Pinnettas: Traditional Shepherds' Huts of Sardinia. Geometry, Shape and Materials

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Abstract. The present contribution shows a summary of the results achieved during a research on traditional architecture of Sardinia. It analyzes the construction technique, architectural and landscape features of the *pinnettas*, the traditional shepherds' huts. The rural landscape studied still preserves several examples of this architecture, some of which still in use and characterized by constructive models that employ different materials and different technical solutions. The investigation also found a prevalent use of a model widely used in the Mediterranean that, set on a truncated cone shape, realize a dome (*tholos*) that recalls - with extraordinary typological continuity - the ancient Nuragic construction, fitting harmoniously into the landscape. A lot of these buildings are precarious and that drove the choice of a survey's methodology that could integrate traditional procedures and computer technology characterized by expeditious quick data acquisition process.

Keywords: Sardinia · Rural landscape · Architectural survey · Geometry · Materials

1 Rural Landscape and Sardinian Traditional Buildings

The Sardinian landscape preserves a very interesting drystone heritage of vernacular constructions linked to agro-pastoral activities that characterizes the island. It is represented by historical buildings organized through a skillful use of materials and traditional construction techniques in a tight dialectic relationship with the environment [1]. A historical heritage that is the *result of an immense deposit of work and planning skills of local communities and gives to the territory of the Island an unique character offering to the rural landscape a new centrality in which technologies and local materials, and their re-use as design tools, seems to be consistent with an eco-design approach and a contemporary art of building and living* [2]. The historical buildings still existing in the rural landscape of Sardinia shows different dimension, shape and function; in fact it is possible to find complex structures like rural houses related to permanent activities and - in the geographical area investigated by this paper and subject already to a systematic survey [3] - more simple buildings like *pinnettas and barracas* mainly for the exclusive use of the shepherds but sometimes in support to agricultural activities. First of all a shelter for tools, therefore a specialization of

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facilities for work, in which living is substantially a derived function. The shepard also uses this shelter not only for storage but also as a place to sleep and process the milk. Baldacci [4] - a geographer - according to construction type, subdivided into two categories the temporary shelters of Sardinia: the *pinnetta*, that we can find especially in the northern Sardinia, realized on a circular, semi-circular and elliptical plan, and the *barracca* a typical model of South Sardinia, characterized by a quadrangular plan. The *pinnettas* - togheter with the *barraccas* - represent one of the examples of the ancient drystone building tradition scattered individually, and sometimes in groups, along the open air work paths and included in the cultural heritage as defined by the Regional Landscape Plan of Sardinia (PPR).

1.1 *Pinnettas*: Traditional Stone Huts of Sardinia

The *pinnettas*, traditional buildings made of stone with lytic or wooden covering, offer an interesting repertoire of stylistic and constructive solutions and a chromatic pattern determined by the use of local stone. The repertoire offers models entirely made with the use of vegetal materials, with a stone base (which penetrates the ground about 0.70 m) and vegetal roof or entirely realized with stone where the elements that make the cover define a solution very similar to the *trulli* or, as Baldacci reminds us, to the Istrian *casite*. The structure of the *pinnetta* change in several areas of North Sardinia showing a prevailing use of circular shape adapted to the specific use and to the topography of the place. In fact, within the construction models used in the pastoral activity we can observe a very peculiar space: the so called *pinnetta de sos crabalzos* (the temporary dwelling of the goatherds) that present an additional space called *sa chirra* to accommodate the young goats that still must remain in their small enclosure and do not follow the adults in the pasture. The circular models are themselves distinguishable into two types: those constructed with a unique material, limestone or volcanic slabs, which allows the construction of the pseudo-conical dome using the same construction technique of Nuraghe (the ancient buildings of Sardinia) and of *Trullo* (a characteristic vernacular architecture of Puglia), and those constructed with a stone base and a vegetal conical roof ([5], p. 46). The construction techniques, which may be found in different regions of the island - and are common to different regions of Europe and the Mediterranean area - define a plan solution adapted with “special attention” to the places. This structures are realized sometimes next to the enclosure which delimits the properties or sometimes isolated, according to the topographical characteristics of the place and - in the case of exclusive agricultural or pastoral use - to the use of the plot of land (Fig. 1).

