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An interdisciplinary perspective on generalising and highlighting buildings in their urban context

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Abstract: The analysis of historical urban transformations and the development of the built environment as a whole is an important branch of research within architectural history. One of the challenges in this type of research is the appropriate visual 3D representation of these historical changes, both as a means of analysing them within the research and communicating the research findings. Conventional sources such as 2D plans and archival documents often fail to capture the spatial relationships and transformations within the built environment, necessitating the development of an appropriate visualisation concept. The concept uses 3D models with different levels of generalisation to visualise urban change in focus and context areas, suitably balancing abstraction and detail. A visualisation process was developed allowing highlighting building volumes and their contexts. The levels of generalisation include detailed representations and reconstructions, generalised building forms and block edge models. The levels are delimited by urban elements such as streets or rivers. The process utilises various sources of information, such as archive plans and historic photographs, to approximate historic structures. Key urban elements – landmarks and infrastructure such as streets and rivers – are integrated, and geometric abstractions and colour are used to direct the viewer's attention to selected focus areas. The approach was tested in selected urban environments with different urban morphologies. The results show the transferability of the approach to different urban environments and provide a tool for analysing the architectural historical development of urban building structures and for communicating research findings to a wider audience.

Keywords: 3D-city models, generalisation, building reconstruction, focus+context visualisation

1. Introduction

What is a suitable representation of 3D models to represent building culture? The term building culture – or “*Baukultur*” in German – has been coined in recent years as an important field of policy development and research in the field of architecture and architectural history in Switzerland and other European countries (European Ministers of Culture, 2018; Swiss National Science Foundation, 2024). The term refers to the idea of viewing and analysing the manmade built environment, focusing not only on what is classically understood as “architecture”, i.e., individual buildings and their construction history, but on the spatial relationships in the built environment and the processes of change brought about by historic developments. To this end, various contexts, processes, discourses and networks that characterise building culture are examined at different scales – from single-family homes to large infrastructures (Bundesamt für Kultur, 2020). In particular, the building culture of the post-war years (from 1945) and the massive changes in the built environment resulting from the building boom during this period are an area of interest for analysis. Still today, almost 30% of the existing building stock in Switzerland dates back to these boom years after the Second World War – and therefore deeply influences the built environment in which we live. The basis and source materials for this type of historical investigation are primarily 2D representations and written sources such as building plans and archive documents, historical photos and historical maps. The lack of easily accessible 3D data and models for this period, which could visualise the spatial relationships within the built environment from different perspectives, created the need to develop a suitable 3D urban visualisation concept that illustrates the historical processes of spatial changes in the build volume and makes them visible and spatially tangible. This raises the question of what the visualisation should convey. What is an appropriate visualisation of a 3D city model for this use case? Especially as the topic of digital 3D models is not yet firmly established in this specialist area of architectural history, neither as a tool for research nor to communicate scientific findings to the public. Therefore, the question must also be asked as to how the viewers can be guided and supported in understanding the changes and connections between a building and the surrounding structural context in digital city models? On the one hand, these visualisations should serve as an analysis tool in the context of research and, on the other hand, facilitate the communication of research results to a wider audience. Although there are already numerous methods and applications for the 3D reconstruction of historical situations and buildings from other historiographical fields such as archaeology, these are generally very complex, time-consuming and fraught. These include the need for large amounts of data with a high level of detail, which can often not be provided due to limited resources, e.g., in research projects, but also in smaller communities. To address this lack of homogeneous, detailed information about a larger area, we present a visualisation approach, which uses different levels of generalisation to focus and guide the viewer through the changes.

1.1 State-of-the-art

The generalisation of city models can be roughly divided into two scales: the generalisation of individual objects and the generalisation of larger environments. While the generalisation of buildings in 2D space is established and many different methods are used (see Sester, 2007 for an overview), these methods can only be transferred to generalisation in 3D space to a limited extent. However, also various options for 3D generalisation have been researched.

