

Knowledge of Places: An Ontological Analysis of the Social Level in the City



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Abstract The present paper proposes to enrich standard methodologies to interpret places with information coming from other forms of place interpretation and description. We develop this proposal investigating geographical places since these are complex spatial environments well suited for the exploitation of different paradigms. The new approach we explore is based on ontological analysis. This approach, we believe, is very useful to integrate a cognitive stand within the traditional analytical and organizational views of complex spatial environments, in particular aiming to facilitate decision-making processes. The overall rationale of this paper is twofold. From the one hand, the introduction of ontological levels is rather useful for organizing the modeling of complex systems. On the other hand, while these levels are informative, our understanding of space cannot be reduced to the ontological elements per se since they lack the contextual perspective. Therefore, deeper studies and research are needed to develop formal frameworks that can completely integrate standard and ontological methodologies for general modeling purposes.

1 Introduction

Places are landscapes seen from far away, are cities lived from the inside, are cities imagined from the outside, are ecological ecosystems and much more. This richness of the notion has always been a challenge for the modeler which has available only limited methodologies and modeling techniques and, yet, is asked to identify and manage a large variety of information and viewpoints (Borri and Scandale 2005; Casey 1997; Cresswell 2004).

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We pick up this challenge by focusing our attention on *lived places*. To understand lived places one has first to develop a notion of physical place which in turn relies on a concept of space and a concept of place. Each of these concepts has different declinations and for each declination there is a possible definition. Still, none of them is simple and space here is not just a 3-dimensional geometrical entity (Ballatore 2012; Freksa et al. 2014). From a cognitive or design perspective, for example, space itself is something that develops and that changes with the agent.

Lived places are even more complex: at the same time an interpreted space, a reasoned space, a space that raises feelings, the result of an aesthetic fruition and so on. In short, a lived place is a space with multiple qualifications some of which depend on mental images, thus on agents with their architecture of cognitive processes. The essence of place lies in the quality of being somewhere specific, the knowing that one (the agent) is “here” rather than “there” (Rapoport 1977). For example, enclosure (or better the status of *being enclosed*) becomes an important aspect of the making of a place.

As said, we understand places mostly through cognitive contexts. We can interpret our being in a space as an objective proposition according to geometrical rules and topological boundaries. Nonetheless, our *being in it* is defined only via a richer, experiential description. Every single person in a place has a subjective point of view and it is that point of view that characterizes that place as such. Points of view and contexts are results coming out from a historical—cognitive—cultural process. The ‘subjective knowledge’ of space is a core element for the representation of places, and a representation vary from subject to subject and even across one’s life (Orr 1992). “Knowledge of a place—where you are and where you come from—is intertwined with knowledge of who you are. Landscape, in other words, shapes mindscape.” (Orr 1992). Even more challenging, in geographical large-scale activities of spatial organization places are formed by the integration of material objects (as construction of the physical elements belonging to the organized space), intangible objects (as projection of an organized space), technical knowledge (expertise related to different scientific areas) and non-technical knowledge (diffused, often tacit, knowledge).

This generality and broadness of the notion of place brings up several problems which are difficult to solve and even to represent. These problems cover linguistic, perceptive, educational as well as descriptive (completeness—incompleteness of representations) and communicative (in transmitting knowledge) issues.

In terms of participatory knowledge of spatial organizations, the dialectic action among the different languages involved in place representation is fundamental. Every expert and non-expert perspective which participates in the representational effort has its own metrics and refers to a particular knowledge structure and meaning.

In literature there are many attempts to get a definition of representation of space/place, e.g., see Cresswell (2004). Research in applied ontology (Borgo and Masolo 2010) has developed methodologies and tools to move forward in this direction. One advantage of the ontological approach is that ontologies are typically specified in languages that abstract away from data structures and implementation strategies. In computer and information science, an ontology is a technical term denoting

a conceptual artifact that is designed for a purpose, which is to enable the modeling of knowledge about some domain, real or imagined (Gruber 1993).

