2.2 Encoding building relations in graphs

Preceding works treat the individual building elements independently and mostly out of context

suggested (Collins et al., 2022) and describe the extensions made to it. Thereafter we outline the graph matching method used for establishing links (or matches) between the graphs. In brief, the methodology used in this paper consists of 2 steps: 1. Graph formulation for the two data streams, 2. Graph matching with geometric features and topology (Fig. 1).

3.1 Revisiting graph formulation

The graphs for the two data streams (PCD and DT, here BIM) are formulated such that they include both geometric properties about the elements and their topological connectivity. In general, we formalize the graphs for the two streams as G = (,), where **V** is the set of nodes and **W** the distance-weighted adjacency of the nodes. Each node is defined to represent one building element or sub parts of it. A set of features **F** that include high-level geometric characteristics about the geometric shape are attached to the nodes. d

This is unsuitable for the graph matching process both in terms of geometric features as well as graph connectivity because the graphs look to dissimilar.

and low point cloud occlusions (e.g., the slanted ceiling in the Library) the geometric match is correct. This lets us validate the method as a first guess for the next step.

Figure 5: Illustration of the graph matches for Office 1 where is the lower graph, and the one at the top. (a) match with geometric features and (b) after the neighbourhood consensus.

Table 1: graph matching results for the three rooms.

	Office 1	Library	Entry hall
y # of iterations	8	9.81(y)-570.002 (h)2 Td[(y)-8 gt8(c)-10.00 thiatice 1	

Geometric deviations might occur because of varying LoG between the two data sources or because of inherent traits of the scan process (e.g., open doors). Indeed, the geometric feature

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