

THREE-DIMENSIONAL PHOTOREALISTIC MAPS FROM DATA FUSION OF SATELLITE IMAGES AND PHOTOGRAMMETRIC PRODUCTS

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EXTENDED ABSTRACT

Three-dimensional maps are among the first cartographic products to be developed and researched within Computer Assisted Cartography and GIS, because of their direct usefulness in a range of cartographic and related applications. The developments in hardware and software have facilitated the continuation of this trend. Today their value can be appreciated not only in the traditional technical fields such as geo-information, atmospheric- and geo-sciences, but also in fields such as archaeology or cultural resources management. Within the context of Geographic Visualization, three-dimensional digital models are getting particular attention for the purposes of developing VR environments.

The present application is concerned with a process of fusing data from different sources and with the help of techniques from related disciplines, in order to produce three-dimensional maps of photorealistic quality and high accuracy. The objective is to obtain a product of metric quality for use in visualization environments. The study area is recorded on satellite images, as well as on air- and terrestrial- photographs. Stereo pairs of air photographs are used for the digital photogrammetric production of a DTM of the area and for the generation of 3D geometric models for the built environment, through photogrammetric processing. The DTM and the 3D models are combined in a single digital model via georeferencing. Multispectral and panchromatic images of IKONOS satellite, which have been orthorectified, are then merged. The spatial accuracy and spectral quality of the merged image is assessed. Then, the synthetic image is fused with the above model for obtaining a photorealistic impression, by draping the images over the terrain. Using terrestrial photos as well, which are rectified and attached on buildings' facades, further enhances photorealism. The application concerns an area with an approximate extent of 270000 m² (i.e., The University Campus of Thessaloniki, Greece).

The final product in the present application has been developed as an example of a general-purpose tool. It can serve as a basis for a variety of studies concerning an area, such as planning, environmental studies, archaeological, architectural or urban projects.

A number of interesting problems concern data fusion itself and arise from the combination of various input data, having different spatial scales and resolutions and different geometric characteristics. Apart from these, further research questions will be related to the use of the product as a visualization tool (for example, its integration in a visualization environment, the potential links to databases, interface development issues etc.).