Furthermore, the typical ontology languages are based on formal semantics to improve understanding and interoperability across systems and users.

2 Urban Planning

Today's awareness of the complexity of social and natural environments implies that in using state-of-the-art techniques to model such systems we must accept a dramatic, and perhaps discouraging, level of uncertainty. The traditional deterministic and quantitative approaches to urban planning and design in risky contexts increasingly fall short of expectations in environmental domains; and this is now widely recognized (McConnell 2010).

Planning tries to manage complexity as the result of a recurring interaction between collective knowledge and the desired results: a position that requires sharing as the foundation of a necessary political dimension of contemporary design (Formato and Russo 2014). An urban project as a plan or as a strategy has to evolve over time, it can't be frozen (Gregotti 2004). The planner, like the urban designer, has always to look at changes in the territory and to adapt the plan to the different relationships between built space and complex urban organization. Architecture, social sciences or anthropology have an active integral role in the thinking and the development of urban projects: in this anticipation game, a city is a relational system that must be thought of as a whole, not a mere composition of districts (Ingallina 2007). For these reasons a rich and reliable modeling methodology for places is an essential starting point for the planner.

When a planning process begins, one should remember that existing urban spaces, beyond their architectonic flavor, often are the result of anonymous creators, i.e., collective agents that happen to live and act in them without particular constraints. More and more frequently constraints on design, implementation, and management responsibilities are enforced to meet expectations of populations and this holds for architectural as well as non-architectural urban spaces. In recent times, during the conception of integrated design and planning, there is an evident trend toward a growing participation of non-expert agents a matching growing retraction of the role of expert agents. This trend coexists with an increasing awareness of the complexity and the dynamical structure of spatial organizations.

This evolution towards the integration of expertise and inhabitant knowledge, generally seen as positive, is important to recognise that sophistication and ingenuity have to coexist, and that the real risk is lack of communication and language mismatch. These are the critical source of inadequate planning and decisions.

3 Carving up Geographical Places

Humans live, move in and sense complex spatial environments using different paradigms. Their interaction with space is sophisticated. It continuously changes over time and relies on a variety of information types that can be classified in as many types as topology, geometry, dynamics, affordance, society, culture and so on. Perhaps due to the richness of this interaction, humans are not aware of how their understanding of and interacting with space is realized. Ontological analysis, the study of what is at the core of our view on reality, can help to recognize, clarify, discriminate, and organize the essential elements and features of places that is crucial to humans in terms of objects, properties and processes. Searching for a general framework where to discover and organize this kind of information, we can list a few levels that, without aiming to be exhaustive, are extremely informative for our analysis of lived places: the spatial, artifactual, cognitive, social, cultural and processual levels. These levels, in turn, can be subdivided in finer levels as we can see for some of these cases.

3.1 *The Spatial Level*

This is perhaps the most studied since it is in large part independent of the subjective perspective and thus can be more easily elaborated in terms of ontological analysis and formal representation (Schön 1983; Bateman et al. 2007). Here we can recognize the *mereological* level within which one understands space in terms of parts, e.g., recognizing the distinction between an area and its neighborhood. A second level is the *topological* one within which one understands space in terms of contact and unity, e.g., recognizing the contiguity between neighborhoods as well as the (spatial) unity of a city. Another level is the *geometrical* one where space is understood in terms of shapes, e.g., recognizing that the shape of a city is constrained by that of the valley where it is located. Finally, the *geographical* level in which one understands space in terms of spatial locations and their descriptions, e.g., distinguishing being along a river or having a radial disposition in space.

3.2 *The Artifact Level*

This is the level where one recognizes the physical realm and how human activities can change it. Here we have the *material* level where one understands space in terms of materiality, e.g., seeing the presence of wood, concrete, water. Then the *structural* level that allows to understand space in terms of qualified components, e.g., distinguishing natural vs manmade and a residential area vs a production area. The *artifactual* level adds an intentional aspect to the environment (Borgo 2007),

e.g., looking at a garden as an intentionally modified environment. The next level is the *functional* one where one understands space in terms of functionality, e.g., recognizing a building as a shelter. Finally, the *production* level looks at entities as manipulators, e.g., seeing a farm as production site.

