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Photogrammetry and Zhongshan Pavilion: Reconstructing Urban Memory of the Wenxi Fire

Haoran Chang



Figure 1 Photogrammetry model of Zhongshan Pavilion. Image courtesy of the artist.

In line with the government's scorched-earth policy, on November 12, 1938, a devastating fire was started in the city of Changsha, China. This military strategy calls for the intentional burning and destruction of all valuable resources, such as buildings, food, and transportation infrastructure, to prevent the invading enemy

from utilizing them. During the Second Sino-Japanese War (1937–1945), the governor of Changsha followed instructions from the Nationalist government to execute this scorched-earth policy. Yet officials mistakenly initiated the fire too quickly and destroyed the more-than-three-thousand-year-old city. In this fire, thousands of people lost their lives, and the majority of the city's buildings were destroyed. Referred to today as the Changsha Fire of 1938, or the Wenxi Fire, this event left Changsha one of the most damaged cities during World War II, alongside Stalingrad, Hiroshima, and Nagasaki.¹

Zhongshan Pavilion is one of the few architectural structures that survived the 1938 Wenxi Fire. As technology widely applied in cultural preservation, photogrammetry can play a significant role in preserving this structure for future generations. Yet this project intends to further the conversation about the role of photogrammetry in memory preservation by considering the Zhongshan Pavilion as a heterogeneous site. The resulting virtual 3-D model opens new potentialities in challenging historical narratives that are told in the singular voice (the state's) as presented at the physical site in Changsha. Rather than following the path of criticizing digitalization as an extension and magnification of fragmentedness and rootlessness, the constructed virtual 3-D model of Zhongshan Pavilion may expand the fixed and structured memory preserved in the physical location and bring vitality to the preservation of multiple memories in a new kind of public space.

A Brief History of Changsha and the Wenxi Fire

Changsha is the capital of Hunan Province in the south-central part of China, which has a more than three-thousand-year history and has been active since the Han Dynasty (206 BCE–CE 220). However, because of the Wenxi Fire, there are only few old architectural structures found in the city today. At the beginning of the Second Sino-Japanese War, the government was still reluctant to carry out the scorched-earth policy, considering the significant sacrifice of destroying the city. But by the end of 1938, the government decided to execute this strategy because Japan took ownership of the valuable resources of the lands it conquered. At that time, the Japanese Army executed the “Three Alls Policy,” the campaign for “kill all, burn all, loot all.”² A telegraph signed under the name of vice director of the Bureau of Investigation and Statistics, Jiang Zhongzheng, revealed that the Japanese raped women, stole valuable antiques, and plundered food. It was therefore necessary, he concluded, to execute a scorched-earth policy to prevent this from happening again. On October 21, 1938, the city of Guangzhou was successfully invaded by the Japanese Army, and the Chinese Army withdrew to Wuhan four

days later. By November, the Japanese Army decided to slow down the speed of its invasion, intending instead to reconnect the railway between Wuhan and Guangzhou in order to disrupt the supply line between eastern and northwestern China. To achieve this goal, the Japanese Army targeted Changsha, which crucially controlled transportation across the Yangtze and Xiang Rivers and Dongting Lake. Additionally, Changsha is a stop on the Canto-Hankow railway, which makes Changsha a key location in terms of military strategy.

At the beginning of November 1938, the Japanese Army started its assault in northern Hunan.³ On November 11, the Japanese Army attacked Liuyang, a city ninety-three miles away from Changsha. The failure to defend Liuyang aroused panic and chaos in Changsha. The following day, the governor of Hunan province, Zhang Zhizhong, received a telegraph from Jiang Zhongzheng to implement the scorched-earth policy if Changsha was besieged. After receiving the telegraph, the governor of Hunan province called on the garrison commander, Feng Ti, and the director of the security department in Changsha, Quan Xu, to prepare in case the city failed to defend itself against the Japanese Army. According to Feng Ti's diary, November 12 was the day of memorializing the birthday of Sun Zhongshan, and there was a torch parade in the city.⁴ That night, Zhang Zhizhong dispatched the commander Xu Kun, and three soldiers, as one group out of a hundred to initiate a fire in the city. Xu Kun told the soldiers to wait for the signal—another fire at a different location—before beginning their own.

As told by Feng Ti, coincidentally on the same evening, a city hospital accidentally caught on fire. The soldiers saw this fire without realizing that it was an accident, and they mistakenly believed that the scorched-earth policy had already been started. They used gasoline and matches to ignite the fire, which lasted the entire day and was not extinguished until November 16, four days later. The consequence of the fire is significant. Changsha became one of the most damaged cities during World War II, alongside Stalingrad, Hiroshima, and Nagasaki.⁵ This city, whose history can be traced back to South Zhou Dynasty three thousand years ago, was almost destroyed because of the fire, including the majority of its old architecture.

The governor, Zhang Zhizhong, claimed that he did not know who gave the orders for initiating the fire, and said that it must be the responsibility of another department, such as the Bureau of Investigation. Contrarily, the biography of Dai Yunong claims that the director of the Bureau of Investigation, Dai Li, was actually framed by Zhang Zhizhong. After the fire, Guo Moruo, the famous scholar and official of the Chinese Nationalist Party, wrote a letter condemning Zhang Zhizhong for starting the fire.⁶ Zhang Zhizhong denied the denouncement from Guo in a written response. According to the official documents after the fire,

the reason for it being set was that the government officials believed the rumor that the Japanese Army had been near Changsha. Feng Ti, Xu Kun, and Wen Zhongfu were executed for the fire. However, the execution of Zhang Zhizhong, the main figure in the fire, was waived and he was merely dismissed.

