

Photogrammetry and Reconstruction of Memory Memories of Heritage Buildings: The Case of As-Salt City

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Abstract

This paper aims to show the potential of combining photogrammetry and gamification with extensive interviews to document and preserve the memories of heritage buildings. The project was carried out with the Title "The living frame" in 2022 in the city of As-Salt, Jordan, with the aim of creating a local narrative of the city's architecture and culture. Using photogrammetry and gamification, we were able to invoke the memories of old residents and seniors, as they got to View, experience, and relive moments from their past when presented with a detailed virtual walkthrough of their old houses and public buildings, regardless of their current location. Most seniors moved out of their old houses due to changes in their economic status, family size, job necessities, and other conditions. Other buildings, such as schools and public centres, are deserted due to changes in standards and regulations, deterioration of their physical state, and various other reasons. The memories and stories regarding these buildings are still an essential part of the city's intangible heritage that must be documented, or it will be lost. Through these extensive interviews, seniors describe in detail their memories and lifestyle within the older buildings while virtually walking through the scanned models, remembering certain events in their different spaces. These memories and stories are directly synchronized with the scanned architectural data creating a new layer of information that would not have been possible otherwise. The lifestyle Layer shows us how these buildings shaped and got shaped by the everyday usage of the locals, the significance and function of specific details within them, and the connections they had with different cities and communities. These memories are later overlapped with other people's memories from the same area extracting a shared history and narrative that could be considered the Architectural/Cultural narrative of that time.

Keywords: Generations of families; UNESCO; Economic changes; Al-Khatib family; Traditional architecture; Architectural input

Background

Introduction

The preservation and understanding of old city centers in Jordan play a crucial role in capturing the cultural essence and historical significance of these culturally and architecturally dense areas. The houses in these urban cores have witnessed generations of families and have withstood numerous cultural and architectural transformations within the region. Examining the memories of senior past inhabitants becomes essential for constructing a comprehensive local narrative of the city's formation, inhabitation, and growth [1].

In this research paper, we focus on the city of As-Salt in Jordan, situated in the Al-Balqa Prefecture. As-Salt was chosen as the survey site due to its abundant collection of well-preserved heritage architecture, complemented by a significant number of original residents still residing in the city or its vicinity. The "The Living Frame" project started in the summer of 2022 and is currently ongoing. The primary objective of this project is to document both the tangible and intangible heritage of Al-Salt, thereby capturing its rich historical legacy.

In the documentation of the city's intangible heritage, it was noted that many senior residents were found to reside outside the city area for various reasons. Consequently, conducting in-person interviews with these individuals in their original houses was not feasible due to their age and physical condition.

As-Salt city

The city of As-Salt is located in the Al-Balqa prefecture in Jordan, and as of 2021, it has been recently recognized as a UNESCO world heritage site. The old city consists of 3 main mountains: Al-Jadaa, Al-Qalaa, and Al-Salalem. The commercial district is located in the

ravine, passing the mountains as well as the main souq, mosques, and churches. The city is famous for its mosaic society, where Muslims and Christians from different sects live neighboring each other [2]. The houses are organically climbing the mountains and are connected by a series of stairs that create the city's urban fabric. The city went through different significant socioeconomic changes in a short span of time, and the current existing architecture stands as a witness to such changes as shown in Figure 1.

Challenges

A great number of the older generation who lived through the pre-modernization period of the city moved out of their old houses due to changes in their economic status, family size, job necessities, and other conditions. Other buildings, such as schools and public centers, are deserted due to changes in standards and regulations, deterioration of their physical state, and various other reasons. The memories and stories regarding these buildings are in danger of being lost with the older generation passing away.

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Methodology

The "Living frame" project follows a methodology that consists of a multistep process that captures the multilayers of information hosted in an architectural set. Each step captures a set of information that later overlaps with the other.

Photography

- Identifying typologies and architectural practices/trends that are common within an area as shown in Figure 2.
- Invoke possible connections with the documented buildings that could be investigated through the interviews.