3.3 *The Cognitive Level*

At this level the specific capabilities of humans take the lead. The basic *cognitive* level allows to understand space in terms of experience, e.g., perceiving how to move across objects in space. Instead, the *representation* level leads to understand space in abstract terms, e.g., perceiving the relationships among areas in an airport. The *observation* level is where one understands space in terms of how things in it do or may change, e.g., perceiving the change in the transportation system. Next, we have the *phenomenological* level where one understands space as a moving entity, e.g. perceiving a city in its evolving process. The *perspectival* level allows to understand space from a perspectival viewpoint, e.g., differentiating a square depending from where one is looking at it. At the *conceptual* level space is seen as a collection of realized concepts, e.g., perceiving space as the manifestation of entities that manifest a natural and/or an artificial nature. Finally, the *action* level where one understands space as an entity in which to act, e.g. perceiving the changes that one can enforce on things.

4 The Case Study

Participatory mechanisms of knowledge about and for spatial organizations rely on facilitation agents (as knowledge engineers) who organize dedicated knowledge basis about the issue to be dealt with. Their presence aims to develop true ‘participatory conversation’ (for ‘reflexive conversation’ on a problematic situation see Schon (1983), among the participating agents, often translated into verbal texts transcripts (‘verbal protocols’) by the same agents formulating the interventions in the conversation or by verbalizing agents, with analysis of the results (qualitative or quantitative methods: semantic, statistical, ontological methods, etc.). This is clearly a complex structure, entirely subject to possible biases (like inconsistencies, inadequacies, misunderstandings, etc.) towards the paradoxical Babel effect for the development of plural knowledge.

It is fundamental to translate and disambiguate the different languages belonging to the different expert disciplines as well as those used to convey the non-expert knowledge (the non-expert knowledge has to be at least critic and critically formed). This is to guarantee that the participatory conversations between the various technical and not technical actors is productive and individuates the more convenient spatial frame avoiding the babel risk.

