Object-Oriented GIS on the back of GRIFINOR

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Motivation

- Centre for 3D GeoInformation was opened in 2001 as an European Regional Development project - target2
- From beginning there were a strong cooperation with both government and private companies
- There has been a strong belief in Virtual Environments for communicating georelated information
- One of the goals was to create a Virtual Geographic Infrastructure
Two separate systems where there is a constant translation between 2D and 3D sub-systems. A fusion of CAD and GIS.
A combination where the 3D visualisation is enriched with thematic geodata. The data is kept in separate databases due to the difficulties to implement 3D structures into the geoinformation database and visa versa.

3D Mapping - Data-model type 2
The ultimate solution for 3D. An object-oriented database with real 3D structures in the map generated from different geodata-sources. This type of datamodel is very depending on a clear object classification.
What is GRIFINOR?

- Griffins are legendary creatures
- They are half lion and half eagle
- They fly in the sky but they can also walk
- Sits on our buildings and from the top of the roofs they watch us
- GRIFINOR is a digital Griffin
What is GRIFINOR?
What is GRIFINOR?

- GRIFINOR is a platform for different sorts of applications
- GRIFINOR can store, retrieve, analyze, simplify, generate, and visualize spatial data that are generic 3 dimensional
- GRIFINOR will be able to handle "soft" real-time demands as well as being application and device adaptable - that is the system will be module based and object oriented so it can be adapted to PDA’s, PC’s, mobile units and so on, without requiring alterations to the code of the applications
- GRIFINOR is collaborative so that more than one user per session can experience and interact in the same virtual world
- GRIFINOR is part of a research project and for that reason the users are not specified ahead of time
Processing components

- GeoDB
  - 2D
- ODB
  - 3D

Diagram:
- Building
- Bridge
- Mast
- Chimney
- Windmill
- Structure
- Terrain
- Property
- Cadaster
- Vegetation
- Pine tree
- Leaf tree
- Forrest
- Tree group
- Grass
- Field
- Roads
- Urban road
- Main road
- Secondary road
- Path
- Railway
GRIFINOR user-interfaces
Index for Distributed Spatial Object (DSO-index)

- Distributable data structure suitable for indexing 3d objects on world scale
- DSO-index is based on an octree-like data structure
- All nodes and objects are directly or indirectly referenced from the same top node. This top node can be used for arbitrary number of servers
- When used for visualization, the index allows for querying the visually most important objects at a given viewpoint
- The index is used for dynamically changing the fidelity of the visualization according to the capabilities of the hardware and the network as well as user preferences
- Objects can be cached locally and clients can form a peer-to-peer network to relieve object servers
Topographic surface representation indexed using global grid

- For terrain we use a separate index solution
- The indexing transformation uses a method that divides three-dimensional space through a tessellation of a sphere
- This tessellation of a sphere is known as a global grid
- The global grid is a special case of Voronoi tessellation
- Tessellation is made in multiple resolution which is used for indexing LOD
Geo-embedded visual navigation

- Estimate the gravitational up vector at any given position of the user in relation to the globe and aligning the view accordingly.
- On a global scale it is more apparent that the navigation works differently, simply because it is more obvious that the world is spherically represented.
- Similar to navigation of planar maps, the user can, for example, look over a 3D area, which is actually part of a spherical model; looking down one could zoom-in and zoom-out and pan to any side.
- This provides a natural experience for humans and offers a visual navigation and perception at many scales.
Summary

• GRIFINOR addresses the need for a global object-oriented solution for browsing geoinformation of many kinds

• Consider this as the engine for future applications within the area of GIS

• Further research should be done regarding implementation of a better raster engine for the system

• We will soon be able to open for online access to a prototype of GRIFINOR - please contact us if you are interested in this!
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