Ruimte voor **Geo-Informatie**

Project no.: RGI-011 (3D topography, comparing different 3D models)

Management summary

Setting up a world-class network of 3D geo-information modelling research groups. Based on their international scientific reputation various groups were approached and accepted the invitation to exchange their knowledge via the proposed top-up project (of RGI-011, 3D topography). The project will make 3D model requirements explicit (type of data, model implementation, model creation, model use, model update, etc.) in order to provide a comparison framework; including a benchmark scenario/data set. The 3D models of on-going projects in the different research groups are exchanged and compared. The top-up project will function as the network between the individual projects, which contain themselves the main research activities. Results will be made available via both scientific channels (journals, international workshop, book) and channels for the general public (newspaper article, demonstration of 3D models and applications via popular interfaces; e.g. Google Earth).

Leading organization

Organization: TU Delft/OTB

Contact for the top-up: Prof.dr.ir. Peter van Oosterom

Project consortium

1. Delft University of Technology – Research Institute OTB – Section GISt — existing member
2. The Department of Natural Resources and Water, Queensland Government, Australia (Rod Thompson) — new member
3. University of Glamorgan, Wales (Chris Gold, Rebecca Tse and Pawel Boguslawski) — new member
4. City University London, England (Jonathan Raper/Aidan Slingsby) — new member
5. University College London/CASA, England (Paul Longley) — new member
6. TU Wien, Austria (Andrew Frank) — new member
7. Private Company Ludvig Emgård — new member

Project extension

In the on-going 3D topography project one important aspect is the use of the Tetrahedron Network (TEN) model as basic storage structure. However, alternative 3D storage structures are investigated by other leading geo-information research groups. The purpose of the international top-up project is to exchange the results of the different on-going projects and to compare these different 3D models in order to discover the strong and weak points. This top-up proposal should be considered as a ‘glue’ project between the existing 3D projects via visits, joint development, test scenario’s (data sets and use cases for a ‘benchmark’) and an international scientific workshop.

Proposed approach

The current 3D topography project decided to explore and develop a TEN approach for modelling 3D data as it offers a very solid basis (with sound mathematical theory). However,

it is really in the research phase and several other 3D models are investigated in parallel (being developed by other groups all over the world). The alterative 3D models are: Regular Polytopes (Rod Thompson), TIN Boundary representation and 3D volume quad edge structure (Chris Gold/Rebecca Tse), layered/topology models and voxel based models (Jonathan Raper/Aidan Slingsby), 3D models used in urban planning/polyhedrons (Paul Longley), and n-dimensional models including time (Andrew Frank). It is impossible to perform this huge amount of research within one project, but an international 'networked' (or glue) project will be the good set-up for comparing the different 3D model alternatives.

The exchange of ideas and comparison with other 3D models will increase the insight in the cutting-edge of the 3D model research (of which important parts are in development and not yet published). This will benefit all involved parties: the 3D topography project can benefit from this external knowledge (to improve the TEN approach) and the other partners can benefit by potentially including some of the TEN concepts. The 3D model requirements will have to be made explicit, but include aspects such as: type of 3D data (scale, resolution, data set size, natural/man-made, static/dynamic, partitioning of space, topology structure relevant,..), creating the initial model from input data (surveys and existing sources), implementing the model in a finite digital environment (instead of the ideal infinite mathematical number representations), querying and using the model for several types of applications (of course visualization, but also for 3D analysis: overlay, buffer, path computation, simulations, visibility, etc.), updating/editing the model (creating new versions of the objects), etc. The newly gained insight will be published in a number of articles (both scientific and professional journals) and become available to the society at large.

The main research activities are being conducted within the scope of research projects executed by the various groups (all of the above mentioned models are being developed within the context of projects). The related projects are: 'Towards a Rigorous Logic for Spatial Data Representation' (Thompson), '3d Building Reconstruction from LIDAR Data' (Gold/Tse), 'Full 3D Data Structures for Building Interiors' (Gold/Boguslawski), 'LOCUS project' (Raper/Slingsby), GeoVUE (Geographically Enabled Virtual Urban Environments: Longley) and the 'Felix Klein program: dimension independent approaches' (Frank). The envisaged activities include: visits (5 visits from international partners to the 3D topography project and also 5 visits from the current 3D topography project to the international partners), joint development (often initiated during a visit, the development can be in different categories: theory, software, ..), test scenarios (data sets and use cases) and an international scientific workshop with published proceedings (book by respected scientific publisher; e.g. Springer-Verlag or Taylor & Francis/CRC Press).

Securing knowledge and communication

Many of the activities in this category have already been mentioned as explicit activity in the previous paragraph (as it has the character of a network project communication is extremely important). The existing 3D topography has an existing, very well used, website (www.gdmc.nl/3dtopo), which will be extended with the results of the top-up project. Further, nearly all involved partners are Universities and they include the new research results in the MSc education programs. The website www.spatial-literacy.org is a resource centre for graduate students and professionals and a conduit for knowledge transfer and exchange. Also in this context, the developed overview and comparison is very important. Besides the earlier mentioned professional and scientific publications, the project also tries to reach the general public (politicians) via publications in newspapers and magazines, accompanied by demonstrations of 3D models and applications via popular interfaces (such as Google

Earth). In this context, the www.spatial-literacy.org site has received up to 200,000 hits per day when its work on applications interfaces has been featured in the international press.

Bsik grant *(please mark with an x and justify in the accompanying estimate spreadsheet)*

X Between 50 and 100 k euros (if RGI partners and partners from other Bsik programmes are involved)

Note that not the 'small' top-up project grant has been requested as five new project members are involved, which all have a non-trivial contribution (of at least 1 or 2 days per month during the project life-time 2007-2008).

Plan

Start date: 1 January 2007

End date: 31 December 2008

Appendices

- *Estimate in accordance with accompanying spreadsheet*

Attached.

- *If not yet available to RGI: signed admission agreements (see Appendix 5).*

For a number of partners this has already been arranged. However, for some partners it is not so easy to arrange this (as legal departments have to agree and this takes time), but there is good hope that these can be arranged within the required timeframe (within 6 weeks of the leading party receiving the grant award). In the worst case (legal departments of involved organization do not accept the conditions), then a last option is to participate against '0-tariff' (similar to the role of Oracle in the existing 3D topography project).