Photogrammetry/Gamification

This phase involves Capturing and scanning the currently available buildings and their surroundings from both the exterior and interior.

The capturing is done through handheld DSLR and Mirror-less cameras in addition to drone imagery when it is permissible [3].

The Images are later filtered and imported into Photogrammetry software for alignment and meshing.

The meshes are then cleaned in modelling software then sent back to the Photogrammetry Software for final texturing as shown in Figure 3.

After finishing the model, the 3D data is imported into a Game engine to create virtual walkthroughs and live experiences that could be experienced on big screens, phones, and Virtual Reality.

Live interviews

The Older residents of the city and owners of houses are interviewed in lengthy interviews. A virtual walkthrough of their houses is presented during the interview, where they start telling stories about

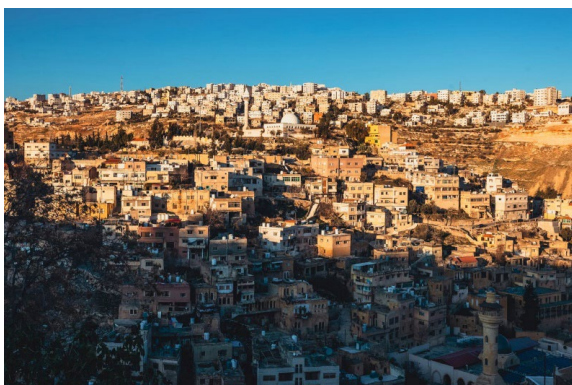


Figure 1: The City of As-Salt Source: Author 2021.

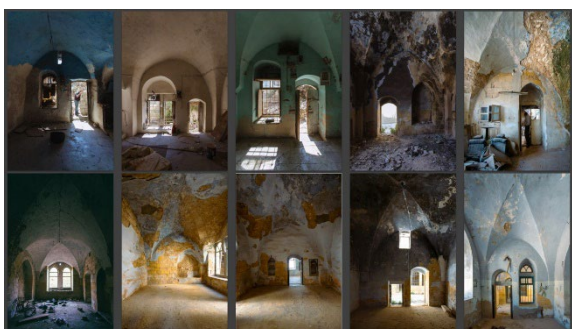


Figure 2: Typology of Vaults Source: Author 2022.



Figure 3: Documented House Using Photogrammetry Source: Author 2022.

their childhood and memories of the Building. These stories include how they used to live in the different spaces, their traditions, names, and meanings of the architectural details, the connections they had with the outdoors and surroundings, and stories that were common in their generations. They also recall certain events with huge impacts that happened in the city and their location in addition to the older state of the city.

The old residents have no architectural background, and the language they use, in addition to the accent, gives an authentic layer that is also preserved in the documentation.

The Case of Al-Khatib House in As-Salt City

Background

Alkhatib house complex is an extended family housing complex in Jabal Al-Jadaa in As-salt City in Jordan that belongs to the Al-Khatib Family as shown in Figure 4.

The complex is built over different periods that span over 300 years which stands as a witness to the rapid socioeconomic changes that occurred in the city.

The housing complex was documented entirely using photogrammetry as shown in Figure 5.

Many details were not visible on-site due to the lack of lighting and the terrible condition resulting from the old house's fire and mis-usage. After generating the model and texturing it, most of these details appeared, and through the interviews, their usage and significance were made clear.

The first part of the complex is a "Fallahi" house which dates back to 1687 A.D., according to the owners' original documents. A "Fallahi" house is the traditional peasant architecture in the region. The house exists on three different levels. The walls inside the house contain several storage spaces specific to the agricultural lifestyle the city used



Figure 4: Jabal Al-Jadaa documented Using Photogrammetry Source: Author 2022.



Figure 5: Al-Khatib House Using Photogrammetry Source: Author 2022.

to have; each niche and storage space had a specific name and use. Some of the storage spaces contain openings from above, which were used to fill them from the upper levels.