1.1.1 *Generalisation of 3D-Buildings*

Several approaches for the generalisation of 3D buildings were developed. They aim at an appropriate balance between geometric simplification and the preservation of structural characteristics. Thiemann and Sester (2005) proposed model-driven generalisation techniques for 3D buildings by decomposing structures into basic geometric shapes. Their work emphasised the use of formalised rules to reduce complexity while retaining essential spatial relationships (Thiemann & Sester, 2005). Kada (2007) introduced an approach for simplifying building models based on their semantics and structural hierarchies, reducing geometric details while ensuring that the overall appearance remains consistent with the real-world object. This approach used a combination of boundary simplification and topology preservation to support scalable visualisations. The term Level of Detail (LoD) refers to the degree of complexity and detail of the geometric representation of a 3D object. These LoD's are often modelled according to standards like the CityGML standard from OGC (Biljecki et al., 2014; Kolbe et al., 2008) to allow a uniform representation of the different levels. The CityGML Standard defines five levels, "where objects become more detailed with increasing LoD regarding both their spatial and thematic differentiation" (Kolbe & Donaubauer, 2021, p. 616). The aim of the LoD concept is, on the one hand, the reduction of the amount of data that is displayed and with which the user may interact. On the other hand, the various LoDs are intended to support immediate recognition and understanding to emphasise the important information or make less relevant information less clear (Sester, 2007). A growing trend in the field of 3D generalisation is the use of machine learning techniques to automate and optimise the generalisation process while preserving semantic information. This is particularly important for urban applications where detailed building models contain valuable metadata regarding function, material, and occupancy. Machine learning has also been applied to identify patterns and anomalies in building structures that can guide generalisation (Grilli & Remondino, 2020). For instance, trained models can learn from large datasets of building designs to predict the optimal level of simplification for different Level of Details (Jiang et al., 2011). While significant advancements have been made, several challenges remain in the field of 3D building generalisation. These include maintaining the semantic accuracy of the buildings, handling complex architectural forms, and ensuring real-time performance in interactive applications. Moreover, generalisation algorithms need to balance between simplification and the preservation of topological consistency and spatial integrity, which are critical for many applications like navigation, urban simulation, and planning.

1.1.2 *3D representations in Architectural History*

Virtual reconstructions of archaeological data were undertaken since the 1980s, and the development of 3D modelling, Augmented Reality (AR) and Virtual Reality (VR) furthered the notion of a "golden age of digital archaeology" since the early 2000s, fuelling an increased access to and use of these methods in cultural heritage fields at large, including architectural history and monument preservation (Jeffrey, 2020). The visualisation and reconstruction of historical spatial contexts is not a new concept, as seen in the various examples of digital reconstruction and virtual reality projects for archaeological sites and ancient buildings. However, traditional visualisations are oftentimes mainly concerned with creating computer-aided virtual reconstructions and immersive environments in order to impress a non-expert user audience, rather than being utilised for research itself, thereby sometimes misleadingly presenting hypothetical findings as factually accurate (Manzetti, 2016; Tsiafaki & Michailidou, 2015). 3D digital reconstructions aiming for scientific reliability while maintaining extreme accuracy and a high level of detail, however, are generally very time-consuming, necessitating optimised procedures for data processing of 2D and 3D sources as well as a cross-disciplinary, iterative methodology for the modelling process (Gherardini & Sirocchi, 2022; Guidi et al., 2014; Guidi & Russo, 2012). Moreover, such visualisations typically focus on a single building or a small area, rather than the broader spatial context, since data for larger areas is often unavailable, which further complicates the process. This makes it challenging to create a homogeneous visualisation of a larger area. All in all, the use of technologies such as Geographic Information Systems to record, process, organize, analyse and present historical, spatial data is still a relatively new interdisciplinary field of research within the Digital Humanities. While these "Spatial Humanities" have become more established in the social sciences and archaeology in the past few years, their methods are still underutilised in architectural historical research – particularly in Switzerland – and especially in the study of the building culture of the more recent past (Münster et al., 2019).

