

The Lure of CyberPark

Synergistic Outdoor Interactions between Public Spaces, Users and Locative Technologies¹

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Abstract. This paper highlights the emerging concept of the CyberPark - the hybridized relationship between open public places and technologically mediated urban activity patterns. The concept questions whether urban space can keep binding people and their outdoor practices in new meaningful ways, but in fact, what is being asked is whether the relationship between ICT, open public spaces and urban activities can open up creative pathways for a multidisciplinary field. Projecting the transformative shifts not only in the way people choose, move and experience open spaces in cities but also from the impacts of the extensive outdoor use of digital media technologies such as wireless sensor networks, GNSS or cellular networks enabled by mobile devices, into the same coordinate space can transform the oppositional conditions in our understanding of the stroller/machine relationship. This paper introduces a synergistic user-centred methodology for deriving effective strategies for the appropriation and use of wireless urban spaces. To achieve this, it unfolds the first results from the CyberParks Project to help us locate its

concept into the possibility of an enhanced form of open urban space that exceeds the “any space”.

Keywords: digital media, public open spaces, hybridised spaces, Cyberpark.

I. INTRODUCTION

The emerging reality of new, wireless, forms of urban spaces challenges the traditional idea for democratic outdoor space-appropriation and social engagement [1]. When considering the expression of the neo-analogue forms of activities that postdigital technologies cultivate based on socio-personal man/object interactions and online storytelling communication and information possibilities (CHESS project, Playful City, Smart City, intelligent urban furniture), this reality is one that readdresses the conception of our outdoor life distinct from its dateless tangible bond with materiality (physical

¹ COST Action TU 1306: CyberParks - *Fostering knowledge about the relationship between Information and Communication Technologies and Public Spaces supported by strategies to improve their use and attractiveness*. The Action is financed by COST – European Cooperation in Science and Technology. For more see <http://www.cost.eu>, http://www.cost.eu/COST_Actions/tud/Actions/TU1306 and the project’s website at www.cyberparks-project.eu.

surroundings, spatial features within etc.). While human tasks are in a way even more pervasively regulated by machines, the humanistic content of the interaction often raises them in a more conceptual level. Florian Cramer, writing for A Peer Reviewed Journal About Post-Digital Research (APRJA), described them as “neo-analog do-it-yourself” approaches that distant themselves from their “post-digital” predecessors that were simply referring “to a state in which the disruption brought upon by digital information technology has already occurred” [2]. Here, the term “neo-analog” does not refer to a chronological descendant of the post-digital, but to a shift that opens up a new perspective to be emerged, one that expresses itself in complex patterns of user-to-user-to-machine interrelated activities, interlinked variables, and so forth. To some extent, we can trace such interactive tendencies in different neo-analog projects found around the web: generative mindmaps, force-feedback algorithms, digital semantic relations, applications for visual music etc.

Similarly, and during the last years, the wireless dimension of the urban space seems to have received a more dynamic and hybridized form, mostly because it is not any more recognized as a simple spatial unit. Wireless connectivity has transformed it into an (even more) complex system that is part spatial, part immaterial and interactive [3], [1], [4], [5]. In this paper, we approach the CyberParks Project (COST TU1306) as such a complex system to develop a method of understanding how people use media and locative technologies in their attempt to appropriate and make sense out of space’s new intangible properties. In the complex nature of the field, in a parallel way, the interest of ICT remains spatial in terms of improving planning and make it more participatory, since through ICTs people could contribute information to be useful, for example, to improve intervention in public spaces.

The first wave of outdoor cyber-mediated spaces were mostly focused around artistic modalities. Smart urban furniture with embedded media objects (from sounds and images to projections and lighting) were called to attract –maybe temporarily– some public attention and interest. Lately, more practical urban uses and services like mobile charging, wireless sensor network hotspots and urban sensing opportunities for measuring, for example, air pollution were also employed within benches, post-boxes or public lighting in an attempt to make people more engaged in an effective use of -the otherwise- empty open public space. Now, a *place-based* IT mediated community [6] is emerging from the cross points of our mobile activities and the physio-virtual organization of public space. In this sense, and as of this writing, locomotional participation, agency and interactivity between the user and the digitally displayed or wirelessly transmitted material seem to appear more and more often as elements of an evolved mode of cyberspatial outdoor experience.

