Virtual reconstruction of a ghost disco: the Woodpecker in Milano Marittima

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Abstract. Conservation and restoration of cultural heritage and protection of abandoned buildings is possible using new technologies in order to create a knowledge base to maintain the original condition of buildings as long as possible. This paper presents the digital geometric survey, combining photogrammetry and photogrammetry with drone for the documentation of a building located in the *Riviera Romagnola*. The fundamental task to survey historic buildings, in order to document their geometric and morphological features with very high accuracy, becomes an important incentive for the use of innovative hybrid approach. The building case study is the *Woodpecker* nightclub built in 1966 and abandoned in 1970 due to a fire that devastated the structure.

1. The abandoned *"dancing"*

In the heart of Milano Marittima (Cervia), the former disco Woodpecker stands in a state of total abandonment. From an aerial view it almost looks like a paranormal creation inspired by the crop circles drawn by aliens.

The nightclub, wanted by the De Maria family, was designed by the architect Filippo Monti and built in 1966. Filippo Monti was born in Faenza where he spent his childhood, marked by the experience of war. Monti graduated from the Technical Institute for Surveyors in 1947 but soon realized that he wanted to continue his studies. Passionate about painting and drawing, between 1947 and 1948 he attended courses in graphic design and painting at the school of Arts and Crafts in Faenza.

Later he enrolled in the Faculty of Architecture at the University of Florence where in 1954 he graduated with a master thesis on a velodrome covered with tensile structures [4].

Back in Faenza, from 1954 to 1963 he taught and produced his first works, but it was in the period 1964-1971 that he developed his qualities as a designer of plastic architecture, creating several works, including the Santa Margherita residential complex in Faenza and the Woodpecker nightclub in Milano Marittima, which is the subject of this study.

The Woodpecker, abstract and minimal, represents a seal to the continuity between earth and sky, open and closed, visible and invisible.

The place, born as a dance hall intended for an elite audience, consisted of a ring with a platform covered in yellow Siena marble, cut out by circular shapes surrounding small communicating lakes. A prominent element of this venue was the dome, which housed the dance floor, which still exists (figure 1, figure 2).

Figure 1. The Woodpecker nightclub in 2021.

Figure 2. The Woodpecker nightclub and the interior of the dome in 1968.

The umbrella dome is composed of 23 ribbed fiberglass sails with steel profiles. The innovative combination of materials together with the sinusoidal shapes of the sails were an extremely innovative choice for the time, so much so that their realization was entrusted to the shipyard of S.I.P.L.A. (*Società Italiana Lavorazione Plastiche e Affini*), the nautical industry at the time was the only one equipped with appropriate technology for the required processing. Other examples of this type of reinforced concrete structure cannot be found in the literature. The supply of the steel profiles of the structure and their assembly was, instead, entrusted to Fabbri Ferrai, an engineering company specialized in frames. The dome, which housed the dancing room and a small bar, is a portion of the sphere with a diameter of 16.4 m and a height of about 9.6 m. Each arch is 2.08 m wide and 2.25 m high.

Over time, the fiberglass that externally covers each segment has taken on a yellowish color and is currently covered by moss and lichen while the resin that covered the uprights of the arches is now flaking and degrading, leaving exposed metal boxes that, weathered, have oxidized.

Today, digital survey techniques provide valuable tools and technologies in the field of three-dimensional metric survey for continuous documentation of Cultural Heritage [2].

Considering the risks to which the built heritage is subject, especially for the abandoned buildings, it is necessary to have a 3D digital model that can be used as a working basis for the hypothesis of intervention.

2. Data acquisition

Nowadays, modern architectural surveys are mainly based on two modeling methodologies, the first one is a range-based technique and the second one an image-based technique [5].

In the specific case of the Woodpecker, the interest of the survey is mainly aimed at the strict geometric definition of its shapes, with particular regard to the 23-segment dome.

The 3D data acquisition of the nightclub was carried out by means of a photogrammetric survey, with terrestrial and drone images acquisition.

The terrestrial acquisition was performed with the aim of generating a whole coverage of the dome, while the drone acquisition was performed to acquire images of the top of the dome and the geometry of the water bodies. In this way, using images captured from different viewpoints, it was possible to obtain a complete coverage of the images of this mystical architecture.

The survey was based measured by means of the Canon EOS600d camera and the Mavic Pro-DJI drone (figure 3).

Figure 3. Part of the survey campaign with drone.

