

The ArchiMediaL Project: Opening up the Architectural Heritage in Repositories and Image Databases

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1 Introduction: Digital Images in Architectural History

Architectural history is emerging as one of the key areas in the implementation of digital humanities and this development holds a lot of challenges and opportunities for both research and education. Researchers in the field revel in repositories of images, films and texts, and diverse digital libraries to access diverse visual media such as photographs, paintings, and drawings, or physical and virtual models. With the shift towards a global perspective on architectural history and heritage preservation and the availability of information from all world regions, the field started to explore transnational data transfer and pursue global commodity networks, tying local spatial developments into multinational investigations. A global research community is emerging and exchange among scholars opens up the possibility to compare and contrast and ultimately synthesise different approaches, methods and technologies and their respective cultural implications. Such cross-cultural engagement around global sources is essential in a world where students in the same classroom stem from different parts of the world and where urban history needs to be taught from a global perspective.

However, this development faces some obstacles that go beyond the pure access to these sources: The reliability of the sources themselves. Due to plausible economic reasons, the digitalization was and is a process of pure re-medialisation in which image and meta-text are transferred as come upon. Thus, the digitalized images change in terms of medium and become easily accessible but they do neither change in terms of reliability nor regarding the reference system or power of interpretation underlying traditional image collections. The digitalization but conceals the structures in which the images relate to each other and their meta-texts. In result, the digital databases and repositories that involuntarily perpetuate thematic or regional marginalizations and biases inscribed in established systems of knowledge clash with today's postcolonial need for a balanced and globalized knowledge production and exchange

2 ArchiMediaL

The project ArchiMediaL, which we present in this paper, developed in cooperation with two faculties at TU Delft, the Vrije Universiteit Amsterdam, the HafenCity University Hamburg and the University Duisburg-Essen. It has been set up to address some of the crucial points in the use of digital image databases in architectural and urban history. For the period of three years, it brings together scholars from humanities and computer science to apply novel computing methods such as automated image recognition and crowd-sourcing platforms to link and enrich disconnected bodies of images relevant for the study of architecture and urban form.

This project features close collaboration of historians of architecture and urban form and computer scientists. The goal is to develop a mutual understanding of the rationale, values and research perspectives on how architectural history is explored. The project pursues to define a framework of hermeneutic analysis and quantitative reference system, in which discipline-specific canons and limitations are questioned and that can be used as design requirements in cutting-edge computer science solutions for the automated and crowd-sourced recognition of buildings (image recognition, deep learning, computer vision research, actual 3d datasets). We propose three interconnected pilot studies with different degrees of digitization, availability of meta-data, lingual, spatial and temporal focus -- the open access repository of colonial architecture located at TU Delft, photographs, postcards and other illustrations of Japan from the late 19th and the early 20th century, and digital imagery of waterfronts and port cities. Using three major datasets as starting point, we explore novel types of reading that aim at assessing the underlying values in urban history. We propose a reading across three dimensions:

1. *Global*: allowing for a revision of the underlying (colonial) paradigms of architectural history in view of a truly global perspective.
2. *Balanced*: integrating so-called “high” and vernacular architecture and thus going beyond the current focus on hero-architects and select (Western) architectural movements. By understanding architecture as a cultural practice in general and not as an art form alone, this allows for the smooth integration of architectural data that was formerly coded as ‘ethnographic’.
3. *Heterogeneous*: exploring diverse architectural representations notably from popular culture, including postcards, maps or toys that are not part of traditional sources in close relation to the existing canonic media.

To enable the linking of the heterogeneous data sources and make these readings possible, ArchiMediaL employs multiple enrichment strategies, extending beyond the state of the art of computer science:

Firstly, we will research and develop image recognition solutions that establish links based on the image content. The medial representation of architecture may consist of photographs, architectural drawings but also cadastral maps as well as 3D models or paintings. Despite the *deep-learning* revolution in Computer Vision we need rich and specified methods to match and link such diverse representations.

Secondly, we employ *text analysis* methods to extract structured metadata from natural language text in multiple languages. In this project, we firstly focus on English, Dutch and German.

Finally, for automatic extraction of metadata as well as for validating and improving the image and text analysis results, we will deploy *human computation*. Here, information can be provided by human experts, the crowd (crowdsourcing) and through *nichesourcing* (a specific type of crowdsourcing where knowledge intensive tasks are distributed amongst a small crowd of amateur experts)

We develop methods to aggregate the results from different analysis methods so that we derive metadata and links with sufficient quality. The results of these enrichments will materialize in an online infrastructure that connects the different and heterogeneous data sources. These data sources include both datasets specific to the architectural historical research (for example the colonial architecture repository), crowd-provided online datasets such as Flickr and more generic datasets such as online geographic datasets to provide context and background knowledge. To combine these datasets in a flexible and extensible way, we use the principles of the *Semantic Web* and specifically the practice of *Linked Data*. Linked Data can be used to publish datasets that are the result of historical research; to integrate these datasets into a knowledge graph and to re-use these integrated datasets, allowing for new types of (historical) analyses.