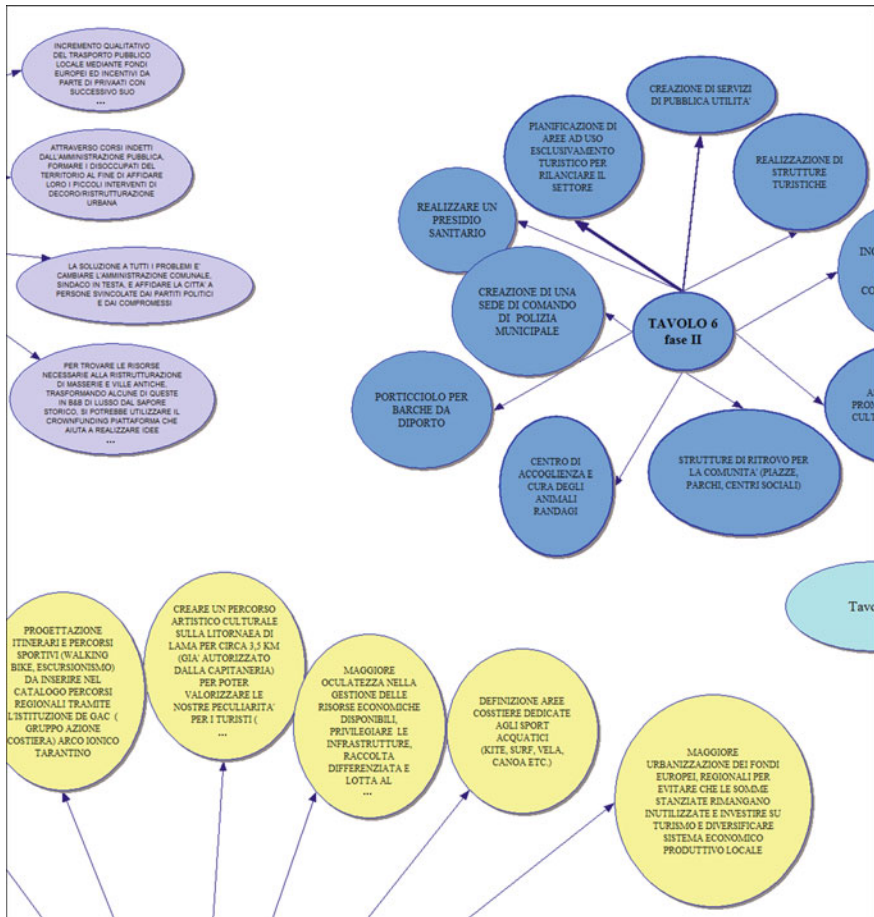
Our ontological analysis of places starts from the data collected for the making of Taranto strategic plan toward 2065. Data were collected via a series of nine community-based, interactive processes of knowledge exchange, aimed at building future scenarios for the new plan. The interactive processes of knowledge exchange were carried out in Taranto, a city in southern Italy, during spring and summer 2014. They were carried out to support policies and decisions on urban socioeconomic as well as environmental domains and organized as a sequence of face-to-face brainstorming forums aimed at cooperatively singling out strategic lines to build alternative development scenarios. From a methodological point of view, it was a 2-step *scenario-building* activity (Borgo et al. 2011; Khakee et al. 2002). First, participants were invited to report problems they faced in their town districts. Then, each participant was invited to generate a reflection about the future of the district, particularly concerning expectations of future changes. Such sessions were organized in all town districts, indoor or outdoor, with participants divided in groups each of them sitting around a dedicated desk. A municipal representative coordinated each desk without taking part in the generative session, she/he had only the task of transcribing in linear charts concerns, problems, expectations and desires presented by the participants at the desk.

In order to manage the results in real time (synthesis and refinement), the interactive process was supported by the use of conceptual maps drawn using dedicated software tools (Decision explorer, Inspiration) (Khakee et al. 2002; Heft 2013) (Fig. 1). This resulted in a real/virtual hybridization of the process, following well-established research trends, as reported in a number of case studies (Borgo et al. 2011; Heft 2013). Results achieved during the nine organized meetings were very different from one another. In particular, the first meeting was organized in the Città Vecchia (inner city district) with its great historical, environmental and cultural resources as well as significant environmental, physical and social degradation problems. In the Città Vecchia session the citizen participation was very high. About 80 stakeholders joined from different societal domains: residents, merchants, students, tourists, visitors. These participants, gathered around 6 desks and about 150 instances were collected.

The database collected during this session resulted interestingly rich and articulated. For this reason, it is a significant and valuable source for the present research effort.

The process naturally leads to two general types of instances: (a) contextual problems; (b) future visions. These two set of instances are about each quarter of the city as well as about the city in general. From an analysis of the data emerges that the environment is the most recurring issue in the groups. It is present in community problems and/or expectations, but also in the perceptions of the physical reality of the city. The industrial problem, on the contrary, is often absent from the discussed issues.

A first common character across the groups is the natural environment that persists in many city representations, so apparently resisting the consequences of an industrial culture. A second one is related to a structural relationship that the city has with the sea, intended as an element of both union and communication. A third is the



potential of the city as tourist attraction which is linked to different characters in relation to the different peculiarities of the area. The industrial problem often seems idiosyncratically absent from protocols, but it is difficult that findings can be used for strategies disregarding industrial relations.

There was an almost total absence of participants in the forum session held in the industrial district, perhaps given the disillusionment with past policymaking. Other issues are related to the inadequacy of urban and metropolitan linkages to the city center, as well as related to the recovery of many illegal settlements. Other instances are about the inadequacy of the urban services and about the inadequacy of metropolitan connections. Further instances are about the recovery of unauthorized coastal settlements.

