Generation of 3D building model using different LoD

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With the technological progress, the demand for a three-dimensional presentation of the world around us is growing. Currently, modelling of urban space in 3D based on presenting it as simple geometric solids is not able to satisfy the needs of the constantly growing market. There are also noticeable trends aimed at representing the real world as faithfully as possible in virtual space.

The purpose of this work is to show the differences between the individual levels of detail (LoD) of the building facade model obtained using classic geodetic measurements as well as ground photogrammetry and UAV photogrammetry. For this purpose, pictures of the building facade were taken and its characteristic elements were measured so that the generated model was metric.

Creating a vector model of the facade consisted in modelling individual blocks based on points obtained from the total station measurement. The model was generalized for individual levels of detail using fewer points to make it. Subsequently, vector models were textured by photos.

In addition, oblique facade photos were developed, and then a triangular mesh model was made from the dense point cloud generated on their basis. The model was analyzed for meeting the accuracy criteria of individual LoDs in order to determine whether the use of only photogrammetric data allows the generation of a suitably detailed spatial model.

The resulting models were compared with each other, thanks to which it is possible to verify whether the facade is symmetrical and how repeatable its architectural elements are. The outcome also enables the assessment of the accuracy with which the building elements should be measured in order to obtain a reliable model that meets the criteria of the assumed LoD level for the resulting product.