DIGITAL PARTICIPATION AND HERITAGE DOCUMENTATION: AN INTERFACE FOR SURVEYING ATTRIBUTES AND VALUES OF ARCHITECTURAL RUINS IN LARANJEIRAS, SERGIPE, BRAZIL

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ABSTRACT:

In the 21st century, participation is a key factor for ensure effectiveness of safeguarding culturally significant buildings. Integration of local communities in the process of architectural conservation is seen as complex task, but also an excellent strategy to avoid top-bottom processes – "made by experts" – that tend to fail more often. Recording heritage buildings often need some level of expertise but also tend to support biases, in which the "expert" operator might reproduce his perception away from the values acknowledged by the different communities that live and support the heritage itself. This paper presents a prototype of a digital interface designed to record the values' perception of derelict buildings of Laranjeiras' heritage site, an 18th century urban settlement classified since 1996 and valued as a Brazilian national heritage by its architecture and historical significance in the Cotinguiba river basin in the State of Sergipe. The project used as a case study the ancient "Cinema Iris", a popular building in the main street ("calçadão"). The methodology adopted the following procedures: 1) Survey; 2) Pre-selection of material attributes; 3) Integration; 4) Data collection; 5) Evaluation. As a primary product, yet to be perfected, the creation and application of the digital interface gave attention to the need for an integrated survey database of Laranjeiras' ruins as perceived by the local community. Turning them into a collection of balanced values, the interface proved to be a positive tool to support the development of further conservation actions (design, management, and monitoring) in the heritage site.

1. INTRODUCTION

To contemporary architecture, participation has become an unavoidable topic to develop efficient processes for designing a building or planning an urban environment. Under participative methods, design decisions become more "horizontal", bridging social diversity, and allowing the introduction of complexity by prioritizing user's demand-responses in the proposed solutions (De Carlo, 2005). Therefore, in the 21st century, powered by current conditions of material scarcity (Till and Schneider, 2012), architecture creation is abandoning traditional concepts of artistic ability and reaffirming it as a capacity to seize, manage and cope with community demands. However, despite these statements, a contemporary range of methods are driving the use of the topic in different ways (Alivizatou, 2019), while participation "has become a focus of debate among academics and practitioners in very diverse fields" (Harder, Burford and Hoover, 2013, p. 41).

In Heritage Studies, participation is a key factor for ensure effectiveness of safeguarding culturally significant buildings (Rossetti et al., 2022). Integration of local communities in the process of architectural conservation is seen as a complex task, but also an excellent strategy to avoid top-bottom processes that tend to fail more often. As a tool, participation engages crucial procedures of heritage awareness and careful maintenance actions while awakening community belonging as means of subjective well-being (Ateca-Amestoy, Villarroya and Wiesand, 2019).

It is always important to remember that cultural heritage are significant sites, buildings, landscapes, among others, that embody the values attributed by a given community. However, in the process of developing a conservation design, recording heritage buildings are often made by "expert operators" – nowadays with more and more cutting-edge drones or laser scanning machines. Thus, heritage documentation, as a core cognitive process of understanding building complexity (Marino, 1990), might dangerously support biases when the operator's perceptions lead survey campaigns, in some cases involuntarily away from the values attributed by the people that live and support the permanence of significant assets.

So, to ensure the desired effectiveness of conservation design, how participation can also be integrated and experienced into the processes of heritage documentation?

1.1 Objectives

This paper presents a prototype of a digital interface designed to record the values' perception of derelict buildings of Laranjeiras' heritage site, an 18th century urban settlement classified since 1996 and valued as a Brazilian national heritage by its architecture and historical significance in the Cotinguiba river basin in the State of Sergipe, Brazil.

The work is a result of the research project *"HOSP: discreto e participativo no existente" (HOSP: discreet and participative in the existence)*, which had the purpose to discuss participation

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strategies of design into pre-existing features in heritage scenarios (Galvão, 2022). This paper describes how the interface was built, combining different digital methodologies and coding strategies, using as a case study the ancient "Cinema Iris", a popular building in the main street of Laranjeiras, currently an "urban void" with archaeological remains. The paper has the purpose to discuss limits and possibilities of digital platforms on engaging local communities for recognizing heritage environments.