The session held in the inner city was quite complex. It was held with a hybrid computer-based and traditional, rather conflictual interaction among the participants. Outcomes showed a clear prevalence of visions on mere problems: important issues were the unstopped relationship with the sea (for touristic aims and/or city infra-structuring) and the enhancement of Taranto as archaeological and historical center (Magna Graecia colonization).

5 Analyzing the Social Level

Once the theoretical framework has been outlined and the case study introduced, the next step is to analyze the levels one at a time. Generally speaking, this analysis is useful to identify if every level is well structured or if it is necessary to model additional information. A third step in this research line will be to characterize the specific sub-levels.

Admittedly, the data for the Taranto case is not meant for our research objectives since it was collected during the participation activities belonging to the strategy planning process well before the preparation of our research study. Nevertheless it is useful to start from this data for a first delineation of ‘objects’, ‘attributes’ and ‘relations’ populating the different levels. We decide to start from the social ontological level since the material collected in the Taranto case study is very rich from this perspective. We also believe that the material could help to analyze the cultural level but this has not been evaluated yet. It seems however clear that the material collected in Taranto is not suitable for an analysis of the remaining levels, e.g., cognitive and spatial.

First of all, since ‘social’ has a broad connotation, we have to limit the boundary of this first analysis. The data we have focus primarily on social reference points, i.e., the elements that people use to identify an area or to navigate across the city. Note that at the social level it can be difficult to elicit the distinction between formal and informal knowledge because the social knowledge is principally informal, tacit and implicit. For this reason, the work in this paper is preliminary under several aspects.

The first analysis singles out references to places and landmarks for the relevance they have in social practices, and lists the relevant entities and some relationships that emerged during the discussions. Another modeling aspect is given by the use that inhabitants make of those places and the social habits they (implicitly or explicitly) express. Finally, the collected entities should be classified in ontological terms following a foundational ontology like DOLCE (Borgo and Masolo 2010).

From the data at the social level it clearly emerges that the objects of the city are not just mere building, locations and landmarks. These terms are used to indicate complex cognitive objects enriched with a set of different meanings/signifiers that can be contextual. A building can acquire different meanings depending on the time and even on the person that mentions it. This analysis shows that at some point it will be necessary to elaborate complex definitions for such entities.

Surprisingly, several objects that a technician would image essential key points for the sociality were not mentioned in the discussions, for instance: the San Cataldo cathedral, the S. Domenico church, the doric columns, the Aragonese castle, Fontana square, and even the town hall. Instead we find mentioned more general *places* and *landmarks* like the beachfront, the bathing establishments, the area of Porta Napoli, the new Acropolis, the island and the piers. These entities show that there is a distinction between *objects* which are taken at their face value (like buildings of low interest, the cruise ships and, from some aspects, the sea itself) and objects that somehow *mean* something else to the inhabitants. Indeed, the same term can occur during the discussions with different meanings, e.g., as a landmark and as a functional building. Many entities have special social *roles* like the city itself as the capital of Magna Grecia, the convergence point (a place where important roads and the railway lines converge), the service center or the old city seen as an eco-museum. Another layer of meanings is introduced by reference to the *service* level that includes public services like restaurants, cafes and shops, bathing establishments (this time the term denotes the service, not the physical entity nor the landmark), the university and the pedestrian network across the city (mainly identified in special areas like the waterfront). Finally, the data provide desired features which can be understood in different ways: functional objects, reassessment of existing objects, services, norms or generic topics. Here we find: work to do, areas to be reclassified (e.g., to be closed to traffic), primary and secondary infrastructures, regulation of public spaces.