1.2 Territorial Survey of the *Pinnettas* of Planargia

The research begins with a territorial survey of a geographic area that conserve a rural landscape characterized by homogeneous construction models and a wide variety of lithic typologies that guides the use of construction materials and allows an interesting variety of colors.

Fig. 1. Building typology in geographical areas of northern Sardinia: Baronia (a), Meilogu (b), Planargia (c, d).

Many examples of *pinnettas* are still present in this area, some of them still in use and some ruined or incorporated in most recent buildings.

A first analysis of an interesting map realized by IGM (Military Geographical Institute) in the 1958 - a time when *pinnettas were largely in use* - allows to locate a big amount of these structures and make possible to identify them throughout a specific graphic code that includes "stone house, silos, hut and ruins". Then a comparison with the latest aerial surveys made it possible to easily locate the buildings represented in the map of 1958, carry out an audit *in loco* and observe many examples, some of which are still in use but mostly in a state of ruin and characterized by precarious static conditions.

Once completed the territorial recognition the investigation continues at two different scales of analysis: the scale of the landscape and scale of the architecture.

Starting from a first analysis of the landscape that hosts the *pinnettas,* the investigation continues with the identification of some sample cases and with the choice of the survey methodology most suitable for the architectural characteristics of the buildings and their accessibility, state of decay and in general for their static conditions.

The chosen method integrates the direct survey - first and important "direct contact" with the architecture - and photogrammetric survey that allows an quick reconnaissance (Figs. 2 and 3).

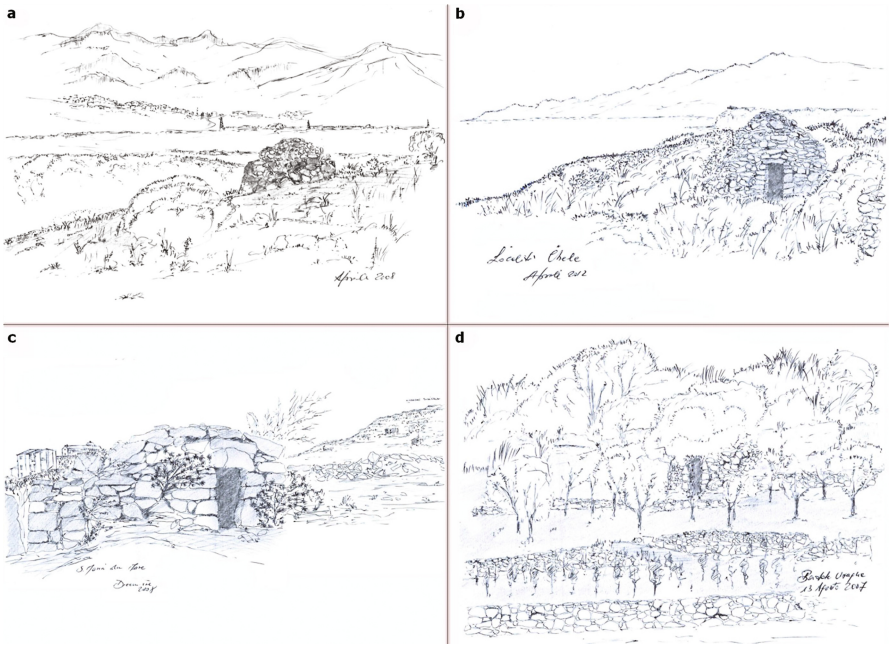

Fig. 2. Graphical representation aimed to the landscape components interpretation in which the contact with the reality and the value of the natural vision of the elements become decisive [6]. (a) Plateau landscape in the territory of Tresnuraghes. The pinnetta in basalt stone is realized next to the drystone-made boundary wall of the property. In the background the canyon drawn by the Mannu River, the small village of Sennariolo and the peaks of Montiferru's mountain; (b) Coastal landscape. First image: the pinnetta is positioned very close to the cliff. In the background the highest trachitic crests in the north of Bosa. Second image: pinnetta abandoned in the coastal village of Magomadas. In the background the early twentieth century church and the newer building of the '70 s; (c) Landscape of terraced hills. The Pinnetta is "hidden" in a agricultural property located in the territory of Magomadas.