2. ATTRIBUTES AND VALUES OF LARANJEIRAS, SERGIPE, BRAZIL

2.1 Context and Site Assessment

Selected as a general context to debate these issues, Laranjeiras is an 18th century urban settlement valued as national heritage by its architecture and historical significance in the Cotinguiba river basin in the State of Sergipe, Brazil (*"Conjunto Arquitetônico e Paisagístico de Laranjeiras"*, Listing Process n. 1288-T-89, listed in 1996). At the time, the river offered the most efficient contact with the exterior, making possible the development of an urban environment built to export the sugar production of nearby plantations. This generated economic revenues and outstanding cultural importance in the 19th century recognizable in some streets, buildings, squares and riverfronts that still preserve picturesque aspects and views of Portuguese colonial typology. The listed area frames almost 500 buildings in the urban centre, configuring an organic landscape based on views associated with roads leading directly towards the river margins while naturally defining public open spaces.

Since 2009, the city houses the Laranjeiras' Campus of the Federal University of Sergipe, an institutional intervention in the urban heritage site proposed by the *Programa Monumenta* in 2006 and developed by the National Institution of Historical and Artistic Heritage (IPHAN) with urban regeneration purposes. In Laranjeiras, interventions were carried out in several buildings, and 7 of them in an advanced state of abandonment were combined to develop the new campus.

As already widely diffused in the literature (Brendle, 2017; Nery and Baeta, 2022), the initial strategy of the project was to transform what was called "ruins" by heritage experts and develop participative practices with a strong artistic *quilombola* community in the city. The equipment would invite the local population to use the pre-existing space, towards the development of an academic environment that they could enjoy. However, after the deconfiguration of the original project and building's design by political demands aiming full reconstructions, superficial adaptations of cultural events and the abandonment of less interesting buildings from 2006 to 2009, the campus turned to be a scenographic and socially isolated place, denying the heritage value as daily assessed by the locals and diminishing the possibilities of engaging new forms of attribute's recognition.

The discussion was, in fact, caused by the difficult conceptions of the term "ruin" as perceived by government, university managers, experts and locals in the city. As heritage experts regarded the positive aesthetical values stated by History of Art, using theoretical statements as design criteria to be followed and respected, a strong common ground stating the negative functional values of misuse and degradation to be erased prevailed in several examples (Almeida, 2022). Under these polarities, sometimes is also given space to misconceptions of "urban void" that ambiguously denies the presence of building's remains or enforce the depreciative observation of degradation. In both cases, the perception of actual materiality documentation, balanced by the values of different stakeholders with interest in regenerating derelict buildings, is often ignored to fulfill case by case design prejudices (Freitas, 2019).

With an attentive awareness of this ontological problem, how one could collaborate? Also, to what extent perceiving and documenting (or not) the site influence(d) these questions?

2.2 A Prototypical Interface

In order to explore these issues under a conservation design perspective, "HOSP" was a prototypical interface developed by Pablo Galvão to engage the digital participation in the heritage site of Laranjeiras.

The interface was an idea developed to bridge the complexity of the abovementioned questions, as were discussed into a preparatory discipline called "Contemporary Theories of Intervention on Built Heritage". The discipline provided a theoretical and practical framework to disseminate methods and exercise strategies of conservation design on pre-existing features (Freitas, 2023). The project (and the discipline) used as a case study the ancient "Cinema Iris" (Figures 1 and 2), a popular building in the main street of Laranjeiras ("calçadão"). As the beginning of the COVID-19 pandemics made urgent the forced isolation and the need for rapid digital integration, digital systems became interesting ways to gather site feedback and build resilience.

Figure 1. Laranjeiras' heritage site, 2022 (Galvão, 2022).

Figure 2. Ancient "Cinema Iris" ruin, 2022 (Galvão, 2022).

Digital platforms or other systems of digital participation are not actually new in architecture. Since 1960's, they are positive tools to provide radical changes in architect's position, enabling

different forms of co-creation. According to José Sanchez (2019, p. 29), “platforms have become a central medium to socialise complex simulations including architectural design. They offer the capacity to profoundly change the dialogue that architects are able to establish with a client or audience”.
So, the interface was planned to respond 3 topics of concern, conceived as steps to achieve better participation processes:

1) *Presentation*: a step for enabling the presentation of classical dissemination of physical documentation, as catalogued in archives and available under traditional bibliographical research. This also have the purpose to provide awareness and qualify social and historical values, as would be important to heritage experts and government authorities (Figure 3).

2) *Assessment*: a step for enabling collective assessment of attributes and values of an existing site, where a group of users of the community can select (in the platform) what they consider significant, as would be important to locals on explaining what they think about the place, without judgement and prejudice.