This work defines CyberParks as synergistic urban landscapes that operationalize physical and digital syntaxes to foster multipurpose communication

opportunities amongst different parts of their systems. It definitely expands Frick’s definition of the supportiveness of public space that concerns the relationship between “people and things” beyond its clearly physical-spatial characteristics [7] to relocate our appreciation of “things” and connect their materiality to a growing digital world. In line with this, the research suggests a rather synergistic human-agent methodology [8] for CyberParks to understand the role of ICT on the basis of the mending mechanisms that space induces to users as a result of the man/environment interaction [9], [10]; traditionally this is termed as *cognitive constructs* but the way they can shape outdoor hybrid configurations is yet unexplored. In this sense, a synergistic methodology for CyberParks reflects, on one hand, personal decisions, significances given and preferences of the people involved within their premises but, on the other, the reflection presents a significant difference: it is based on the combination of users’ analogue *and* digital responses to external stimuli to help us comprehend the effects from the use of such hybrid spaces on spatial experience. The method to extract synergies from within such complex landscapes consists of examining the possibility of an underlying cognitive base [11] in the software agent automation proposed during the project (starting from the WAY CyberParksⁱⁱ application and its future development) to determine whether ICT in urban space are supportive of cognitive processes. Synergistic dimensions of the CyberParks are important because the exploration of the cognitive aspects of the employed tools can humanize the strictly algorithmic nature of the method and then response strategies for the formation of local space, ICT, and user ties can be questioned. Can media and locative technologies affect an outdoor user’s experience span? Is it possible for applications running in smart phones and tablets contribute to a stronger (or different kind of) social engagement that foster a sense of participation and enhance his/her ability to understand the wireless public realm and online social diversity? If so, how desirable and how prepared are we for this? Finally, how ICT can help us to improve public space by focusing on its participators and sending useful for the planning process information?

II. BACKGROUND

The following discussion on the “lure” of the technologically enhanced public spaces (CyberParks) and the spectacle of their wireless image initiates from interweaving the immateriality of the supported computational environment with the geography of the material urban space and the cognitive skills of its user. The project, embarked on April 2014 [e], has so far explored the relationship between space, people and mobile technologies in three supplementary but distinct ways:

First, through a *position informatics* framework in which a mobile application has been initially developed to map the position of its user (Fig. 01, 02) and provide information on his/her orientation and moving

ⁱⁱ See more at <http://cyberparks-project.eu/app>

preferences inside open urban spaces based on its spatial and virtual affordances for ICT interaction (mostly quiet places with free wireless sensor network spots for internet surfing, chatting and instant messaging). This framework offered valuable, but rather limited, information for identifying emerging outdoor lifestyles as dominated by screen action and for exploring further their impacts on space. One problem regarding the limitation of the position informatics approach as a research framework to track visitors' stationary and moving patterns in areas with multiple convex spaces was that it could not effectively record those spatial imperatives (configurations, architectural facilitators etc.) and syntactic measures (connectivity or integration) [12] contributing to user's behavioural shift. The same limitation occurred in terms of mapping the wireless and digital facilitatorsⁱⁱⁱ responsible for the above-mentioned shift. In Lisbon (June 2014), the two case studies of the *Parque da Quinta das Conchas* and the *Jardim da Estrela* employed this newly developed locative application accompanied with a traditional survey method (questionnaires, Fig.03) given to the visitors. The focus was to study how moving patterns were subjects to change depending on not only the spatial specification and configuration of each green setting but also on the immaterial conditions and networks established within them. For example, by changing, restricting or replacing nodes of the network where man/machine interaction was supported (in the case of *Jardim da Estrela* wireless sensor network access wasn't available, being replaced by GNSS monitoring devices and splitting visitors in six large groups) it became apparent that space appropriation and occupancy could also change respectively based on the location of digital facilitators. A comparison technique between visual data representations (tracks mapped on Google Earth Map) illustrates how free wireless sensor network provision affects not only the routes that users prefer to follow but also the temporal

order of the matter and the time spend within each park's individual clusters (Fig. 04). It was also apparent that when immaterial affordances for digital interaction were not supported, users were tending to replace the gap of identifying gathering places that could invite and sustain social interaction by the traditional use of spatial landscape features.