1.1.3 *Focus+Context in city models*

Glander and Döllner (2008) identified three primary methods for generalising building models based on the hierarchical organisation of infrastructure networks: cell generalisation, where buildings within cells are represented as 3D blocks; convex-hull, which approximates buildings by creating a convex hull around the ensemble; and voxelisation, which converts building geometry into a regular 3D raster, employing techniques like morphological operations and Gaussian blurring to simplify the geometry (Glander & Döllner, 2008). Additionally, Glander and Döllner (2009) developed a method to automate the generalisation of virtual 3D city models, reducing complexity while maintaining important features through abstraction. Their approach generates multiple levels of abstraction by grouping buildings into cell blocks using the infrastructure network and preserving landmarks via a hierarchical selection process. This allows for smooth transitions between abstraction levels, dynamic landmark highlighting based on camera distance, and enhanced route visualisation through focus+context techniques (Glander & Döllner, 2009). Complementing this, Trapp et al. (2008) introduced 3D generalisation lenses for combining different abstraction levels in a single view. Focus areas within 3D lenses are shown in full detail, while less relevant surrounding details are minimised. This technique allows the use of multiple, nested lenses, offering an interactive way to explore complex city models by different levels of detail (Trapp et al., 2008). DeCarlo & Santella (2002, 2004) analysed and confirmed based on eye-tracking data that image abstraction can be used, e.g., to influence the viewing areas on paintings. They found that eye fixations were focused on areas with preserved details and less on areas with fewer details. In the field of art, this corresponds to the idea that artists can actively direct the viewer's attention to the desired areas by adding or omitting details (DeCarlo & Santella, 2002; Santella & DeCarlo, 2004). Cole et al. (2006) extended this observation to 3D models. Using static 3D visualisations with different focal points, they drew the viewer's attention to highlighted areas (Cole et al., 2006). Semmo (2016) concluded that there is a need for adaptive, context-dependent visualisation techniques that enable dynamic transitions between different presentation styles based on user input and task requirements.

1.1.4 *Generalisation vs. photorealistic visualisation*

For projects concerned with the depiction and/or reconstruction of historical buildings or situations, the question of generalisations vs. photorealistic visualisations is particularly relevant. Non-photorealistic rendering (NPR) gives the capacity to explore a variety of illustrative styles. This flexibility allows artists and designers to communicate complex information more effectively through visual abstraction. NPR techniques are characterised by the communication of targeted information and often improve clarity in scientific, educational and artistic contexts where photorealism might obscure important details or overwhelm the viewer (Coconu et al., 2006). Ackermann et al. (2023) state that in scenarios where a 3D model is incomplete or simplified — lacking specific details or entire sections — the designer faces a critical decision. One approach is to deliberately omit these elements, but this can leave viewers confused, unsure of how to interpret the absence of information. Alternatively, designers might fill in these gaps through educated guesses about what the missing parts might look like. However, this strategy carries inherent risks, potentially misleading viewers by presenting hypothetical details as factual. This dilemma has sparked considerable debate, during different digital reconstructions of buildings which had no surviving photographs or architectural sketches to guide the process (Ackerman et al., 2023). And even when such sources exist, a degree of uncertainty usually remains, as even analogue historical photographs may have been retouched for aesthetic purposes, or architects and craftsmen may have deviated from building plans during the construction process, leading to discrepancies between the surviving 2D sources and the actual built result. The balance between scientific accuracy and aesthetic appeal in public science communication requires careful consideration at every stage of the design process – particularly when deciding how much detail to model and whether to opt for a photorealistic or non-photorealistic representation. Coconou et al. (2006) conclude that the once-distinct boundaries between photorealism and non-photorealism have blurred. Both approaches are now commonly integrated into the same visual language, offering designers a broader palette of techniques to better convey their intended message (Coconu et al., 2006).

1.1.5 *City landmarks*

City landmarks play a crucial role in digital city models by providing orientation and helping viewers navigate urban environments. These landmarks are visual cues that support spatial cognition, allowing users to form mental maps of the city, which is essential for wayfinding. In digital representations, landmarks also contribute to the creation of a city's identity. Their prominence helps users orient themselves and enhance their sense of place within the urban environment (Lynch, 1996). Research has shown that landmarks can improve navigation efficiency, as they are more memorable and easier to reference compared to abstract or generalised directions (Lynch, 1996; Rautenbach et al., 2015). Moreover, the level of detail in 3D models, particularly at higher levels of detail, enhances the viewer’s ability to identify landmarks (Biljecki et al., 2013). This is especially important in urban planning and tourism, where accurate and detailed representations of iconic structures can make the experience more intuitive and informative. In these models, landmarks, such as historical buildings, towers, and monuments, often serve as focal points, making the digital environment feel more connected to the real world (Frangulea, 2022). Incorporating landmarks effectively within digital city models is therefore essential not just for practical navigation but also for strengthening urban identity and cultural continuity in a virtual space (Lynch, 1996; Rautenbach et al., 2015). In generalised models, the spatial orientation of the viewer plays a crucial role, as the model represents an abstraction rather than an exact reproduction of reality. For individuals who are somewhat familiar with their surroundings, points of reference are essential for navigating the model of the city in their mind (Lynch, 1996). Landmarks such as churches, bridges, or prominent buildings should be depicted with sufficient detail to ensure they are easily recognisable. Additionally, roads and infrastructure elements, such as railway tracks and rivers, provide further orientation, allowing viewers to align their mental model with these familiar features.