Zhongshan Pavilion: Place and Memory Preservation

The Wenxi Fire burned down the whole city, leaving few traces. But this historic event remains embedded in the community's collective memory through documentary film, written memoir, and archival images. Yet these externalized memories are not widely distributed, and this significant historical event is still not well known, even to people born in Changsha. Unlike individual memory, the forms mentioned above are independent of individual experience and instead create a collective memory preserved by external objects. They are not shared experiences of each individual, yet they are preserved in the public space and formed as public memory. Public memory is constantly reassessed and revised with continual conversations in the public space.⁷ Nevertheless, the temporal public memory is not nebulous; it always occurs in the place.⁸

Place plays a significant role in facilitating the construction of memory and remembrance in that it subtends memory, "being the ground and resource, the location and scene of the remembering we do in common."⁹ Externalized memories are unstable, changing with and adapting to the needs of the present.¹⁰ Contextualizing the past by making a linkage to a place and/or site can anchor the fluidity of the past and represent historical "facts." While the past has a temporal dimension, and thus operates beyond three-dimensional space, a place associated with the past can become more stable over time and allow people to have a sustained connection to a collective memory. The relative stability of place can help anchor history and make it timeless.¹¹ Additionally, the physical act of returning to a particular place can create a sense of nostalgia for that past. In Gaston Bachelard's *Poetics of Space*, memories are preserved through the lived experiences between interior spaces and personal and emotional responses. Indeed, home is not just the place of living; it is also a place in which to dream.¹² Not merely a physical space, it is also a spiritual one in that we can feel, touch, smell, and look at the space and make a psychological connection between the present physical space and the remembered past.

Constructing a place, such as building monuments and preserving historic districts, can promote certain perspectives of the past while erasing others.¹³



Figure 2 Photograph of Zhongshan Pavilion in the first-floor exhibition (originally from People's Club 民众俱乐部, ca.1930). Image in the public domain.

Making place plays a significant role in retrieving memory in a way that not only recalls but also reconstructs the past, thus accounting for why we remember and forget at the same time. The affiliation between place and memory is neither linear nor binary, since memory itself is not fixed. The psychologist Dan McAdams writes, “Stories are not merely ‘chronicles,’ . . . Stories are less about facts and more about meanings. In the subjective and embellished telling of the past, the past is constructed, history is made.”¹⁴

Considering the significance of place in memory preservation, I focus on the role of architecture in preserving the memory of this historic fire. With the extensive destruction caused by the fire, there are not many architectural structures in their original forms. One of the most significant surviving architectural structures is arguably Zhongshan Pavilion, a five-story, Western-style, square-shaped clock tower completed in 1930. Originally a three-story, concrete building, the pavilion featured an electronic clock mechanism imported from Germany. At the back of the bell tower, an elliptical pool was surrounded by a lawn. In 1932 a public education center with a reading room and a recreation space opened on the lower floor, an office and classrooms on the second floor in the attached building, and a teahouse on the third floor.¹⁵ As a memorial to Sun Zhongshan, the first president

and founding father of the Republic of China, who was frequently referred to as “Father of the Nation,” the clock tower was named the Zhongshan Pavilion.

Although Zhongshan Pavilion is a significant architectural structure and witness to the area’s history before and after the Wenxi Fire, I would like to argue that the heterogeneity of this building can hardly preserve a singular past. My thinking on heterogeneity borrows from Michel Foucault’s concept of heterotopia to describe a space that is not homogeneous and singular. In his well-known essay “Of Other Spaces,” Foucault distinguishes heterotopia from utopia to describe “counter-sites” that are embedded with dualities and paradoxes. At the beginning of the essay, Foucault uses the mirror as an example of a heterotopic space because of the way individuals in front of it occupy their body while that body is reflected in the mirror. The multiplicity of space described by heterotopia is a “floating piece of space, a place without place.”¹⁶ Zhongshan Pavilion is a heterotopic space because of its changing functions through time, the way it has been subsumed into the current cityscape, and the multiple forms and cultures it embodies. The multiplicity of Zhongshan Pavilion mainly reflects two principles discussed by Foucault: the third principle that the “heterotopia is capable of juxtaposing in a single real place, the several spaces, several sites that are in themselves incompatible,” and the fourth principle that heterotopia are “most often linked to slices in time,” rather than to the accumulation of time.

First, the Zhongshan Pavilion contains different functionalities in different historic periods. In the 1930s, before the Wenxi Fire, it was used as a public education center. Although the building’s skeleton survived the fire, the pavilion has been through substantial changes in recent decades. After the 1950s, the pavilion was run by the local public library. In 1960 Changsha Library was officially established, and the pavilion became one of its satellite spaces.¹⁷ In 1966 the Cultural Revolution began, and the library was suspended. After the Cultural Revolution, the building still belonged to Changsha Library, and the space was utilized as a children’s reading room.¹⁸ Since the Zhongshan Pavilion is at the center of downtown, an increasing number of stores and temporary buildings opened around it in the 1990s. Surrounded by several stores, such as a karaoke bar, a bakery, and clothing stores, the pavilion remained the tallest building in this area. Crowded by the commercial stores that were temporary structures, in the 1990s the pavilion lost its functionality in this urban landscape, no longer offering standard time or serving as a memorial to the “father of the nation.”