The WAY CyberParks application, composed by a mobile platform and a monitoring web service, continued to evolve into a set of options for customizable settings. On one hand, it could track the way people use the space, allowing them to get contextual information and to send suggestions or complains. On the other, the web could monitor the way people use the space in real time allowing to visualize people's path filtered by gender, age, occupation, or reason for visiting the space. Moreover, users could not only upload their personal profile but also share media material (images, videos etc.) depicting the content of their individual space-related experiences, while using the application in both online and offline environment. By assembling digitised sensory experiences based on the habitual seeing and then filtering them in terms of their relation to space (becoming themselves nodes of the network) in order to interface users, spots and facilitators, a second approach emerged, this of the *sensory informatics* framework. In Barcelona (November 2014), two case studies – the public spaces of the Fòrum de Les Cultures and Carrer d'Enric Granados- were used to examine how information of real time sensory data transmitted by digital and moving images or narratives and personal comments could be made usable through interface agents that include maps and graphics in order to record an emergent phenomenon: that our contemporary outdoor life being dominated by screen action is not any more built in a linear chain of isolated moments of sense perception but according to a large number of



Fig 01. A typical representation of an itinerary with path and points, for each point the coordinates and the time it was reached are recorded. ULHT 2014 (source: Smaniotto et al. 2014)



Fig. 02. The recorded tracks of the six groups within the Jardim da Estrela. ULHT 2014 (source: Smaniotto et al. 2014)

ⁱⁱⁱ Here we identify as wireless and digital facilitators those computational agents of the overlying immaterial network and series of platforms, apps or scripted languages that observe public behavior in urban environments, capture users'

contemplative relations between ours and others individual moments spent in the area as well.

preferences and the relations between them in order to establish connections not only between users themselves but also between spaces, users and machines.

In these spaces, users were asked to imprint their personality onto the wireless space of the application and project both mental and physical elements (thoughts, feelings, landmarks, formations etc.) by uploading pictures, videos and personal messages and comments of memorable spots to “compare” their spatial experiences with others (Fig. 05). In this way, the meaning of space previously guided by sole participation seems now to be diverted by the others’ digitised and projected experiences being uploaded and stored on the server as well. The wireless space becomes a mosaic of personalised digital material depicting diverse sensory experiences; and people with mobile devices have the chance to assemble these in their screens and then filter and access them based on their preferences. This phenomenon of our screen-affected appreciation of public places develops affective competencies that are

fundamental to all these new forms of outdoor communication with others that CyberParks encourage. How stimulating or irritating, for example, an urban furniture, material or building was previously found and recorded by others through their pinned images and digital storytelling can induce complex psychospacial dynamics [13] that can affect our emotions, behaviour and perception of object’s future experience. However, if competencies are understood in the context of our interaction with ICT and space, they can enable the formation of procedural synergistic approaches towards user’s spatial experience of the analogue and wireless public space.

Such a challenge to move away from that initial contribution of the WAY platform as a simplistic position and sensory informatics agent towards the more complex approach of a *synergistic interface* opened the possibility of a third framework better explored during Bristol’s case study (April 2015). There, the Playable City^{iv} project that generates social dialogues by cultivating shared experiences through play in the city was introduced to CyberParks researchers. It was found that the interactivity of the Playable City feeds into a technologically mediated response to the neutrality and nonchalance of the outdoor built environment as well as towards a familiarization of the urban landscape design with the new realities dominated by data transference and screen action. In a sense, and if CyberPark’s intention was to be a similar mediated space as described in project’s Memorandum of Understanding^v, and its intention was to foster social interaction between users, spaces and machines, then Bristol’s case study formed a clear proposition for the project. That the previously identified computational functions of the occupancy informatics, like the positional ones for example, could better work together (termed as *synergy*, from the Greek *συνεργώ*) with human functions like behavioral, cognitive or cultural ones in order, as analyst of narratives in computerized forms Marie Laure Ryan states, new types of interactivity and modes of user involvement to be enabled [14]. Following Murray [15] we can identify two reasons why narrative, as a tool and method, has a promising future in post-digital and neo-analog environments. First, the procedural structuring of many digital platforms and applications create not just a set of displayed information images but combinations of “chapters” unfolding through screen action interesting information stories. Second, while people have increasingly turned their mobile devices into everyday fellow travellers and the accessed data or scripted information into new forms of outdoor companion, the interaction between their activities and open public spaces tend to become rather synergistic. Thus, users of outdoor mobile devices are not only “surfers” but also “authors” who can interact and shape electronic narratives and digital forms of storytelling.

cyberparks LISBON MEETING June 2014
QUESTIONNAIRE ON PARKS & TOOLS

Please answer very briefly the following questions:

A Identification Group no. _____

Age			
Sex	male <input type="checkbox"/>	female <input type="checkbox"/>	
Formation			
City/country			
How often you usually go to a public space in your home city?			times a week

B Experiencing the park

Give up to 3 Keywords that characterise the park.