3) *Design*: a step for combining actual responses of collective assessment from both previous steps, gathering common information for enabling (or avoiding) users to create interventions inside the “void/archaeological space”. To provide engagement, a set of predefined modules and parts was developed, as a way of testing interactive design.

This paper details overarching aspects and assessments of step 2. A second paper is being planned to describe and provide results of step 3.

Figure 3. Interface in *Presentation* mode (Galvão, 2022).

3. METHODOLOGY

The methodology adopted the following procedures: 1) Survey: 1.1) drone photography; 1.2) sparse point cloud producing; 1.3) dense point cloud development; 1.4) meshing. 2) Pre-selection of material attributes: 2.1) analysis of the site; 2.2) classification of attributes. 3) Integration: 3.1) development of digital framework; 3.2) organisation of presentation data and interface; 3.3) test of usability and user experience. 4) Data collection: 4.1) field application on attributes’ recognition; 4.2) coding user experience; 4.3) organisation of survey results. 5) Evaluation.

3.1 Survey

In order to allow a detailed analysis of the space in its most recent condition, and due to the difficult access, a photographic survey was carried out, using the DJI Mavic Pro drone, which generated 322 images from two different flights (Figure 4). The first considered the “double grid” plane, and the second a “circular” plane. These images were processed in approximately 72 hours in the Agisoft Metashape photogrammetry processing software, following these steps: 1) creation of a sparse point cloud (containing 74,144 points); 2) creation of a dense point cloud (with 20,774,395 points); 3) creation of a three-dimensional model (with 4,154,879 faces).

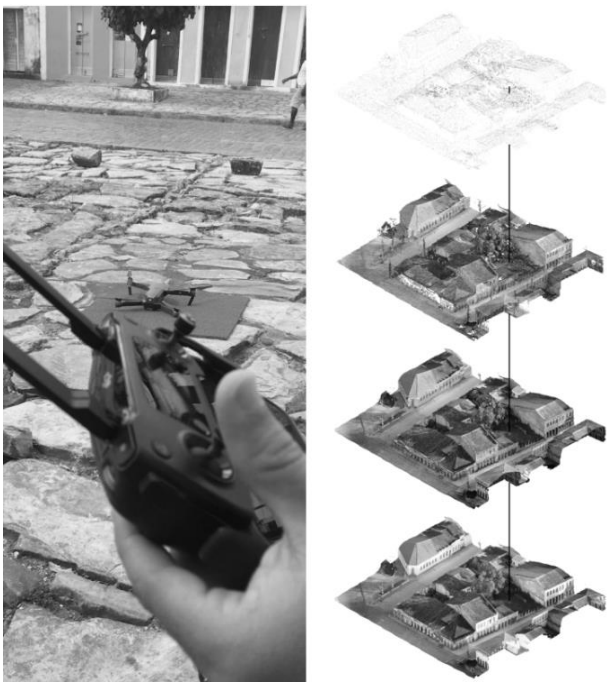

Figure 4. Survey procedures (Galvão, 2022).

Sparse and dense point clouds are steps in the processing of georeferenced photographs: the software is able to define points in space that represent a portion of the information; the more points processed, the closer the cloud will be to represent the real space. From the dense cloud it was possible to produce a mesh that generated a highly detailed three-dimensional model of the built space, suitable for analysis purposes.

3.2 Pre-selection of material attributes

The digital model obtained through the photographic survey enabled a precise analysis of the site. However, considering the objective of the work, discussion was made about which level of participation a user could achieve with the 3D mesh of the site. It was decided that a pre-selection of material attributes, conceived as “UR” – recognizable units – would be enough for the development of the platform and to gather precise information of user’s interaction and, therefore, with the space.

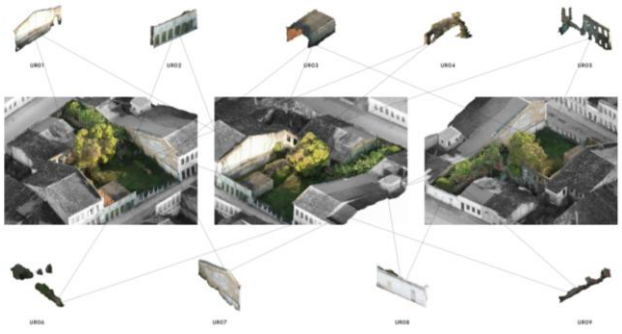

Figure 5. Pre-selection of material attributes (Galvão, 2022).