In 2002 the government spent thirty million RMB refurbishing the Zhongshan Pavilion, cleaning up all the commercial stores around the building. However, the structure was severely damaged because of poor preservation over the years, and the German electronic clock had disappeared. The reconstruction



Figure 3 Zhongshan Pavilion in 2017. Image courtesy of the author.

was finished in 2007, and in 2011 the pavilion was refurbished once again. Today, the first floor of the pavilion is a small gallery space. The other floors of the building are closed to the public: ostensibly, the second floor is used as a meeting place for local government officials, and the top floor remains closed. With investments by the local government in refurbishing the building, Zhongshan Pavilion is now a tourist and political site that embodies the government's effort to educate its citizens in patriotism.

Although the pavilion was refurbished in the 2000s, it is still competing with the surrounding cityscape and its many commercial stores, loud sounds, and numerous advertisements. On the southeast side of the pavilion lies a big shopping mall that includes a cinema, food court, and many different international fashion chains, such as Zara, H&M, and Coach. Under the pavilion, there is an underground shopping street, named Jin Man Di, which can be translated into English as "Gold Is Everywhere." On the southwest side of the pavilion, there are many small restaurants. The domination of commercial spaces overshadows its memorial function. With the loud noise of traffic and promotional sound in the city's downtown area, the sound of standard time announced by the Zhongshan Pavilion can no longer be heard. The clock tower does not function as a timekeeper due to the loud noise and the wide availability of other time-keeping mechanisms. The style of the architecture is in contrast to the surrounding environment, which



Figure 4 Photogrammetry model of first-floor exhibition space in Zhongshan Pavilion. Image courtesy of the author.

isolates the pavilion from the crowded cityscape. Zhongshan Pavilion, submerged within the larger cityscape, disappears with the obscure memory of its past. The history, with the overwhelming modern city scene, is hardly to be heard, seen, and felt in the crowded urban space.

Paul Connerton discusses the phenomenon of losing track of history in his book *How Modernity Forgets*. The city of Chicago, for example, is the railway nodal point of flowing merchandise from the West and East.¹⁹ The assemblages of products from different places make Chicago a site where different ecosystems converge. In the context of fast-paced urbanization in China, Connerton's example provides a useful metaphor for explaining the situation at Zhongshan Pavilion. Like the convergence of different railways in Chicago, the assemblage of style and functions surrounding the pavilion conceals or subsumes its history.

Moreover, the pavilion contains various forms and cultures in a single site with an unresolvable and complicated relationship. In terms of architectural style the pavilion is Western, but the interior exhibition narrative contradicts this (fig. 4). Tour guides have to pass a written test assigned by the government before introducing the “relevant” history of Sun Zhongshan and this building, and Zhongshan Pavilion has been claimed as a local “Red Tourism Site” for its promotion of the historical significance of Chinese communism. According to Jennifer A. Jordan, the preservation of urban memorial spaces is highly associated with the land use and land ownership.²⁰ As a socialist country, China's land ownership and land use are very different from Western countries. Article 10 of the

1982 Constitution states that land of the country must be owned by the state in urban areas, while the land in rural and suburban areas must be owned by the state or local collectives.²¹ Therefore, the curation of the exhibition is led by the local government. In the exhibition, the preface that introduces Sun Zhongshan quotes Chairman Mao, the founding father of the People's Republic of China:

In memory of the revolutionary forerunner Mr. Sun! In memory of his clear-cut standpoint as a democrat who fought with the reformists in the Democratic Revolution preparatory period. He was the leading Chinese Democratic Revolutionist in this combat. In memory of his great achievement in overturning monarchy and establishing the republic in the Revolution of 1911. In memory of the first Chinese Nationalist–Communist Party cooperation, the great achievement in developing from the Old Three People's Principles to the New Three People's Principles. He left a rich legacy of political thought. Apart from a small group of reactionaries, the modern Chinese are the successors of Mr. Sun's revolutionary cause. We have finished Mr. Sun's unfinished democratic revolution, and develop it into Communism revolution. We are finishing the Communist Revolution.²²

The rest of the exhibition introduces the major political contributions by Sun Zhongshan from the beginning of 1900 to his death, including a fraction of modern history in Changsha in the context of other historic moments for the Chinese Communist Party during that period. Western invaders and feudalism are framed as targets that have to be dismantled before establishing a democratic and independent country. The narratives establish an opposition between China and the West, the old and the new, and the democratic and the hegemonic. This binary narration in Zhongshan Pavilion echoes the opposition between victim and perpetrator identified by Dominick LaCapra in written accounts of the Holocaust after World War II.²³ LaCapra discusses two different ways of writing trauma: acting out and walking through. Acting out is the tendency to repeat something compulsively after the trauma. Walking through is when individuals distance themselves from trauma. Setting up clear targets and binaries in response to the trauma, faced by people being exploited by invaders and a feudalistic government, can be considered an instance of “acting out.” Establishing a binary between Western invaders and the Chinese simplifies the complicated relationship between China and the West. Victimized the people in the city can be considered a defense

mechanism against the trauma caused by the invasion and a hegemonic government, and this is one example of “acting out” in writing history. This also justifies the necessity of establishing a new democratic and independent country to overcome the trauma faced by the citizens in Changsha.