Do like this park? yes no no opinion

Justify

Which 3-5 elements called your attention

Positively

Negatively

Which 3-5 elements can improve the park

Please mark in the map with an circle the places/spaces you like in the park and those with an X you don't.

C Your route in the park

How was the consensus finding in the group?

Why the group decided for this route

Others

D Use of the tool

How was the use of the tool? easy complicated but manageable too complicated

Is it useful for research yes no partially

Considering the two questions above, how can we improve the use of this tool?

Fostering knowledge about the relationship between Information & Communication Technologies and Public Spaces supported by strategies to improve their use and attractiveness **cost TU 1306** 1 / 1

Fig 03. The questionnaire “Parks and Tools” as distributed among the Lisbon Meeting Participants. ULHT & LNEC 2014 (source: *Smariotto et al. 2014*)

^{iv} See <http://www.watershed.co.uk/playablecity>. As defined in the web page of the project, *Playable City gives people permission to be playful in public. The ‘Playable City’ is a new term, imagined as a counterpoint to a ‘Smart City’. A Playable City is a city where people, hospitality and openness are key.*

It’s a place where residents and visitors are able to play, and to reconfigure places and stories.

^v See http://w3.cost.eu/fileadmin/domain_files/TUD/Action_TU1306/mou/TU1306-e.pdf

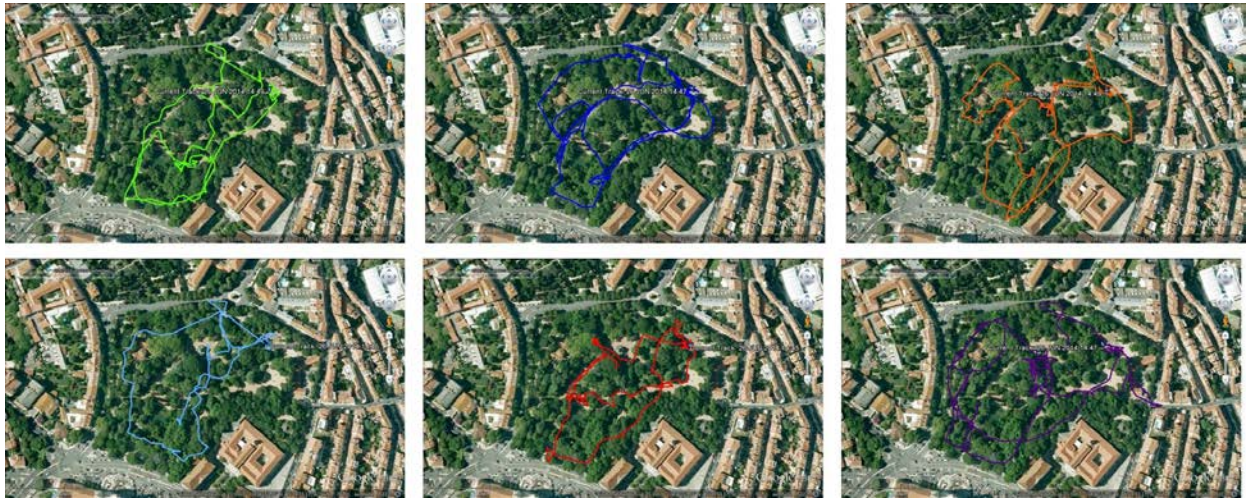


Fig. 04. This map displays the spatial distribution of visitors of the six routes together. It reveals some common patterns in the use of the space. ULHT 2014 (source: *Smaniotta et al. 2014*)

In Bristol's case study, the technical cultivation of this medium of communication [16], [15], [17] has led to some inspiring interactive narrative projects aimed to let users understand, among other, the transformation effect from applying ICT possibilities to the traditional reading and experience of the open public space. In its range of narrative formats, people do not just observe; they are actively engaged and participate in the (re)construction of the wireless outdoor experience by responding and interacting with the immaterial parts of a complex interplay between digital and human "computation". In Bristol, various kinds of plays in the city provided users with structures for enhancing and shifting their cognitive and critical thinking skills while exploring city's public spaces. For example, CyberParks' researchers had the chance to be introduced, among others, with Tom Abba's work *Short Films For You*, part of the *Circumstance*^{vi} project. They somehow learned about the narrative of experience in public space through sound and mobile technology starting with playing an outdoor positional, sensory and rather cinematic in-ear story. Initially, researchers became motivated by the entertainment aspect of the work as introduced to them by its creator, Tom Abba. However, and as the outdoor walk in the city, the moving bodies, the soundscapes and each user's responses to the storytelling became synergistic and interactive between them, the separation of the analogue from the digital was rendered rather difficult. Moreover, decisions or preferences about the use of Bristol's public spaces were guided by the synergistic potential effects of the man/space/machine relationships traditionally repressed by the strict algorithmic counting or processes of the GIS-based logic behind tools of monitoring outdoor urban activity [18] – as previously observed in Lisbon or Barcelona case studies. Indicative of this is the extract from Abba's description of the project:

One experience may find you sitting alone in a cafe while observing a stranger, another may find you examining miniature photographs, another guides the fingers of you and a partner in a dance across the pages of the book. Each 'story' attempts to maintain a relationship between the sound in your ears, the place you are, and the object in your hands. The book has an MP3 player embedded inside it, headphones attached. Inside the book are different materials for each of the different experiences. A hand-made wooden box holds the book, headphones and a magnifying glass. [a]

Gradually, and as *Short Films For You* was unfolding a "collection of micro-experiences presented as a book with accompanying soundtracks and physical objects" [a], researchers found themselves motivated by the challenge of participating in a neo-analogue experience. In fact, Tom Abba's audio book in the hand of the users was transforming images into reality and the individual response into a synergistic outdoor story. The emphasis of a necessary synergy for the story to be unfolded and narrated shifts Bristol's methodological paradigm from an approach of mapping and storing positional or sensory data elements on a server (digital platforms used to analyze moving patterns) to a collaborative process in which cognitive mapping, search approach or sense of direction can evolve from allowing the digital to rewrite and reconfigure city's places and spatial characteristics (digital tools used to foster cognitive skills and understanding).

The Playable City's approach that digitally supported plays in open urban spaces can be described as cognitive prostheses that learn users how to read and interact with ICT and the physical space around them guides the

^{vi} See <http://wearecircumstance.com/define/>. *Circumstance* was established in 2010 as a framework for the collaborations of Duncan Speakman, Sarah Anderson and Emilie Grenier. It is currently a limited company registered in

the UK, primarily based at the Pervasive Media Studio in Bristol but working between Bristol, London and Brussels.

CyberParks module to think forward. We can start imagine the future of the WAY application as advancing synergies instead of unconformities dominated by isolated online navigational experiences that keep the human detached from others and the activities around him/her. The emergence of this synergy is what Jennings *et al.* [8] termed “human-agent collectives (HACs)” and concerns the increasing interest in the wireless public spaces that “reflect the close partnership and the flexible social interactions between the humans and the

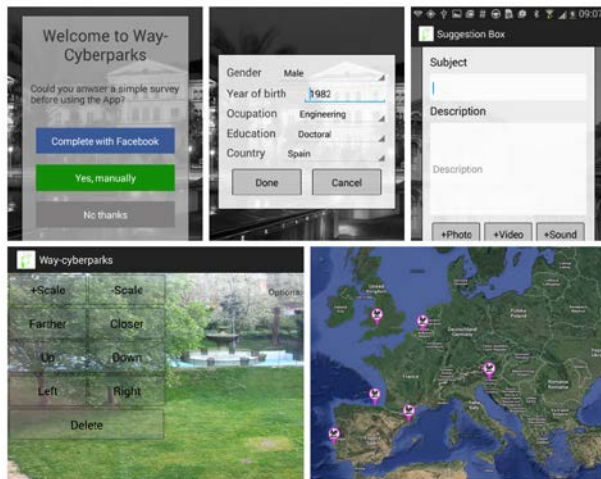


Fig. 05. The WAY CyberParks application, composed by a mobile platform and a monitoring web service, continues to evolve into a set of options for customizable settings (source: <http://cyberparks-project.eu/app>)

computers” [19]. In what follows, this paper attempts to think forward in terms of developing a strategy for such a human-agent synergistic methodology.