However, as operator bias was one of the most important topics to avoid, this pre-selection (Figure 5) was understood as a maximum participation level on assessing the site between "placation" and "partnership" (Arnstein, 1969), to gather data about local population perception of building remains. Further studies must be conducted to achieve different participation levels (see discussion on item 4).

Nine elements were isolated. They were selected based on the presence of historical materiality in its remaining structures:

Attribute UR 01 is a left side wall with traces of constructive elements of a derelict building.

Attribute UR 02 is a façade section facing the sidewalk, with height and fenestration similar to the neighbouring buildings of Laranjeiras' main street.

Attribute UR 03 is a structure with characteristics that differ from the materiality of the rest of the ruin.

Attribute UR 04 is a set of thick ruined walls, and with sections of visible stone material.

Attribute UR 05 is a stone wall indicating the existence of two floors, and a fenestration similar to that of the urban complex.

Attribute UR 06 is a set of walls in a state of disrepair close to the floor and covered by vegetation.

Attribute UR 07 is the right lateral wall with markings of constructive elements of a ruined building.

Attribute UR 08 is a façade section similar in shape to the urban complex, indicating paint interferences.

Attribute UR 09 is a set of ruined stone walls containing dense vegetation.

These nine elements were pre-analysed and chosen to make them "clickable" in the interface.

3.3 Integration

Respecting the abovementioned steps 1 and 2, the interface was organized in two main parts: first, the user is introduced to the space and informed about the importance of assigning social functions and preserving unused spaces in the city (step 1); then, they are able to click on the historical elements of the space on the three-dimensional model of the ruined building, and then assign them possible and desirable uses (step 2).

The organization of the interface was transformed into a functional platform using Unity, a 2D and 3D game engine. The three-dimensional models of the ruin and the pre-selected attributes, coming from the photographic survey, were inserted into the platform, making them manipulable through of a total of 11 scripts in C#, an object-oriented programming language (see Appendix).

The scripts control a series of functions within the interface; the management and export of user information, the data insertion panels, and the attribute selection routine, and the selection of camera angles for visualizing the ruin.

Thus, the user was able to interact with the space and the attributes chosen from the interface, performing their analysis of what is observed and perceived within the stipulated limits, as well as their suggestions and desires regarding the present and future of the historic space (Figure 6).

Figure 6. Interface for attributes' recognition (Galvão, 2022).

3.4 Data Collection

The developed interface was put to the test in November 2021 in the city of Laranjeiras, Sergipe, Brazil. Due to ongoing restrictions of COVID-19, only five residents were invited to use the tool (Figure 7). Onsite activities were needed due to the fact that Laranjeiras is a city with low digital education. The interface could be placed in an online system, however, due to site condition, it could not achieve secure results.

So, the interface included a script that stored the information provided by users in text files (.txt). The information contained in these files was entered into a database, allowing quantitative analysis.

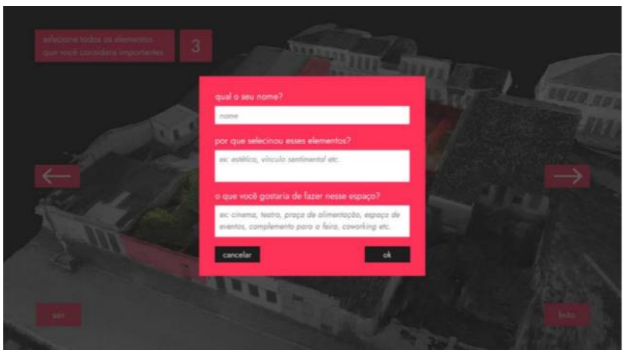

Figure 7. Interface for free data collection (Galvão, 2022).

3.5 Evaluation of Results

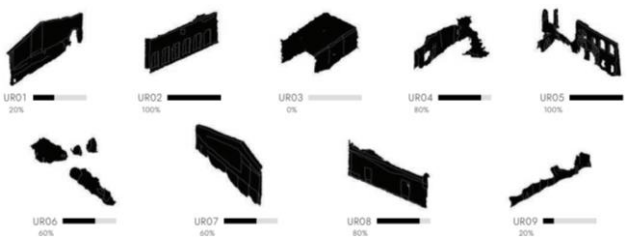

Figure 8. Most valued UR's results (Galvão, 2022).

