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HOW MANY 3D CITY MODELS ARE THERE? - A TYPOLOGIC TRY

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3D city models are intended to represent the reality in some cases as authentically as possible. The geometry information together with pictures, which are precisely mapped as texture information onto the geometric models, renders a realistic impression of the environment. Due to the dense content of photorealistic representations the user has to cope with information which not necessarily refers to his needs. Especially in mobile applications with different constraints like computing capability and display size, inappropriate information may confuse or distract the users from their initial task. To avoid this drawback the illustrative and expressive non-photorealistic visualization technique is chosen. This method enables us to highlight specific geometric and semantic characteristics of 3d city-objects. Therefore the question has to be answered how abstract a city should or can be modelled to convey the impression of an identifiable city model and additional semantic information? Abstraction is a well known technique in the domain of linguistic conversion and almost everyone uses abstraction in their daily life. In terms of generalization abstraction is as well known in mapping and can be transferred to 3d representations. Therefore the Level of Abstraction (LOA) can become a key issue in geovisualization. Due to the fact that abstraction can influence the Information Density (ID), we investigate the relation of the Level of Abstraction, Information Density and the needed Storage Capacity (SC) for the representation of a 3d city-model. Increasing the level of abstraction usually leads to the decrease of information density to be processed. Accordingly, the general storage capacity will decrease as well. Since a higher level of abstraction is less bound to photorealistic aspects, it may allow further semantic information to be accommodated in the visualization process. If the level of abstraction in a city model is increased carefully, so that the characteristic features are enhanced while non-relevant information is inhibited, the user's cognitive load during task completion may be reduced. This implies an increased efficiency of information communication. Using image segmentation algorithms, the elements within a facade per unit of area are successively reduced, while preserving the characteristic structures within the image. The segmented image holds the sufficient information to be recognized in the environment. We treat the three concepts LOA, ID and SC as fundamental variables for the visualization of building facades in a three-dimensional city model. To deal with these concepts we suggest organizing them in a cube showing the relations. Within this cube we can identify two extreme types of representations. One includes a low level of abstraction, a high information density and a high need of storage capacity. The other representation includes a high level of abstraction, a low information density and a low need of storage capacity. Between these two representations exists an infinite field of combinations. This enables us to find a trade-off between a potential loss of information and the level of usage for various tasks.