This exhibition is curated with an underlying logic of nationalism and the fight for liberation from foreign invaders. The first-floor exhibition establishes a binary relationship between the native and the West in that establishing a democratic country is to defend Western invaders successfully. Nevertheless, the original intention of constructing this building was to show the advancement of modernity. For instance, Zhongshan Pavilion was initiated by people who had Western educational backgrounds. The mayor of Changsha in the 1930s, Ji Yu, was a political figure who graduated from the University of Illinois and had worked for Michigan Railway Station as an engineer.²⁴ He led the urban landscape design in Changsha, including inviting the architect to design this Western-style clock tower and surrounding areas. The clock was imported from Germany, and it served as the mechanism for regulating and presenting time in the center of the city; in this way, it was integral to the construction of this social space and its identity.²⁵ Zhongshan Pavilion functioned not only as a work of architecture but also as the symbol of modern culture and science, which was perceived as cultural advancement or progress. Yet this contradicts the widespread characterization of this historic period as one in which the Chinese resisted the invasion of the West.

The superiority of Western politics and science is also mentioned in the exhibition narrative. For instance, Sun Zhongshan learned from Western democracy and proposed the Nationalist revolution guideline, *Three Principles of the People*. The three principles were nationalism, democracy, and livelihood, and this guide remains one of the most important political heritages from Sun Zhongshan. Zhongshan Pavilion is therefore embedded in the complicated relationship between China and the West in modern Chinese history, with an abundance of rejections and acceptances of Western civilization simultaneously. This paradox manifests in the Zhongshan Pavilion, which does not exclusively promote a negative or positive view of the relationship between China and the West, causing multiple narratives to coexist in one site.

Zhongshan Pavilion cannot be seen as a utopic space that is linear, consistent, and complete. Rather, it is a space of fragmentation. In constructing a collective memory of the pavilion, one might get lost in the multiple, often contradictory, narratives that are created about the structure’s history and its continued existence in a growing cityscape. Such mystification prevents people from thinking about the history and origins of the site, impeding the public from having a consistent, collective memory. Since the complex history of Zhongshan Pavilion has

been concealed in this assemblage space, the building's function in preserving the memory of Wenxi Fire cannot be maintained. Not only because the exhibition provides limited information about the building and the Wenxi Fire, but also because the multiplicities of forms, functions, and its relation to the surrounding environment render the pavilion as a “counter-site” with an inherent heterogeneity.

The failure to preserve the history of the Wenxi Fire is also related to the difficulty of accessing the site and the problem of its “age-value.” Zhongshan Pavilion is now in the center of a traffic intersection, and there is no underground passage or pedestrian access. Lacking convenient access, the building becomes an isolated site surrounded by busy traffic and consumer culture. Zhongshan Pavilion therefore offers limited access to the public. Since the pavilion was not preserved well in the past, it has been renovated and refurbished several times in recent years. Once refurbished, the building loses its *age-value*, a term Aloïs Riegl defines as “rooted purely in its value as memory . . . [which] springs from our appreciation of the time which has elapsed since the work was made and which has burdened it with traces of age.”²⁶ The natural look of “oldness” is embedded in this so-called age-value to which it is complementary and on which it depends. It is true that the Zhongshan Pavilion looks different from the surrounding modern architecture; nevertheless, there is an increasing number of pseudo-classical buildings whose styles are historic but constructed in recent years. The building's style is hard to ascribe to the age-value. The age-value is beneficial in making an emotional connection to the public, which can facilitate preserving the memory of the past. Since the pavilion lacks this age-value, it is hard for the public to make a direct connection between the architecture and history.

Photogrammetry in Producing Digital Place and Memory

Zhongshan Pavilion, as a heterotopic space, makes the preservation of collective memory unstable. In this project, I use photogrammetry to digitalize Zhongshan Pavilion, transforming physical architecture into virtual data that can be represented in an immersive virtual environment. The process of reconstructing Zhongshan Pavilion, metaphorically, responds to the site as a spatial heterotopia. Photogrammetry is one of the most prominent technologies in transforming physical objects and places into virtual 3-D models by leveraging spatial computation technologies. According to the geodetic scientist Toni Schenk, photogrammetry can be defined as “the science of obtaining reliable information about the property's surfaces and objects without physical contact with the objects, and of