The recognition of the existing space from the selection of pre-selected attributes reinforced the experts' analysis. The results (Figure 8) showed the preference of items with high historical value such as the UR 02 and UR 05, followed by UR 04 and UR 08, justified by the similarity patterns present in the urban

composition. This result highlighted the possibility of reading historical material based on a collective analysis, which can serve as a criterion for the required interventions. However, as also a protype, it cannot be used as means of validation.

4. DISCUSSION: LIMITS AND POSSIBILITIES

Based on the work entitled "HOSP", the prototype developed sought to integrate issues related to participation, heritage preservation and design processes, using a digital interface as a resource.

One of the main challenges faced during this work was the impossibility of establishing an approach with many participants to use the interface due to the COVID-19 pandemic. This limited the creation of a more consistent database for evaluation. However, it is important to emphasize that, in a context with a greater number of users, it would be possible to collect more diversified and, therefore, more representative data.

Another important point is that the interface was built as a desktop application, accessed by the operating system. A second version based on a web application may be more efficient as it is more accessible, faster and allows for cloud-based real-time data collection. This would enable the creation of a complete and more up-to-date database, which could be used as an information base for future documentation processes.

The attribute pre-selection stage was part of a "vertical" decision process, limited by the expert. A system upgrade could allow all remaining attributes of the space to be "clickable", further provoking the user and enabling the collection of richer and more diverse data. Furthermore, the implementation of a specific taxonomy of values (Tarrafa Silva and Pereira Roders, 2012) could expand the results, enabling a more comprehensive and detailed analysis of the existing space.

Finally, it is important to emphasize that the advances in the presented interface can guarantee even more efficient results, including transforming it an output for design processes. In addition, the possibility of a digital system for documenting what exists can have a series of other applications and scales, such as the analysis of pathologies in a building, the recognition of city assets and the elaboration of urban spots with heritage assets, among others.

So, new studies and improvements of the prototype interface should be carried out, with the objective of increasing contributing to the recognition and safeguarding of heritage. A more comprehensive and diversified collection of data, the possibility of more detailed analysis and the use of results as criteria for design processes are among the possibilities that can be explored and improved in future work.

5. CONCLUSION

As a primary product, yet to be perfected, the creation and application of the digital interface also gave attention to the need for an integrated survey database of Laranjeiras' ruins as perceived by the local community. The interface proved to be a positive tool to support the development of further conservation actions (design, management and monitoring) in the site.

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APPENDIX

The complete structure for the developed interface is Open Source and can be accessed through GitHub: https://github.com/pablogvao/hosp. A demonstration of its usage can also be seen in the Youtube video https://www.youtube.com/watch?v=vChiZYF-4AM.

Below is an excerpt from one of the Scripts developed, with functions that manage the selection of attributes within the interface:

```
using System.Collections;
using System.Collections.Generic;
using UnityEngine;

public class SelectionManager : MonoBehaviour
{
   [SerializeField] private Material _maskMaterial;
   [SerializeField] private Material _clickMaterial;
   [SerializeField] private Material _defaultMaterial;

   public Dictionary<string, bool> ElementStates { get; private
set; }
   private Transform _selection;
   public bool Selecting = true;

   private void Start()
   {
      ElementStates = new Dictionary<string, bool>();
      var elements =
GameObject.FindGameObjectsWithTag("element");
      foreach (var element in elements)
      {ElementStates.Add(element.name, false);}
   }

   void Update()
   {
      if (Selecting)
      {
         if (_selection != null &&
!ElementStates[_selection.name])
         {
            var selectionrenderer =
_selection.GetComponent<Renderer>();
            selectionrenderer.material = _defaultMaterial;
            _selection = null;
         }
         Ray ray =
Camera.main.ScreenPointToRay(Input.mousePosition);
         RaycastHit hit;
         if (Physics.Raycast(ray, out hit))
         {
            var selection = hit.transform;
            var selectionRenderer =
selection.GetComponent<Renderer>();
            if (selection.CompareTag("element"))
            {
               if (!ElementStates[selection.name])
               {
                  selectionRenderer.material = _maskMaterial;
                  _selection = selection;
               }

               if (Input.GetMouseButtonDown(0))
               {
                  selectionRenderer.material = _clickMaterial;
                  ElementStates[selection.name] =
!ElementStates[selection.name];
                  if (ElementStates[selection.name]) { _selection =
null; }
               }
            }
         }
      }
   }
}
```