





III<sup>rd</sup> International Conference on Environmental Design A cura di Mario Bisson

Proceedings ( reviewed papers) of the IIIrd International Conference on Environmental Design, Mediterranean Design Association | www.mda.center | workgroup.mda@gmail.com 03-04 October 2019, Marsala, Italy

Progetto grafico ed impaginazione: Martino Zinzone Immagine di copertina: Mario Bisson | Martino Zinzone



ISBN STAMPA: 978-88-5509-060-5 | ISBN ONLINE: 978-88-5509-063-6 © Copyright 2019 New Digital Frontiers srl | www.newdigitalfrontiers.com Viale delle Scienze, Edificio 16 (c/o ARCA) | 90128 Palermo Published in September 2019

### **3**rd International Conference on Environmental Design

Conference proceedings

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#### Special thanks to:

Giorgio Di Crescienzo for supporting the translation of the introductory contribution

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## **New Frontiers**

| PRODUCT DESIGN| HUMAN SOCIETY 2.0| OPEN INNOVATION

SECTION 3 | New Frontiers

# Smart objects as a booster to appropriating and giving meaning to the environment

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#### Abstract

In a contemporary scenario characterized by rapid and pressing socio-economic, technical and productive changes, pursued or suffered mobility, reconfiguration and disintegration of interpersonal relationships, concepts such as the "sense of belonging", "rootedness" and "re-appropriation of places" become extremely current topics (Buttimer, 1980; Casey, 1997; Tuan, 1975). Places, meaning "places in which we act" (Harrison and Dourish, 1996), are where we activate processes of modification, adaptation and appropriation of their physical / material / structural qualities and where we, at the same time, recognize cultural, social and personal dimensions. Until a few decades ago phenomena such as the increase and spread of new technologies, the emphasis on virtual reality - intended as something different from the 'real world'- and the imaginative paradigm of cyberspace were perceived to be plausible, albeit problematic, universes; and these universes would take over and alienate individuals from the experience of 'real' environments. However, the recent evolution of technology has followed an almost diametrically opposite direction (McCullough, 2004; Ciolfi, 2011): the miniaturization of computing, the diffusion of all kinds of sensors, the continuous connection and expansion of the IoT has brought technology closer to individuals. Technology has become 'human' and individuals are provided with a new tool of domestication, appropriation and signification of the environment.

This is the framework of the 'BeMyPlace - Interactive Environments and Responsive Design Objects' research, an applied research project aiming at designing innovative products and product-systems in the smart living sector: 'smart' items capable, through the integration of advanced sensors, of enabling new models of relationships between individuals and spaces and capable of integrating and transferring personal backgrounds such as memories, identity and culture.

#### Digital Layer and Everyday Life

"The Matrix is everywhere. It is all around us. Even now, in this very room. You can see it when you look out your window or when you turn on your television. You can feel it when you go to work... when you go to church... when you pay your taxes. It is the world that has been pulled over your eyes to blind you from the truth." (Morpheus to Neo, Matrix, 1999)

The Matrix has portrayed, in the cinematographic scenario and in the collective image of several generations, the apex of a paradigm that interpreted the pervasiveness of technology as a potential threat, "distancing" man from reality: the Matrix, seen as a system of control, as an independent and "sentient" organism, able to replace real life and immerse people in an inauthentic, controlled and counterfeit everyday life. A large part of this collective image originates from the imaginary scenarios of cyberpunk literature (Gibson, 1984), resting its roots in what, since the 1980s, has been defined as the "digital revolution". If the first phases of this revolution were characterized by an exponential multiplication of contexts of use of technology - with a specific focus on the enabling function of technology for the performance, accelera-

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#### **KEYWORDS:**

| Rootedness | Human Tech | Environment Experience | Smart Objects tion and optimization of particular tasks/actions - today technology has, through objects of common use, become part of everyday behaviours and habits. Up until a few decades ago virtual reality - herein understood as a digitalized, computerized reality - was expected to take over the experience of the real world, increasing the distance between people and the "physical", concrete world (Baudrillard, 1980). Technological evolution is actually heading towards an almost diametrically opposite horizon: the spread of ever smaller processors, the continuous connection, the spread of sensors of all kinds have created a pervasive presence of "human" technology, which has entered real life as an actual digital layer - not more than what is real, but part of it (Ciolfi, 2011). «Information technology is changing from only being tools for the researcher or the business professional to becoming part of our everyday lives» (Hallnäs and Redström, 2002).