1.3 Architectural Survey: Geometry, Shape and Materials

The survey method is applied on a building already present in the map of IGM (1958) and placed in a locality called *Chele* in the coastal territory of Magomadas (OR). The selected *pinnetta* is positioned on the cliff at a distance of 60 m from the coast line and built on the border that separates two properties where the ground is characterized by a height difference resolved through a stone ramp. The building is currently in non-optimal conditions; it is present an evident collapse in the sector facing the sea and exposed to the prevailing winds, and a decay of some constructive elements (as the stone lintel above the door).

The field operations start with a first graphical analysis of the landscape components, and go on with a direct survey with traditional instruments, a terrestrial photographic survey and an aerial photographic survey with the help of a drone (a special thanks to Salvatore Ganga) to acquire the images necessary to employ a

Fig. 3. Different materials used in some locality within the coastal Planargia of Bosa; (a) Badde Uraghe/San Nicola (Magomadas); (b) Santa Maria del Mare (Magomadas); (c) Lampis (in the north slopes of Magomadas); (d) Chele, in the seaside of Magomadas. The materials are the late Miocene sedimentary lithologies or ignimbrites of the cast-alkaline cycle oligo-Miocenic or the Pliocene basalts [7, 8].

photogrammetric software and realize digital models, a procedure already applied - using a scanner laser technique - for the study of the geometry in the case of Apulian *trulli* [9]. The post-processing of the data have producted a series of graphic models that completely represent the building and allows a study of its architectural features, construction techniques and static conditions.

The constructive model is given by the superposition of two rough stones volumes, a truncated cone with an outer diameter of 4.70 m as base and a cylindrical ring with a smaller diameter of 3.20 m as vaulted structure that present a intrados height of 3.10 m. The planimetric solution is defined by a circular shape with an internal diameter of 2.70 m which connects and completes a first segment created in support of the underlying rock in order to ensure a direct and stable support from which springs the basement.

The dwelling has a single access constituted by a slightly splayed passage with an internal width of 0.80 m, and an external width of 0.90 m, height of 1.40 m and oriented to the South at the opposite of the prevailing winds.

The material used is composed entirely of stones collected on site or close to it (Figs. 4, 5 and 6).