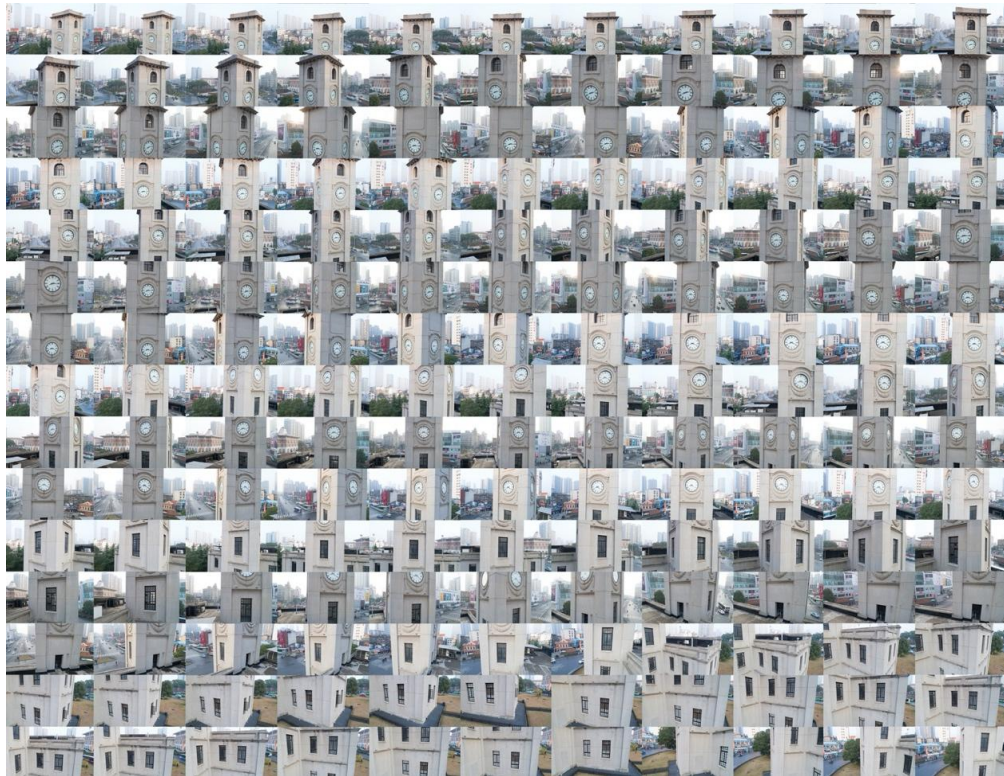


Figure 5 Some images collected after flying the drone. Image courtesy of the author.

measuring and interpreting this information.”²⁷ There is an input and an output in implementing photogrammetry: the input is the information acquired in the form of photographic images, and the output is the photogrammetric product obtained through the process, such as maps, orthophotos, and 3-D models. One of the basic concepts of photogrammetry is using the principles of perspective to align the images to construct a dimensional scene by acquiring information from the physical space.

In January 2018 I went to Changsha, China, and captured digital images of Zhongshan Pavilion using a DJI Phantom 4 drone. To get the highest-quality images, I used raw image files in the process of taking the photographs. After obtaining all the images by flying the drone around the building, I used Adobe Lightroom to lower the contrast of the images and increase the clarity for optimizing the output. In this project, I took about four hundred images for reconstructing the digital model of Zhongshan Pavilion. All the edited photos were exported to Agisoft Metashape, a specialized software that performs photogrammetric processing of digital images.

As a technology that constructs 3-D assets, photogrammetry is based on real objects connected to two 3-D spaces: the physical one and the virtual one. In



Figure 6 This picture is captured in the Agisoft Metashape, which demonstrates how the images are stitched together. Image courtesy of the author.

using photogrammetry to make virtual models, the “real” objects are transformed into flat digital photographs. Then the information is combined by the software to compose a virtual model of the “real” object, and this virtual model can be used in many different ways in the future. In implementing photogrammetry, 2-D images form a bridge between physical and virtual dimensional spaces. Photogrammetry thus disrupts the binary relationship between 2-D and 3-D spaces. Memory also connects two different spaces in a similar way. Our brain captures “reality” and stores it in such a way that “reality” is transformed into a virtual construction that can be manipulated. Photogrammetry, in this sense, more than a tool in memory preservation, can be considered the externalization of the memory.

Digitalized objects can be utilized to form different narratives with various digital media such as video, digital photo, and 360-degree film. From “real” to “virtual,” the construction of our memory is like the process of transforming a physical object into a virtual model with photogrammetry. Hundreds of images are stitched together by algorithm in constructing the virtual 3-D model. From hundreds to one: this process echoes how memory is constructed from the transformation of multiple fragmented moments into one singular form. In the case of the Wenxi Fire, its history has been told in many different ways. For instance, there is not a single answer to who should be blamed for initiating this mistaken fire. The first-floor exhibition space constructs a particular narrative promoted by the local government, which ignores many other perspectives of the building’s history. The Wenxi Fire is briefly mentioned, while the exhibition about Sun Zhongshan can



Figure 7 Dense cloud generated by Agisoft Metashape based on the images before generating mesh. Image courtesy of the author.

only be presented in an abridged version in this small space, highlighting the relationship between the Chinese Nationalist and Communist Parties. Zhongshan Pavilion, a site embedded with many histories, memories, and stories of the city, is reformed and represented with a singular and homogeneous narrative.

Although the virtual 3-D model is stitched together as a singular form, this project reveals the site's inherent heterogeneity. The embedded multiplicity within the virtual model is coherent to heterotopic physical architecture discussed above. The internal conflict of the cultural forms and changing functions of the site are part of the physical Zhongshan Pavilion. There is not a consistent and singular form, in either the physical or the virtual Zhongshan Pavilion, just like the memory preserved in fragmentation without an anchored place.