The second Extension was a vaulted construction consisting of 5 rooms with cross vaults, one space with a barrel vault, and an open courtyard in the middle. Each room functioned as a house for one of the family members, sharing the middle courtyard space and the Barrel-vaulted space, which was a place for the horses.

This Extension had three different entrances; the main entrance was from the lower part of the mountain and directly into the middle courtyard, a side entrance from the old existing Fallahi House and into one of the rooms, and an entrance through stairs that go directly inside the central hall from the upper side of the mountain. The stairs in the middle hall were demolished due to privacy issues.

The third Extension was a modern construction using steel I-beam as a structure. The Extension consisted of a Room on top of the entrance to the courtyard leading to the Fallahi House, and additional rooms on

top of the Building.

The fourth Extension was a contemporary stone and concrete addition that added extra apartments to the complex as shown in Figures 6 and 7.

Visual oral history

The Interviews were conducted with different senior family members of the family who share a personal memory of the house. Some of them were born there and spent their childhood there, and others visited the place often.

The interviews were focused on exploring the following:

- 1- The personal Memory of the person and the relevant architectural connection (Location, Objects, scale, spaces, and details).
- 2- The morphology of the Building through times, The Building was built over a long span of time which meant continuous changes in the form, structure, and usage.
- 3- These changes and additions were traced with the Oral history through the interviews.
- 4- The Effect on the urban and social fabric of the city.

Reconstructing the memory

Using Unreal Engine, old seniors from the family living outside the city were able to revisit the house. Through the interview, they recalled their personal memories from their childhood, the places they used to play at, the things that were demolished and changed, the impression



Figure 6: Plan Showing the house complex with all openings, niches, and extensions Source: Author 2022.



Figure 7: Section Showing the house complex with all extensions Source: Author 2022.



Figure 8: Old City of As-Salt Documented Using Photogrammetry Source: Author 2022.

about the spaces, and local folk tales as well as shown in Figure 8. The harmonical lifestyle of the city was also present architecturally and spatially, where two different families lived together with only a curtain separating the two houses.

The owners' stories provided details regarding the niches and openings, refilling zones, and memories of spaces that were allocated and projected on the 3D model.

Morphology of function

By showing the seniors the reconstruction of the house, the different usages through time were allocated as follows:

1. The Nuclear Family House: The house started as a traditional Fallahi Dwelling for a nuclear family.
2. The Extended Family housing complex: As the family grew, their descendants had families of their own, which turned the Fallahi house into a complex of rooms where each room was a house for one of the members.
3. Shelter for the Palestinian Refugees
4. The School: The second house extension was turned into a school. The vaulted rooms turned into classrooms, and the open barrel vault area was turned into lavatories for the school. The Fallahi house maintained its original usage during that time, and only the Central courtyard Extension was used as a school.
5. Rented apartments and The Alkhatib Family Association.
6. Mostly Deserted
7. Deserted

Discussion

The oral history of the original inhabitants of old cities contains valuable information that is at risk of being lost. Oral history alone can provide an excellent source of information. However, if not overlapped with architectural Input, it might result in it remaining as spoken memories with nothing to build upon. An architectural input and analysis can help preserve and develop the local narrative of the city and help visually transfer it to the younger generation. Such information can be of great importance when planning future conservation and rehabilitation plans. Rapid migrations from and to the cities cause a fraction of the memory and narrative of the city. If not dealt with, it may result in permanent loss of such information.

Conclusion

Through this methodology and extensive research, the intangible layer of memories and stories of heritage buildings can be extracted and documented in synchronization with existing architecture. When overlapped, these data could be used as a base for a bottom-up approach parallel narrative of the city's architecture. Using the 3D data, a reconstruction of the old or original state of the Building could be applied based on the memories of the older residents. The Input of the older residents and how they perceived their buildings and used them could also be a basis for developing systematic tools to analyse and understand local architecture, which can then be improved and used in contemporary architectural practices.

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Conflict of Interest

None.

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