2. Method

To illustrate the historical processes of spatial changes, the requirements for the visualisation concept were established as follows: primarily, the use of publicly available geodata was essential, given the limitations in time and resources that made extensive data collection unfeasible. Reconstructions needed to remain as straightforward as possible while conveying all critical information. Additionally, the concept had to be flexible enough to be independent from variables such as diverse terrain or specific building configurations. This flexibility enables the concept's application to various situations within the built environment.

2.1 Use cases

The use cases to which the method was applied were selected from different spatial situations that were analysed within an architectural-historical research project on post-war building cultures in Switzerland. The focus of this project was not on individual buildings and their specific building history but rather on the mass of what was built and the changes brought about to the built environment in different spatial contexts by the construction boom of those years. Previously, the defined structures have already been tested and specified for a data set in Basel using several spatial examples (see Rutschmann, 2023). The results and findings are illustrated here using 3 examples: Two different urban situations in Basel and another one in the city of Lausanne were selected. The first involves a large-scale, stand-alone building adjacent to a railway station, spanning across the tracks. The second, a department store, is situated within an existing perimeter block characterised by the small-scale urban structure of the mediaeval city centre. And the last, another stand-alone building, is located in a particularly heterogeneous terrain. These selected areas provided a basis for assessing the method's transferability across different urban environments.

2.2 Colour interpretation

A seemingly naturalistic representation, if fictional, could give the false impression of certain knowledge, with the visual impact of realistic surfaces overshadowing the underlying geometric form. While in pre-digital times, drawings and models were created with an awareness of the ambiguity and hypothetical nature of their visual statements, translating this into the digital realm requires a conscious reduction, especially against the growing trend of photorealism. This realism, even if limited to polychrome and stereotypical patterns and/or colours symbolising materials (see e.g., Figure 1), can be limiting. The goal of abstraction is to design a form that evokes an association with architecture without giving the impression of representing an exact digital replica of the building (Lengyel & Toulouse, 2021). For this reason, we deliberately refrained from texturing the façade to focus the viewer on the relevant and prevent possible unnecessary distractions. Additionally, strong colour, while potentially reinforcing a message, can also mislead the viewer or feel too confronting. This is especially true if the colour code chosen contradicts design and colour conventions of the specialist area concerned. In the field of architecture and building construction, norms for the production and use of plans and drawings in building construction, established by the Swiss Society of Engineers and Architects and used by the majority of professionals in this field, assign a specific meaning to certain colours in plan editing (Schweizerischer Ingenieur- und Architektenverein (SIA), 2000). To avoid false colour associations, primarily grey tones were used. Only buildings of particular interest were highlighted in a greyish red to achieve a stronger focus for the viewer.

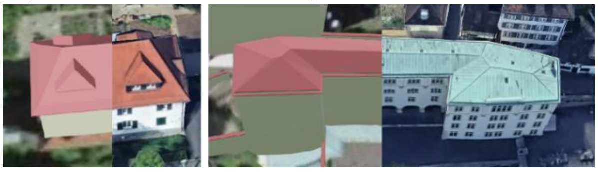

Figure 1: Colouring elements in models can lead to correct or incorrect conclusions. Here, the roofs are coloured red to indicate the element category roof. On the left, the viewer could associate the red roof with roof tiles, which reflects reality. On the right, the building roof is copper, but the red representation may mislead the viewer to believe, that it is tiled.