Other than the metaphorical significance in memory preservation and reconstruction, photogrammetry also has a practical significance. Photogrammetry technology has been widely applied to many fields. Other than being used extensively in landscape surveys and mapping, which was the original intention for this technology, in more recent years, photogrammetry has been used as an alternative way to construct 3-D models and has been applied in many different fields, such as cultural heritage preservation, game design, and archaeology. Photogrammetry has many practical significances in cultural heritage preservation. First, compared with the traditional methods of cultural preservation, which use hand drawing and photographs in documenting different angles, digital photogrammetry is more efficient in that archaeologists do not need to come back and forth between the documents and site to correct the information, and the data can be acquired in real time. With the innovation of digital technology, digitalization of historical architecture becomes more attainable with limited budgets and time. The structure can be documented with photogrammetry in comparatively high-fidelity quality.

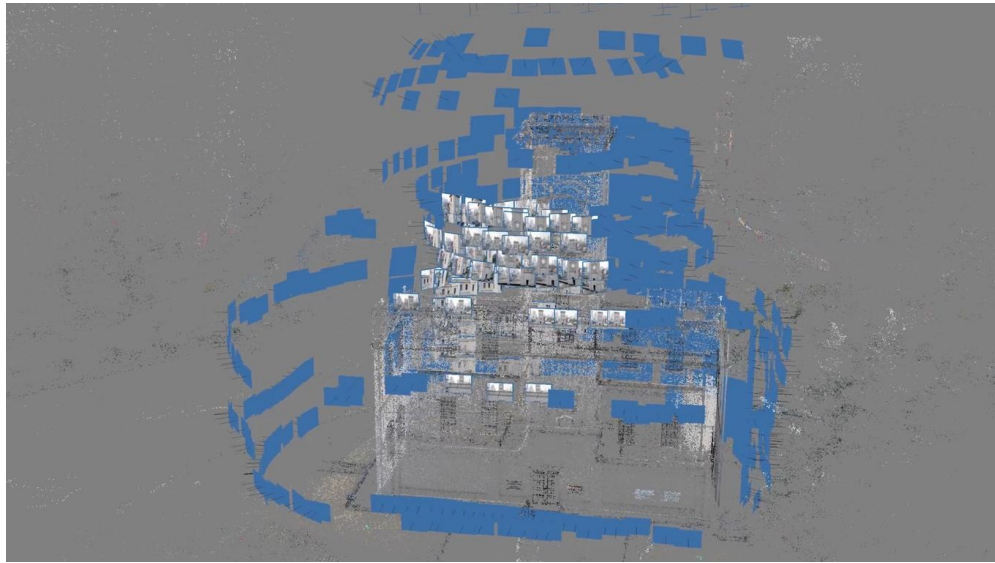


Figure 8 The final result of the 3-D model captured in the Agisoft Metashape. Image courtesy of the author.

Digital preservation can thus play an even more significant role in restoring damaged architecture. For example, in 2019, the Notre Dame Cathedral was damaged by a fire, and the wood latticework roof and iconic spire collapsed. We cannot see the original version of the cathedral anymore because of the damage caused by the fire. Yet the cathedral has been preserved by photogrammetry technology and can be seen and remembered in the digital space. Some companies have done digital preservation by scanning the Notre Dame Cathedral before the fire, and one of them is Art Graphique Patrimoine, a French company specializing in 3-D digitization and modeling of cultural heritage monuments, whose data have been used for the restoration project. Another game company, Ubisoft, the creator of popular video game franchise *Assassin's Creed*, spent hundreds of hours studying and scanning the Notre Dame Cathedral to develop an essential part of the game. Fire may destroy the building, but the memory continues in the digital world, a collective space shared by different people.

Photogrammetry architecture can also effectively solve the age-value and accessibility problems of historic buildings. In constructing the photogrammetry model of Zhongshan Pavilion, physical architecture is transformed into a digital version, which allows people to represent and retell the memory of the fire by sharing digital versions with others who cannot visit the site in person. The original form and appearance can be preserved with the photographic materials attached to the 3-D model. It is also available to people in the future who may witness changes to its appearance. The memory that has been externalized into a

3-D model can be transmitted from one generation to another, allowing collective histories to be represented and retold. The comparative literature scholar Marianne Hirsch coined the term *postmemory* to describe the concept of the relationship that specific generations have with powerful experiences that preceded their birth. She uses this concept to analyze how photographs and family spaces transmit memory, facilitating the construction of “postmemory.”²⁸ Virtual objects can become this “postmemory,” similarly transmitting from one generation to another. The “oldness” presented in the virtual form has a closer connection to the past, triggering the sense of nostalgia, which is important in transmitting “postmemory” because it can preserve the traces of the past with perceived fidelity. Virtual objects also allow an easier access to “postmemory” among numerous people, which facilitates its distribution. Photogrammetry 3-D models have the potential to maintain the memory’s age-value and to increase the collective’s access to that memory.