The concepts of digital layer and everyday life inextricably came together in a digitalized everyday life when "technology" migrated from the desktop to everyday objects and the environment (Norman, 1998): instant messaging systems have changed the way in which people relate to each other in the private and professional spheres; advanced home automation systems have enabled new interactions within the domestic space; new digital infrastructures have expanded the range of services offered in the retail, mobility, cultural entertainment, and many other sectors. The implications of this technological development have been the subject, in recent years, of several studies that have explored new forms of interaction between technology and the physical world - both in the everyday world and in the workplace. These lines of HCI research - among which ubiquitous computing (Weiser, 1991), tangible media (Ishii and Ullmer 1997), pervasive computing (Ark and Selker, 1999) and embodied interaction (Dourish, 2001) - even if with different approaches, propose, in a choral way, «a digital future in which computation is embedded into the fabric of the world around us. (...) The opportunity implied by this ubiquitous computing vision is to capitalize our familiarity, skills and experience in dealing with the everyday world around us. The world can become an interface to computation, and computation can become an adjunct to everyday interaction» (Dourish 2004).

This phenomenon of digitization of everyday life has therefore brought about a change in perspective: the two-way interaction between digital item and user is overcome by a more complex interaction between technology and user in a physical environment and above all in a social and cultural context (Ciolfi, 2004). A place, understood as an "acted space" (Harrison and Dourish, 1996), assumes a meaning of "habitability" that involves not only presence but also a set of meanings, experiences and activities. According to the notion of the geographer Yi-Fu Tuan (1977), space consists of four connected dimensions: a physical/structural dimension, linked to the physical dimensions of a space such as materials, colours, layout of objects, etc.; a cultural dimension linked to the rules, conventions and cultural identity of a place and its inhabitants; a social dimension, linked to the social interaction within a specific place, behavioural codes, etc.; and finally a personal dimension, linked to the memories, connections and values that individuals associate with the place in a process that gives meaning to it. The design of new smart digital objects that will populate contemporary daily life is therefore moving towards modes of interaction which will be able to act on these four combined dimensions, allowing for the activation of processes of modification and appropriation with regards to the physical, cultural, social and personal features of environments.

#### The temporary space within the context of Smart Living

The concrete, measurable and tangible space of the "traditional" city, modeled around the family nucleus and stable work, gives way to the widespread city, to the temporary living habits and to a sociality increasingly structured and conveyed thanks to new digital media. Globalization breaks into modernity and places communication, mobility and connectivity at the heart of people's lives (Tomlinson, 2001). Digital technologies, social media and the expansion of the IoT activate new hybrid relational interfaces, outside the canonical spatiotemporal logic and capable of confronting the local with the global, the digital with the physical, and still, the private with the public. Deterritorialization exacerbates the feeling of connection with one's place of origin and leads to the rise of specific virtual communities linked by

geographical and identity-related similarities. Local and global integrate into the network and trigger significant processes of hybridization and contamination through new and more complex socio-cultural forms. Temporary living is contemporary living and, again, living is being at home everywhere. Urban nomadism produces a geography of fragments, a new culture of global living. The virtual, the smart and the immaterial find their place among the existing surfaces and, at the same time, create new ones. They are sensitive and relational connections; between present and past, between stories and images and, again, between the ordinary and the extraordinary. A landscape, therefore, increasingly characterized by contaminations, hybridizations and negotiations, is capable of breaking the integrity of the boundaries and restoring an even more articulated landscape. A landscape in which technology allows for new insights and where interior design, communication and technology find room for continuous dialogue.

The research BeMyPlace fits into this framework and aims to design and introduce into the smart living market a system of products capable of innovating the new spaces of temporary living. The research focuses on a system of responsive smart design objects aimed at improving the quality of life (cultural facilities, health conditions, individual safety, housing quality, education facilities, tourist attractions, social cohesion) and, at the same time, able to interact with applications of customization and user profiling through the Internet<sup>1</sup>. The aim is to define a system of furniture products capable of contributing to a more fluid living space interconnected with the user himself. A space capable of activating new socio-relational processes and new levels of well-being, acting, for example, from the standpoint of the environmental atmosphere (light, colour, temperature) or that of the services offered (linked to the specific territory or to the background of the user); a design that is aimed at the domestication of temporary spaces in order to envision a new "augmented" space that generates a new sense of belonging. A new temporary living space in which value is related to the interactions between the user and the environment and between the environment and the underlying technological system. A space, again, where the service is not a marginal, functional or added value element but truly the subject of the transaction (Vargo and Lush, 2004).