After analysing these results with the help of the adopted ontology perspective, we obtain a network of meanings that holds for distinct object types. For instance, let us apply our network to the San Cataldo cathedral, a building which was not part of the entities discussed in the meetings. This building, being part of an architectonic type, has a relationship to space in terms of occupancy of an area, separation of inside vs outside, shape and location. The material building (the church) itself is a material object that affects the surrounding elements (e.g. in terms of size and occlusion, and even its color affects the perception of the area), has a particular internal subdivision and its functional classification determines the intended as well as the unintended uses. These are all distinct meanings that the church-building cognitively stimulates when one refers to it. This network of meanings is enriched by the roles a building like San Cataldo plays, e.g., in the hierarchical ordering (in this case, relatively to the catholic organization this is not a simple church but a cathedral) and in the social habits (a safe place, a place where to do some activities like pray, relax, hide) with all the interconnection across these roles. All these meanings have a position in the ontology and by collecting and classifying these meanings, we build an explicit representation of the tacit network about San Cataldo and similar buildings. Via the ontological system, we can then explain which meanings are triggered in a discussion and even identify those that form bundles, i.e., are intrinsically interconnected, from the inhabitants' perspective. In this way we elicit the local "culture", the way inhabitants tend to understand their own place, and even what they (perhaps unconsciously) consider to be the primary relationships between the elements in it.

6 About the Analytical Frame

In the participatory knowledge of (urban) architectural spaces there are plenty of descriptions (as shown in the Taranto protocols) generally oriented to three identifying dimensions: by name, by function and by localization. Apparently there are no hierarchies among these except (perhaps) the dominance of the name which is both a function and a localization. However, there are relationships and redundancies, in the sense that the name turn out to indicate also a function. In fact, if an agent in a participatory knowledge forum cites the name 'lungomare' (promenade) in Taranto, he immediately expresses the function of (urban) architectural space along the sea. The fact that often the promenade is accompanied by a personal (e.g., Nazario Sauro waterfront) rather than toponymic (e.g., seafront promenade) identifier expresses only indirectly the localization dimension (when there are more versions of the space), that needs a qualifier of person or place to be specified.

The outcomes of participatory conversations in both architectural and non-architectural space organizations can quickly provide site and agent positioning knowledge (for varied situations: transformative, emotional, evaluative, orientational, etc.) whose level of structuring in relational terms is usually low. It is so low that it cannot be a basis for behavioural performance in material (operational cognition: design-realization) and immaterial (cultural cognition: case comparison, structural critique) manipulation of spaces characterized by a sufficient degree of integrated social acceptance (which is obviously the only type of valuation possible within knowledge systems integrating expertise and common sense knowledge).

The problem here is important from both a substantial and a methodological point of view and calls for a solution and/or representation in order to give robustness and operational utility rather than fragility and uselessness to the participatory knowledge of space organizations.

The complex cognitive dialectic between expert knowledge and non-expert knowledge is characterized by 'cognitive balances' between the different cognitive subsystem involved. This is framed in the anthropology of an even more complex cognitive milieu whose structures are formed by distinguished relations between the different agents (human and not-human, biotic and abiotic in the socio-technical systems). Those relations are developed dynamically and in contingent situations that could be analyzed via a theory and a method based on ontological analysis.

There is a strong perspectival aspect in the way we live in places, a kind of description (mostly implicit) of the place that includes what are for us the relevant elements in it and their relationships. Thus, a perspective provided by a place is an information entity that contains: a (typically partial) description of the place, what there is in it and how the place is evolving (e.g. things moving, leaving or arriving, agents acting and transforming them etc.) and possibly the potential interactions between the inhabitants and what is in the place. A place is grounded, as opposed to a generic location, is a context that refers to one or more actual/existing entities.

A place is however also something that goes beyond the single agent. It is the result of many shared links across entities that, as we argued with the example of the San Cataldo cathedral, can be elicited via ontological analysis. The classification of what we use for understanding places in general and the actual place that we are experiencing is then a powerful tool for a more comprehensive representation of places. For this reason, we insist that the analysis has to include the physical elements (e.g. locations and objects), the material components and layout (e.g. enclosed spaces, object distribution); the agentive figures (e.g. habitants, organizations, social roles), the relationships across them and the objects (e.g. generic dependences and actual goal or habits).

In this paper we have only started this complex ontological analysis with which we aim to unravel the complex knowledge that forms the city as lived place.

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