Some may argue that photos and videos can also preserve the appearance of the building. The difference between the flat and dimensional presentations is that the 3-D environment has more agency because the 360-degree model enables people to interact with the site in ways otherwise inhibited by its location and function. Digitalizing a physical structure transforms physical space into virtual reality, yet it holds the potential to be equivalent to its physical iteration. With the implementation of the virtual 3-D model of Zhongshan Pavilion with expressive media, such as VR or AR technologies, people can feel the architecture’s presence through its size, texture, and the relation to their body. People can understand the proportion of the architecture in relation to their own body, instead of through their imaginations. The physical interaction between people and the virtual 3-D model allows people to have a more physical connection, instead of purely through the sense of the visual or ocular. The immersiveness brings people into a dimensional space, which cannot be achieved through flat photos and videos. The placement of the virtual Zhongshan Pavilion 3-D model in a virtual immersive world, to some extent, has the equivalent effect on people as it would in “real life.” Moreover, the virtual 3-D version of Zhongshan Pavilion becomes the anchor in memorializing this building by reproducing narratives through expressive media. For instance, people can use the model to reproduce stories that may differ from those presented by the government in the exhibition space. The digital version of Zhongshan Pavilion functions as more than a digital replica. Rather, it is an archive, one that is constantly expanding in virtual form. The expansion of photogrammetry 3-D model breaks the singular narrative and, compared with the physical site, it embraces the heterogeneity of Zhongshan Pavilion in a different way that is more democratic to people in the reconstruction and representation of collective memory.

Repositioning Memories with Photogrammetry

Unlike cultural preservation projects, reconstructing a 3-D model of Zhongshan Pavilion in this project creates more than just an architectural model for heritage preservation. This project also exposes the fragmented and rootless nature of memory preservation. In constructing the photogrammetry model, I chose the medium quality in building dense cloud before generating the mesh of the 3-D model in the software because of the constraints of my computer and for efficiency. In professional and commercial projects, photogrammetry 3-D models are generated from the information captured by the laser scanner and cameras combined with high-end equipment. Yet, in this independent artistic project, with limited budget and time, I captured only the lower resolution of the building instead of being completely loyal to the physical architecture. This partiality reflects how memory is represented and retold in the process of construction. The reproduction of memorial space is closely related to the ownership and the authority facilitating the preservation project. As mentioned before, the Zhongshan Pavilion is refurbished by the local government, and the land and architecture are owned by the government. Zhongshan Pavilion is deemed a key cultural relic and is therefore owned and used by the government. Because of this particular government's role in constructing the memorial site of Zhongshan Pavilion, the narrative constructed is largely based on the government's interests.

In this independent photogrammetry project, the 3-D model of Zhongshan Pavilion I created is free to download on Sketchfab, one of the major 3-D model websites. The open-access nature of this digital 3-D model of the pavilion enables the narrative to be represented differently. As discussed above, the narrative in the first-floor exhibition space of the pavilion focuses mainly on the opposition between the native and the foreign, and between democracy and feudalism, for the purpose of constructing a patriotic education site. This narrative curated in the first floor recontextualizes the memory around the building. How the Wenxi Fire of 1938 was initiated, why the government tried to execute the scorched-earth policy, and how this fire was started as a mistake are not preserved in this space. Zhongshan Pavilion as a physical memorial site is repositioned in an artificial narrative. The background of the 3-D model is like a green screen, and it can be replaced by any virtual space. Therefore, the Zhongshan Pavilion can be repositioned in different environments for creating different narratives. The context of the digital model can be easily manipulated with the convenience of digital tools. Photogrammetry models can be situated in different contexts and offer new

meanings detached from the original historic circumstance. This repositioning gesture puts into question the notion that memory is authentic and instead suggests that it can be manipulated to match the context in which it is being used.

The practice of repositioning is very prominent in emerging spatial computational media, such as virtual reality, augmented reality, and mixed reality. For instance, users can use an AR program, such as Spark AR by Facebook, and bring the Zhongshan Pavilion into their lives. Users can interact with the virtual Zhongshan Pavilion in real time, while more advanced users can bring the pavilion assets into game engines, such as Unity or Unreal Engine, and make their own VR projects.

One example of repositioning Zhongshan Pavilion in VR is my *Hymn to the Fallen*. In this VR project, audiences can fly through different spaces that are infused with photogrammetried buildings, archival images, video footage of the Wenxi Fire, and interviews with survivors. In this multilayered space, Zhongshan Pavilion is used as a trace or witness of the fire, but the narratives are formed by multiple, heterogeneous contexts and experiences. My 3-D model of the pavilion is repositioned in this artistic VR project for retelling and reproducing a nonlinear memory of the Wenxi Fire. Because I published the model online for free, other people may use the model for their own purposes. They can reposition the structure in their own virtual environment, which cannot be controlled by me or the state. Utilizing the 3-D model in this way is different from the memory reproduction in the physical site of Zhongshan Pavilion. In this photogrammetry project, the hundreds of images converge together as one singular 3-D model, and this singular form can be repositioned by people who can create their own moments with many possibilities.