The research BeMyPlace focused particularly on the high-tech textile system - intended for interior design applications but also for furnishing accessories - through the use of patented DreamLux technology<sup>2</sup>. In this specific context, therefore, the issue of the design and production of interactive systems integrated and "hidden" within the elements for home and contract furniture has assumed great importance; systems capable of conferring innovation not only in terms of the aesthetic and formal characterization of the environments/objects/ furnishings themselves but also with respect to the user's own behavior, users who are looking for an ever-increasing integration between products and services and between times and places of temporary living of new urban and social rituals. The new smart living system, increasingly capable of managing and reacting to information, is therefore primarily a project of service and interaction conveyed by its material and aesthetic dimension and made possible by its ability to assume and manage data and information.

## Smart Objects as activators of new models of relationships between individuals and the environment

In this framework of new digital domains and continuous connection, the research BeMyPlace has developed a series of concepts relating to smart objects and interactive environments capable of capturing and monitoring information connected to human activities or the environment and transforming it into feedback. The research was therefore structured into three phases: a first phase of meta-design research in which the state of the art of temporary smart living was defined and the project scenarios were articulated; a second phase of concept generation - in the sector of high-tech textile systems and upholstery, an area of interest for the project's partner company conducted through a design workshop activity; a third phase, currently in progress, involving the improvement and prototyping of the selected projects.

The concepts covered a wide range of fields of application, focusing on the design of smart environments capable of creating experiential contexts through the interaction - and integration - of functional, symbolic and self-representative elements. Among the main functions and features of smart objects - including interactivity, reactivity and proactivity - the selected concepts developed and placed particular emphasis on the notion of context-awareness (Ghajargar and Wiberg, 2018); this notion describes smart objects that are aware of their surroundings, able to acquire and understand environmental events and human activities, store them and generate adaptation or reaction responses to stimuli (Dietrich and Van Laerhoven, 2015).

#### • Square. Nomadic spaces and relational surfaces<sup>3</sup>

Square is a system of DreamLux fabric modular panels, integrated with sensors and designed to cover the vertical surfaces of large crossing spaces. The project is the result of a reflection on how frequent travellers, travellers with a high "baggage of needs" (security, continuous connection, up-to-date and contextualized news and information, as well as micro-opportunities for comfort and rest), can occupy highconsumption temporary spaces - such as rest areas and lounges in stations, airports, hotels, etc.

The panels, made up of a modular matrix, propose different ways of covering the spaces: like a second relational skin, they become a backdrop capable of generating interaction and enabling the passage of information between the environment and individuals.

Through pressure and motion sensors, specific and different modes of interaction between the panel and the user are activated: way-finding information (location and distance from gates, services, family members, ...), updated information about the journey (potential delays, connecting flights, luggage, ...) or about specific destinations (information relating to the weather, tourist attractions and cultural aspects, ...). The combined use of sensors and Beacon technology allows the panels, covered with optical fiber fabric, to be transformed into actual punctual and personalized communicative surfaces, able to establish an individual and exclusive relationship with the user, thus reducing the overall amount of information/signage commonly present in crossing spaces (fig.1).



## • Roots. Building an exclusive relationship between the individual and the environment<sup>4</sup>

Roots is inspired by a reflection on some of the main issues related to smart living: the Smart City, the needs of citizens and the demand for sustainability. Considering sustainability as the protection of the common good for future generations, this project focuses on self-regulation, on responsible choices of the individual allowing **Ol** Square Project (BeMyPlace Workshop, 2018). for a positive impact in their daily actions within the environment. Roots translates the principle of self-regulation into a product through which users are made aware of specific objectives - environmental, health, cultural, etc. - and encouraged to achieve these goals while respecting and caring for others and the environment.