2.3 Generalisation of 3D city models

Increasingly, 3D building data in varying degrees of detail is being used for analyses. In Switzerland, access to this data has become easier in recent years, as many geodata and 3D geodata sources are now publicly available free of charge (see e.g., Bundesamt für Landestopografie swisstopo, 2024). The data basis is an up-to-date 3D model of an urban area. In order to create a focused view of a specific area and, at the same time, show the surrounding context, different levels of generalisation can be used in the visualisation (Semmo et al., 2011; Trapp et al., 2008). This approach ensures that the main area stands out clearly while maintaining an overall understanding of the environment (Glander & Döllner, 2009; Semmo et al., 2011), so we maintain the focus through generalisation. The number of generalisation levels is freely selectable, but experience has shown that between 2 and 4 levels are recommended. The area to be focused on is represented with a higher level of detail, while the surrounding areas are generalised step by step. For the generalisation sections, proven 2D generalisation techniques, such as the grouping of objects and the simplification of complex geometries, are mainly applied to 3D models. In addition to buildings, roads and rivers, other infrastructure elements such as railway tracks are also used to define block edges and neighbourhoods. Four levels of detail were defined for our use cases, extending from a focused centre (see Figure 2). The two highest levels represent the buildings with the highest level of detail (2) and a reddish highlighted building in the centre (1) to draw the viewer's attention to this area. The third level (3) consists of general buildings, but the structures of the floor plans are still recognisable. The lowest level (4) shows block edges, with an average building height for the respective block, which were generated based on roads and railway tracks. The various levels wind around the central building in the middle. The definition of these lenses is flexible and can be adapted or refined depending on the area to be visualised.

Figure 2: Schematic visualisation of four generalisation levels: (1) detailed building in focus, highlighted in red; (2) detailed buildings in dark grey; (3) generalised buildings in grey; (4) generalised block edges in light grey.

2.4 Reconstruction

An important basis for reconstructions are databases and registers that contain information on years of construction and demolition. In combination with the current city model, it was therefore possible to determine and trace the conversions, demolitions and new buildings in the city between the post-war years and today. However, for the buildings that have already been demolished, there are no 3D models of what they looked like at the time, which means that reconstructions are necessary. In the context of the research project on building culture in Switzerland, the aim was not to achieve the highest level of detail in a reconstruction but to give the viewer a sense of the volumes of the buildings, including their context, special features, relationships and topology. Thus, the model should emphasise the most important features of the building. Accordingly, geometric shapes like cylinders or cuboids were used, and the respective building heights were derived from archive material (photos and plans). This enables a reconstruction that conveys the volume of the building with minimal effort. The simplified representation avoids focusing on intricate details and encourages the viewer to consider the building in the context of its surroundings.

3. Results

The following chapter presents the implementation results of the visualisation concept.

3.1 Visualisation

We applied the visualisation approach to the three use cases (see Figure 3), proving not only its feasibility but also its transferability to other contexts. For better visualisation and analysis, an interactive 3D viewer was implemented as a web application. This application allows users to dynamically explore the visualisations by panning, zooming and rotating the scenes. The static images were extracted from the application, showing scenarios from different angles and perspectives. The first example shows the post office building in Basel. As can be seen, it is a freestanding building that is part of a railway station area that extends over the tracks. The highest levels of detail concentrate on the buildings immediately around the focal building and the station site to show the interplay between the post office and the railway. The BIZ tower is also a landmark in the immediate surrounding, which is easily recognisable thanks to its unusual, rounded shape. To show the functionality of the railway station, the tracks were indicated in the form of linear objects. The second example shows the ‘Jelmoli’ department store. The building was built within an existing block of buildings by tearing down older small-scale buildings around a courtyard. The height of the building is orientated towards the neighbouring buildings, allowing the building to blend into the block. As a result, the size of the building complex can hardly be estimated from the outside from a pedestrian's perspective. The detailed level around the department store should give a feeling for the structures and the dimensions of the individual buildings to be able to compare them. The last example shows the ‘Ensemble Chauderon’. This free-standing building complex stands in a very heterogeneous terrain. Due to its exposed location, the south side has more storeys than the north side. The terrain also has an influence on the generation of the block edges, as the streets that surround them have large differences in height. Through the examples, we demonstrated the transferability to other