Virtual is not the opposite of the real. In Pierre Levy's book *Becoming Virtual*, virtuality is a potentiality: "The virtual is by no means the opposite of the real. On the contrary, it is a fecund and powerful mode of being that expands the process of creation, opens up the future, injects a core of meaning beneath the platitude of immediate physical presence."²⁹ The digitalized 3-D model of Zhongshan Pavilion is more than a simple mimic; instead, it opens doors in reproduction. These new possibilities enable new stories, new memories, and new identities surrounding the pavilion. This photogrammetry project is more than a critique of the failure of memory preservation of Zhongshan Pavilion. It opens a new approach in retelling and reproducing narratives about the past in an immersive environment. This new space is not fixed and structured; rather, it is an expansion of the physical site. The virtual 3-D model provides the vitality of memory preservation in differentiation from the singular voice promoted in the physical site. Repositioning is not the enemy of memory preservation but instead offers other forms

and energies in representing the past. The Wenxi Fire of 1938 is not well known even to people born in the city. This is not because the memory is not preserved in the collective space but because its heterogeneity is obscured. Photogrammetry not only provides an opportunity to archive and preserve the architectural structure but also has the potential to energize the vitality, heterogeneity, and potentiality of memory construction.

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Notes

¹ *Wen* means the date of the day based on the Dai Ri Yun Mu (代日韵目), which is a dating system used in the telegraph since the Qing Dynasty in China; *Xi* means evening in Chinese.

² John Fairbank and Merle Goldman, *China: A New History* (Cambridge: Belknap Press, 1998,) 320.

³ Wei-chen Yang, "Revisiting the Case of the 1938 Changsha Blaze Incident," *Academic Historica* 33 (2012): 42.

⁴ Ibid.

⁵ Ibid., 36.

⁶ Zhongchi Tan, *Changsha History* (Changsha: Hunan Education Publisher, 2013), 962.

⁷ Edward Casey, "Public Memory in Place and Time," in *Framing Public Memory*, edited by Kendall R. Phillips (Tuscaloosa: University of Alabama Press, 2004), 29.

⁸ According to Edward Casey, social memory is in the internal circle of public memory, while collective memory is in the external circle; in this essay, I rephrase it as public memory, rather than distinguishing the differences among them.

⁹ Casey, "Public Memory," 22–23.

¹⁰ Karen Till, *The New Berlin: Memory, Politics, Place* (Minneapolis: University of Minnesota Press, 2005), 14.

- ¹¹ Ibid., 24.
- ¹² Gaston Bachelard, *The Poetics of Space*, translated by Maria Jolas (Boston: Beacon, 1994).
- ¹³ Brian Ladd, *The Ghosts of Berlin* (Chicago: University of Chicago Press, 1997), 7–20. <https://doi.org/10.7208/chicago/9780226558868.001.0001>.
- ¹⁴ D. P. McAdams, *The Stories We Live By: Personal Myths and the Making of the Self* (New York: Morrow, 1993), 28.
- ¹⁵ “The Story of Zhongshan Pavilion as ‘Standard Time’” (中山亭‘标准钟’的故), xinhuanet.com, last modified June 21, 2013, http://www.hn.xinhuanet.com/2-013-06/21/c_116234341.htm.
- ¹⁶ Michel Foucault, “Of Other Spaces,” *Diacritics* 16 (Spring 1986): 27. <https://doi.org/10.2307/464648>.
- ¹⁷ Jianyong Liu, “The Must-See Exhibition: I Have Stared at You for Eighty-Six Years” (这个展览值得看：它已经注视我们86年了), *Chenbao Weekly Magazine*, last modified October 19, 2016, <http://chuansong.me/n/996645145053>.
- ¹⁸ Haibo Liu, “The History of Zhongshan Pavilion and Zhongshan Memorial” (长沙中山亭、中山纪念堂小史), txhn.net, last modified June 26, 2012, http://txhn.net/hnfw/xzcsjy/changsha/201206/t20120626_18253.htm.
- ¹⁹ Paul Connerton, *How Modernity Forgets* (Cambridge: Cambridge University Press, 2009), 45. <https://doi.org/10.1017/cbo9780511627187>.
- ²⁰ Jennifer A. Jordan, *Structures of Memory: Understanding Urban Change in Berlin and Beyond* (Stanford, CA: Stanford University Press, 1996), 11.
- ²¹ Xian Fa (1982) (P.R.C.), *Xinbian Zhonghua Renmin Gongheguo Changyong Falü Fagui Quanshu* (2014), 1, English translation available at Westlaw China (by subscription).
- ²² Translated by the author.
- ²³ Dominick LaCapra, *Writing History, Writing Trauma* (Baltimore: Johns Hopkins University Press, 2014), 24.
- ²⁴ Xiaodong Ouyang, *Hunan Old Streets* (Changsha: Hunan Wenyi, 2012), 100.
- ²⁵ Wu Hung, “Monumentality of Time: Giant Clocks, the Drum Tower, the Clock Tower,” in *Monuments and Memory, Made and Unmade*, edited by Robert Nelson and Margret Olin (Chicago: University of Chicago Press, 2003), 107.
- ²⁶ Alois Riegl, “The Modern Cult of Monuments: Its Character and Its Origin,” translated by Kurt W. Forster and Diane Ghirardo, *Oppositions*, no. 25 (Fall 1982): 21–51.

²⁷ Toni Schenk, *Introduction to Photogrammetry* (Columbus: Department of Civil and Environmental Engineering and Geodetic Science, Ohio State University, 2005), 8.

²⁸ Marianne Hirsch, “The Generation of Postmemory,” *Poetics Today* 29, no. 1 (2008): 103–25. <https://doi.org/10.1215/03335372-2007-019>.

²⁹ Pierre Levy, *Becoming Virtual* (New York: Plenum Trade, 1998), 16.