community

Datamodell

Needs ↔ Available Technology

www.3dgi.dk
Global drivers effecting the GI (-FIG) community
Global drivers effecting the GI (-FIG) commuty
Standards for Scalable Vector Graphics

Standards for 2&3D Virtuel Environments and GeoVisualization

GMXL XML= standard for WEB-communication

Global drivers effecting the GI (-FIG) community
Global drivers effecting the GI (-FIG) commuty
Pervasive computing
Small Mobile
Portable
Embedded

Global drivers effecting the GI (-FIG) community
Global drivers effecting the GI (-FIG) community
Computers will be scalable, interoperable and networked – from portable to big servers

Internet Protocol version 6 and more

Speeds and Capacity thousands times faster and bigger within few years

Global drivers effecting the GI (-FIG) community
Modelling and Dynamic 3D visualization

Global drivers effecting the GI (-FIG) community
Nature Risks, Homeland Security and Intelligence

Global drivers effecting the GI (-FIG) community
Modelling Human Activity

Global drivers effecting the GI (-FIG) commuty
Datamodel - Standardization

GSDI
Global Spatial Data Infrastructure

XML
Extensible Markup Language

LBS
Location Based Services

Environment and Ecology

Needs

Technology

Threat and Security

Portable and Wireless

Economy and Market

3D and Pictures

Unlimited storage

and Transmission

Virtual Environment

www.3dgi.dk
Links:

Videnscenter for 3D GeoInformation (www.3dgi.dk)

Research Team GeoInformation og Medieteknolgi (www.gim.dk) and

Researchcentre Forest & Landscape (www.fsl.dk)

and partners:

COWI (www.cowi.dk)

Kort- og Matrikelstyrelsen (www.kms.ds)

Informi GIS (www.informi.dk)