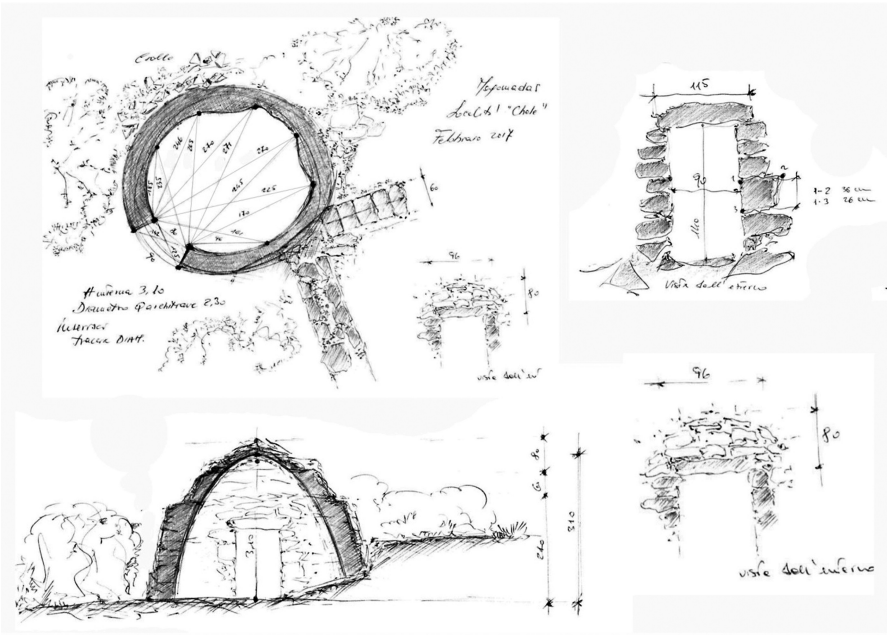

Fig. 4. Direct survey: sketches

Fig. 5. Constructive details: (a) relieving arch above the entrance, (b) inner part of the roof, (c) direct contact of the basement to the rock, (d) stone ramp.

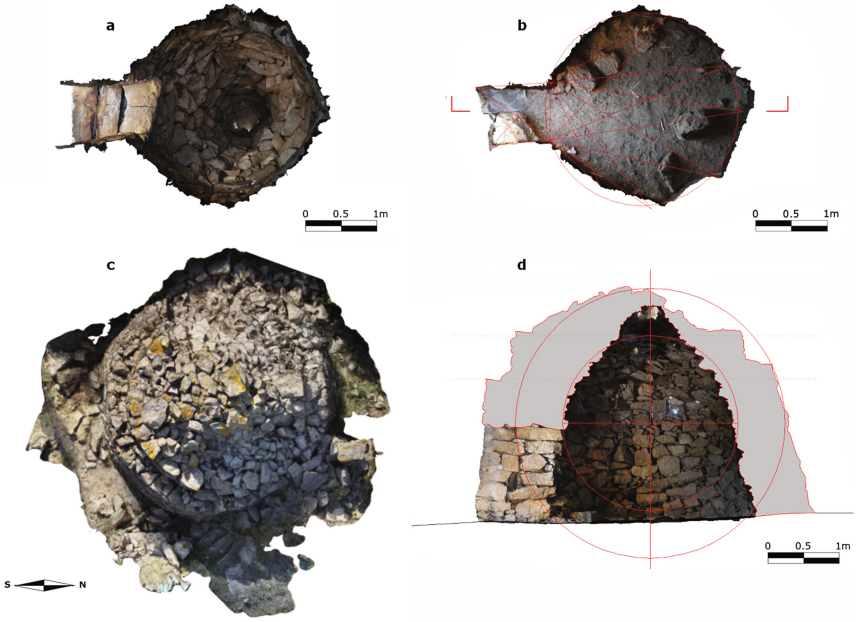

Fig. 6. Graphical models developed with the application of photogrammetric survey. (a) bottom view of the digital model (with the cracked lintel clearly shown), (b) plan at a +0.50 level from the ground and trilateration, (c) Ortophoto, (d) Cross section. The different representations highlight how the circular scheme was adapted to the ground and land conditions, shows the tholos structure, the different thickness of the masonry, the on-going collapse on the elevation facing the sea.

2 Results and Conclusions

The survey methodology adopted, consisting in a preliminary survey of the cartographic documentation, a reading of the landscape components and an architectural survey of a selected *pinnetta*, has given excellent results on different fronts of research.

The analysis of the places through "life drawing" showed the correct, harmonious - and sometimes hidden - insertion of this architecture into the rural landscape.

The quick procedure set on the integration between direct survey - required for an "indispensable contact" with the building and its architectural shapes - and photogrammetric survey allowed a rapid execution of metrics operations, necessary requirement in relation to the conditions of decay and the precarious stability of structures.

The survey methodology adopted allowed an in-depth knowledge of the dimensional, structural and geometric characteristics of the models employed for the realization of the *pinnetta*s and a first check of static conditions of some of its structural elements.

The planimetric solution appears in fact as the result of using a circular pattern adapted to the sites and the volume of the artifact is clearly, despite the presence of the collapses, a volumetric composition of a truncated cone and a circular ring.

The processing of the data offered by the 3D model also highlights the different thicknesses of the masonry used for the realization of the basement and the pseudo dome, shows a non-homogeneous curvature of the lower surface and allows a graphic reading of the original volume.

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