The combination of different techniques, which can be developed individually or combined in hybrid techniques, allows today to acquire more precise data for modeling [1]. With the point clouds obtained by processing the images acquired by these instruments, it is possible to obtain geometric and colorimetric information, thus being able to have a model that defines the state of the structure to be used as a basis for design or maintenance of the work [6]. In this way it is possible to constantly check the update of all the information concerning the structure and operate as needed [3]. The favorable condition in the drone photography is related to the space completely free of buildings around the structure. Particular attention was paid in not interfering with vegetation and trees.

3. Point cloud generation

The processing of the images acquired by drone and terrestrial acquisition was carried out through the new release of the Agisoft Photoscan software: Agisoft Metashape. Thanks to this software it was possible to obtain polygonal models and a model composed of Tie Points [8]. First the sparse cloud was generated, then the dense cloud.

Then the reference and scaling of the model was done by means of measurements or known points recollected in the field, with creation of mesh and projection of the HD oriented image onto the obtained mesh model [7]. The number of images that were processed in Metashape for the creation of the dome are 82 terrestrial photographs and 143 aerial photographs (figure 4).

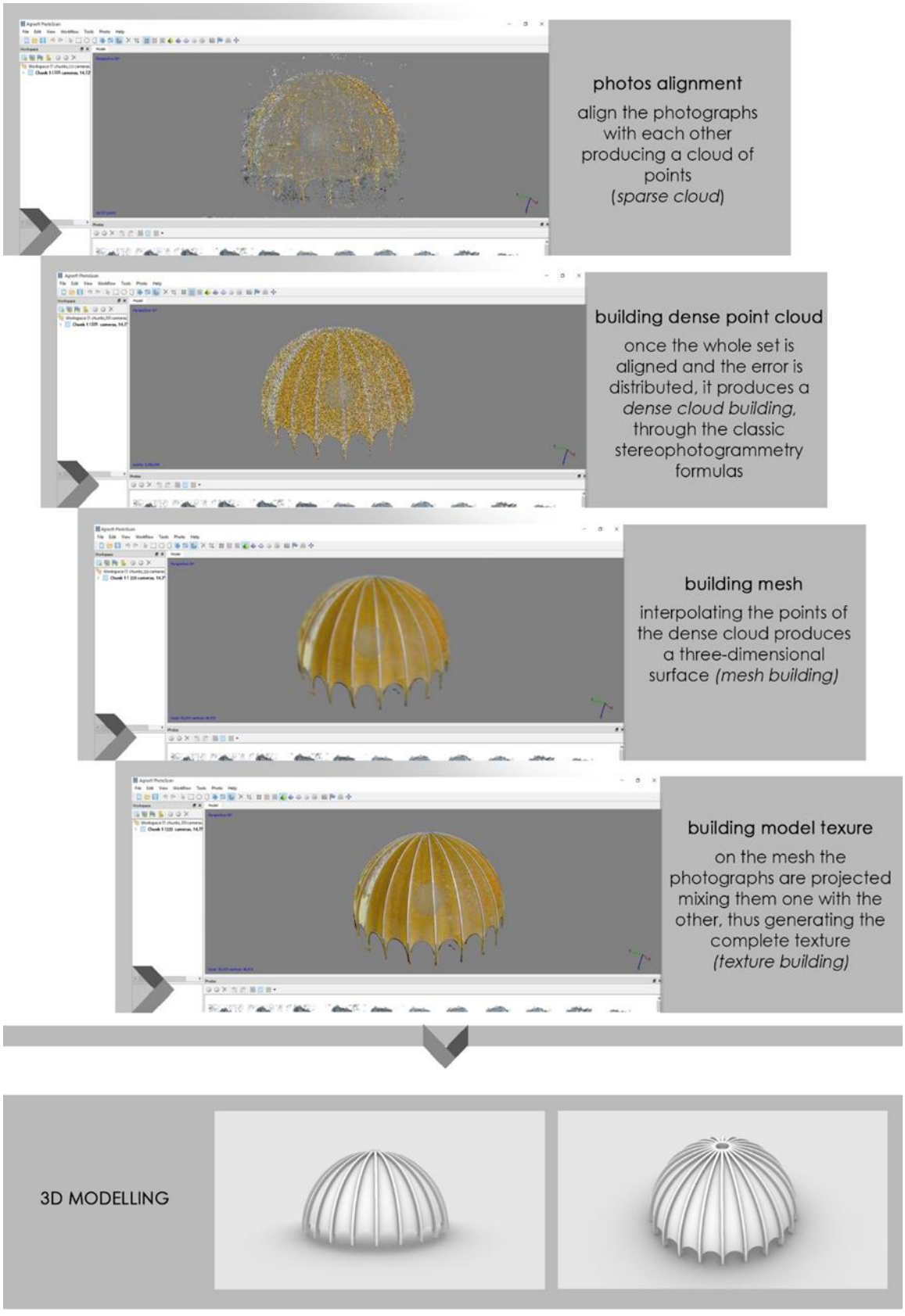

Figure 4. Modelling Process.

4. Conclusion

This paper focuses on the survey of dome structure and its surroundings. This experience shows that terrestrial acquisition and UAV acquisition and automated 3D image modelling represent an effective way to achieve fast and accurate results.

Proper flight design is needed for terrestrial and UAV acquisition are crucial to obtain a photogrammetric model with good image overlay [9].

This technology is cheaper than laser-scanning surveys due to the use of non-metric cameras and the use of automated software for processing, which minimizes human intervention [7].

The model created in addition to the possibility of being used as a design basis for future use of the dome and the surrounding spaces (figure 5) can be used as a potential basis for the implementation of a structural model for the structural safety assessment [10].

The accuracy of the images is such that surface degradation phenomena can be identified and mapped, a useful basis for future restoration work.

This study is the starting point for the creation of a useful model for the renovation of this complex of great potential. Digital modelling becomes essential to design a second life for abandoned places.

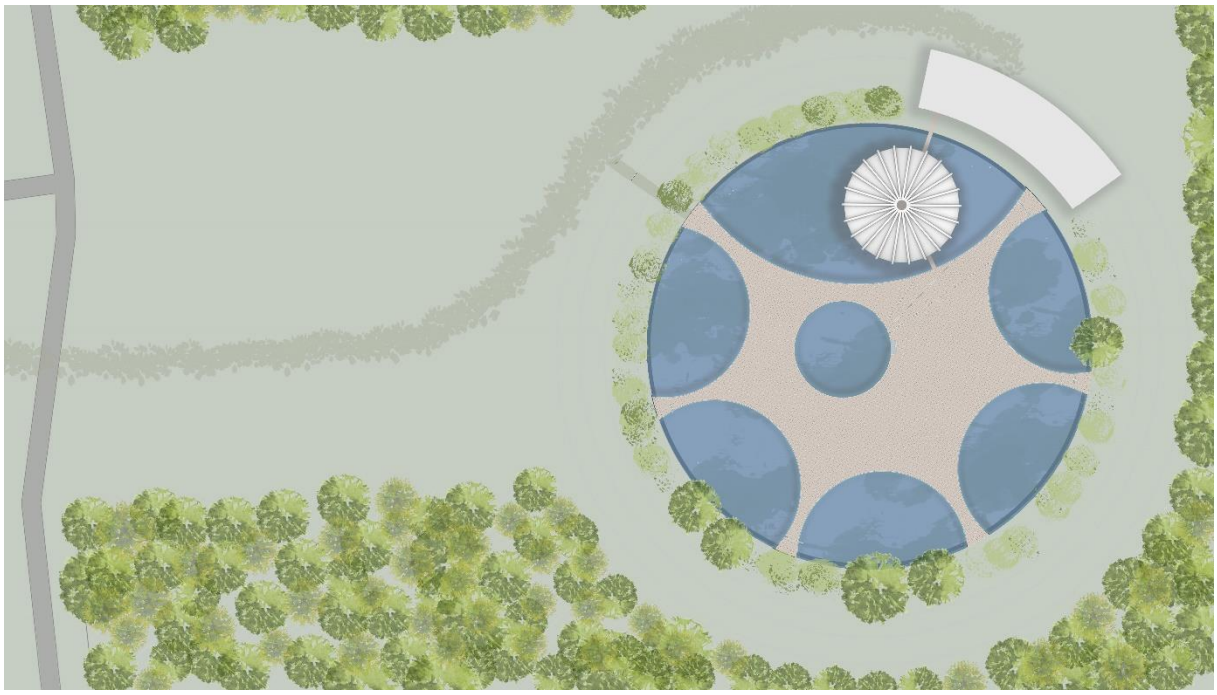

Figure 5. Insertion of the model within the context.

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