

An efficient framework for spatiotemporal 4D monitoring and management of real property

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SUMMARY

In recent years there is a clear tendency towards replacing traditional two-dimensional cadastral and land information systems with three-dimensional ones, because of the significant value introduced by the rich and detailed information residing within 3D models of real property. Considering the fact that real property is subject to frequent change (e.g. in terms of appearance, dimensions, function, use, etc.), the need arises for solutions that enable 4D management and monitoring of real estate assets (i.e. the three dimensions in the course of time). A serious impediment to the development and adoption of such 4D systems is the high amount of resources required (equipment, manual labour, expertise, time) which makes most approaches prohibitively expensive (both computationally and financially) and, ultimately, unrealistic. In this paper we present an ICT framework whose goal is to assist surveyors and other related experts to efficiently reconstruct, monitor and manage real property in four dimensions. The proposed framework is based on three main pillars: (i) 3D modeling of buildings based on sophisticated close range and airborne photogrammetry, a process that was applied in real world settings in the city of Calw in Germany, (ii) rich real property metadata inclusion using the CityGML open information model and (iii) Change History Maps, a concept that allows to exploit unchanged 3D information from past documentations and only focus on regions of change, so as to efficiently effect 4D monitoring of real property. The proposed framework is an endeavor to enable professionals involved in real property monitoring and management to reap the benefits of the progress of 3D modeling techniques as well as of the continuous improvement of open data models pertaining to urban development and real estate.