A furnishing accessory, a cushion, placed in the most intimate domestic dimension, becomes at the same time a response to the activities of the user outside the home and an incentive to consider one's own responsibility towards the sustainability issue. Through an app the user has the possibility to set and monitor objectives related to running, walking and other different physical activities. The pillow, made of fabric embroidered with DreamLux technology, responds to the intensity of physical activity during the day, gradually revealing different patterns and light effects. The more the user has preferred to walk and cycle, the better it will work. The result is presented as a reward or vice versa as a stimulus. The project strongly insists on the cultural and personal dimensions of the experience of a place - as an activator of new behaviours and rules of use and, at the same time, as a singular element strongly linked to a system of values and experiences (fig. 2).



**02** Roots Project (BeMyPlace Workshop, 2018).

#### • Symposium. Highly convivial contexts and "augmented" connections<sup>5</sup>

Symposium is a system of textile products (runners) designed to generate interactions between users and the environment in a highly convivial context. Symposium interprets the concept of conviviality by extending its traditional boundaries - a ritual occasion closely linked to the consumption of food -, towards a scenario of more open sociality: parties, events, celebrations and collective entertainment.

A multifaceted system of technological variables and fabric and embroidery combinations provides Symposium with many variants and makes it a flexible and customizable system. The product is composed of several layers of fabric, each with a different embroidery; the layers, the combination of which produces a distinctive pattern, have the possibility to light up, entirely or partially, and reveal different decorative motifs. Symposium is not only a stratification of fabrics but also a channel for multiple and shared experiences: it can modify the environment in which it is located, and it can connect users to one another. The product is designed to enable, through a dedicated app, a unidirectional interaction, i.e. between the individual user and their Symposium; or a mediated interaction, i.e. between users, Symposium and a data collection system or control system. Depending on the type of interaction, Symposium can activate one or more functions: create a particular lighting atmosphere, make changes and leave "imprints" in the environment, send lighting feedback and connect users (fig. 3).



#### Conclusions

The next generation of smart object creators, as already pointed out, are experimenting with new ways of interacting between the individual and the environment within a framework of enhanced context-awareness: increasingly refined and targeted processes of adaptation and learning with regards to environmental stimuli make these new product-systems actual tools of "manipulation" and "appropriation" of spaces. The selection of projects developed for the BeMyPlace research is located within this specific scenario: smart objects capable of triggering relationships and interactions between individuals and between individuals and the environment while acting on the activation of mutual influences between the physical, cultural, social and personal dimensions of a place. On the one hand, the Square project modifies codes, rules and conventions relating to crossing spaces through tangible and embodied interaction, Symposium exploits the transformation of space to activate, facilitate and spread new and unexpected social interactions, while Roots insists on the personal perception of a place, its being the reflection and expression of memories, experiences and values. The three concepts aspire to activate actions and processes capable of inspiring reflection on experience (Cross, 2001) and on place attachment (Scannell and Gifford, 2010).

Finally, the research partner company considered the projects they found particularly interesting and, in the coming months, a first phase of improvement and prototyping will be initiated. One of these concepts, Roots, was also presented during the event Smart City Now - Conference & Expo, Arese (Italy), a nationally recognized B2B event for the Internet of Things, Smart Cities and the Smart Living Industry.

#### • <u>Acknowledgements</u>

The paper is the result of common research and findings undertaken by the authors within the research BeMyPlace. Interactive environments and responsive design objects. Nevertheless, chapters "Digital Layer and Everyday Life", "Smart Objects as activators of new models of relationships between individuals and the environment" and "Conclusions" were edited by Alessandra Spagnoli and the chapter "The temporary space within the context of Smart Living" was edited by Valeria Maria Iannilli. **03** Symposium Project

(BeMyPlace Workshop, 2018).

#### Notes

- BeMyPlace. Interactive Environments and Responsive Design Objects is an ongoing research project lead by Valeria Maria Iannilli, Chiara Colombi, Barbara Di Prete, Agnese Rebaglio, Alessandra Spagnoli - Design Dept. - and Marco Brambilla - DEIB Dept. - Politecnico di Milano in partnership with the companies Samsara srl and RCR srl. The research project is supported by Regione Lombardia through the Smart Living Fund, 2017.
- 2. Fabric system and embroidery in optical fiber, internationally patented by the project partner company Samsara s.r.l. (https://dreamlux.it/).
- 3. Project by Sara Bottesin, Boris Cribio, Maria Maramotti and Sara Savoldi, 2018.
- 4. Project by Francesca Bonfim Bandeira and Emma Gambardella, 2018.
- 5. Project by Roberta Gargiulo, Gaia Noce and Asia Poli, 2018

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