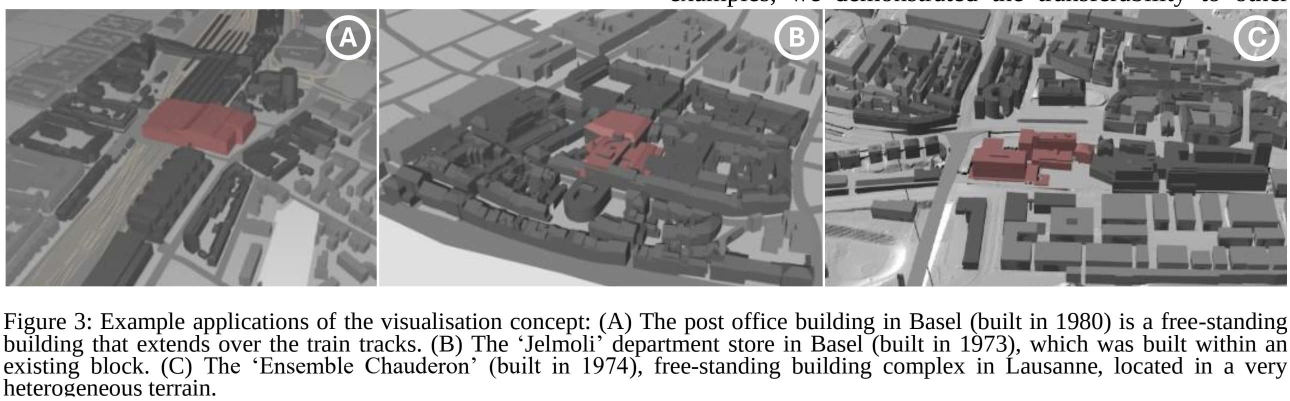

Figure 3: Example applications of the visualisation concept: (A) The post office building in Basel (built in 1980) is a free-standing building that extends over the train tracks. (B) The ‘Jelmoli’ department store in Basel (built in 1973), which was built within an existing block. (C) The ‘Ensemble Chauderon’ (built in 1974), free-standing building complex in Lausanne, located in a very heterogeneous terrain.

urban contexts. The colour and generalisation concept of the visualisation subtly guides the user to focus on the key elements within the visualisation, creating a balance between freedom and targeted exploration.

3.2 City reconstruction

With the help of building statistics, it was possible to reconstruct the spatial situation before the construction boom and analyse the changes in building volume on this basis. The reconstruction of the spatial context is shown here using the old post office building (1908) as a focused example. The model concentrates on capturing the most important features of the building, such as the two small towers at the corners, with predominantly simple geometric shapes (see Figure 4). This meant that this building could be reconstructed with minimal effort. In addition to the roughly triangular ground plan, the corner towers were also considered important features. The rounding of the corners was also considered important, as the main post office building does not appear to have any corners from a pedestrian perspective. In addition, the total height of the building was estimated based on photos and plans so that the size relations to the neighbouring buildings match. The rough representation should prevent the viewer from focusing on details and instead encourage an understanding of the building in the context of its surrounding.

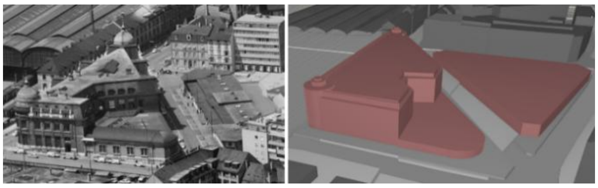

Figure 5: Left: Photo of the former Basel post office building (Comet Photo AG (Zürich), 1964). Right: Reconstruction of the former post office building using simple geometries with a focus on including special building features (corner towers).

3.3 Changes to the constructed mass

Using the visualisation created the changes in building mass before and during the construction boom can be visualised in direct comparison. Interactive animations in the web application make it even easier for the viewer to visualise these change processes. The comparison between the two periods is shown here using the post office building in Basel as an example (see animated video: https://go.fhnw.ch/axNbbL). Figure 5 shows the old, reconstructed post office building and Figure 3 (A) shows the replacement building. Both illustrations show the same section of the city and as the extent of the individual levels does not differ between the two periods, a direct visual comparison is possible. The colour concept directs the viewer's gaze to the immediate area around the highlighted building, allowing the changes in the surroundings to be analysed alongside the building itself. The further away from the focal building, the less attention is paid to the changes. The increase in the built volume between the two points in time is particularly clear in this example. Although both buildings have largely the same function, the replacement building is not only taller, but also considerably larger.

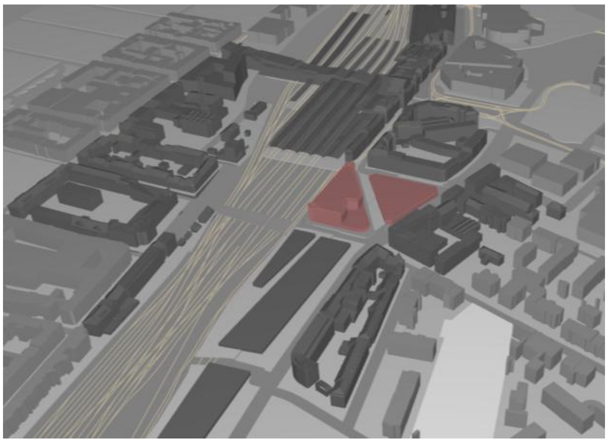

Figure 4: Embedding of the reconstructed building and its urban environment based on the same visualisation concept for easier analysis and comparability of the built volume. Uncertainties in the modified environment were also replaced by simple geometric objects.

4. Discussion

The implemented visualisations demonstrate the potential of interactive applications to focus on specific buildings while still presenting important contextual information about the immediate surroundings and the broader city. The use of colour coding and varying levels of generalisation guides viewers to areas of interest, making it easier to navigate the visualisations, particularly for users familiar with the city. By integrating detailed contextual information, such as landmarks, the usability and orientation in digital city models can be further enhanced – also in generalised city models. While some users with extensive resources might prefer to prepare and visualise historical data more comprehensively, this method highlights the value of efficient, targeted visualisations that balance detail and generalisation. Interdisciplinary discussions revealed that, depending on the use case, achieving the highest level of detail in visualisations is not always necessary. Instead, selectively detailing key areas and generalising others provides a meaningful representation. The approach developed in this study also offers several practical advantages. It can serve as a low-cost solution for smaller municipalities that may lack sufficient resources for more extensive visualisation projects. In this use case, always a handful of buildings were considered in their urban environment, which made it seem natural to create rounded boundaries. In further research, other forms of lenses could also be considered, e.g., elongated with certain infrastructures such as the road network or railway network. While this study focused on urban areas, the approach could be adapted for rural environments, where other objects and contexts, such as vegetation, topography and infrastructure, might be more relevant. The visualisation technique could extend beyond historical perspectives to support future-orientated applications, such as urban planning and development scenarios. Generalised representations can clearly visualise to the viewer that the objects in the model are based on hypotheses and assumptions and do not necessarily look like this in the real world but nevertheless convey impressions of how these objects fit into their environment. As was established at the beginning, digital models are not yet firmly established in the field of architectural history, neither as a tool for research nor as a means of communicating findings to the public. Due to its very simple structure, however, the model lends itself to being used increasingly for communication purposes to familiarise viewers with this type of representation. And this may also be critically considered as to whether this type of presentation for a wide audience may require familiarisation, as most digital models that can be seen pursue the goal of depicting reality. To maximise their usefulness and impact, it must be ensured that such visualisations are accessible and understandable to the public. As a next step, the concept would have to be systematically evaluated by users regarding the generalisation levels and the colour scheme. The visualisation process combines manual and automated steps. In the future, as more experience is gained regarding the influencing factors, the method can be further parameterised to enable fully automated creation based on input data, making it even more adaptable and scalable.

5. Conclusion and Outlook

This research was motivated by the search for suitable 3D representations for the visualisation of building culture. We presented a visualisation approach with generalisation levels and demonstrated its feasibility using various urban situations in Switzerland. This visualisation concept provides a basis for architectural-historical research to analyse historical changes in the context of the built environment. It allows focusing on the buildings and their volume changes over time without being distracted by too much detail of the surroundings. The visualisations may also serve as a communication tool for conveying these changes to a broader audience. During this interdisciplinary project, it became clear that different disciplines have different conventions on how design and content are developed and interpreted depending on the subject area. Thus, to make a visualisation accessible to different domains, these research areas must be included in the development processes at an early stage. While this work focused on buildings and their changes in urban contexts, future research will apply and extend the developed concepts to more rural environments.

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