III. COGNITIVE-BASED STRATEGIES FOR CYBERPARKS’ PERFORMANCE AGENTS

A. Is human separated from the data captured?

The first analysis within the *CyberParks* project carried out in Lisbon and later on in Barcelona (June and November 2014) rather than merely illustrating some more high-tech environments, focused to explore the contribution of –the rather *ordinary* in a sense-computational objects (applications, GIS systems) in transforming traditional open green spaces into more socially cohesive constructs. This integration and reconceptualization of technology-driven spatial configuration illustrated an interesting emergent phenomenon. That while the use of *software-agent* computational material [4], [20], [5], [21] has now a rather fair history in allowing us to illustrate various aspects of users’ mathematical distribution in urban space, this kind of material provides us only with limited access through the computational turn of the traditional key-stones of the outdoor common space itself. The case studies showed the difficulties and oxymora that exist and emerge when human-centred aspects -like for

example our outdoor social interaction, contact with nature, leisure and recreational behaviours, appropriation of public spaces as places for gathering and encounter with others etc.- take a computational turn themselves. In the analysis of how people move or choose to upload digitalised spatial experiences, agents of the WAY application were so far independent scripts running somehow autonomously in order to register in a database the codified information, being locomotive or sensory. Human activity (mostly move) was captured and processed but the reasons behind this activity and the cognitive constructs it encouraged in people minds were aspects being excluded from the data collected about it. Smaniotto *et al.* [22] argue that software-agents follow their own logic as well illustrating that algorithms formed from positional or sensory models may have such deficiencies:

With ICT, via the app, the collected data provides important information, but it goes in line with the computer logic and the way it arranges the data. It transforms persons into numbers, and might ignore other facts, that a researcher can capture in the field work, not only in terms of spatial-physical presence, but also spatial-temporal. The symbolic meaning of the human being, in this case of being urban, is difficult to be materialised through the data collected by an app or other digital method. On the other hand, using traditional methods can be led by the view or approach of who analysis it (i.e. in a too personal manner). In the process of data gathering and analysis the observer / researcher / analyst should strive his/her best to be a translator and an interpreter then those data. What is needed in CyberParks is to find out a bridge between the two possibilities. [23]

However, through personalised menus, stored user profiles and implementations with agents that group user’s decisions, preferences and opinions, the CyberParks initiative can receive the personal shift necessary to produce the conditions for the computational turn of something more interesting: the symbolic meaning of “being urban” [22]. In this sense, agents become more dependent of patterns of interaction [24] between humans and data, integrating others’ situated positions (personal opinion, thoughts, effects) in the registered information as well. The *<remesh [c]* application provides an ideal post-digital example that bridges these two possibilities (human and software agents). The specific chat app allows a group to speak as one, noting in this way the contrast between data being registered individually and interactively. In the last case, user’s opinion is adapted to others’ own particular viewpoints and prior to registration when compared to the former. WAY app can also construct digital networks (positional for example) but it has difficulty integrating those autonomous algorithmic nodes within common frames of references. With *<remesh*, integrating different personal viewpoints is achieved by grouping and indexing individual digital messages (nodes) in a readily understandable manner for others’ retrieval. “By suggesting your own message and voting on other messages from the group, consensus is quickly reached

and the group's message is sent. While it looks like a simple text message, there can be tens or even hundreds of people on either side of the conversation." [d] The cognitive possibilities of such a neo-analogue attempt can be inspirational for CyberParks' methodological development as well, since there is a common thread running through them that highlights a new level of human/human interaction, distinguishing them from post-digital attempts based on human/machine interaction. In this sense, the WAY app can adopt this technology to allow park's user to carry on an ongoing dialogue with hundreds of others' found in the same area in a dynamic way. Here, personal narratives intervene both on the micro (individual screen text) and on macro level (integration of others' texts) with the successful production of *one shared view* hinging on preferences and final, the voting (man/machine interaction). The social benefits and challenges from groups speaking to other groups or to an individual person in the area with one common voice give us the opportunity to examine the value of narration in structuring a cognitive-based methodology for the future development of the WAY app.

In Bristol's case study, Playful City's digital narratives and games instantiated similar peculiar relationships between *human agents*, cognitive development and media technologies not previously encountered. The user/stroller of the urban space was attributed with an active role in the shaping of how open space is really experienced and comprehended, while synergies between personal and interpersonal selection/choice, acceptance/rejection and approval/disapproval processes where mediating between digital actions and their physio-virtual context.

[Playful City's digital approach] *corresponds to familiar objects, their stories bridge between paper and an adjacent digital layer using, as appropriate; audio, interactivity, location-based pervasive content and reader-generated content. We are concerned with the conjunction between 'fixed' physical books and 'fluid' digital text, the nature of 'ambient literature'; work that embodies the presence, actions and reactions of its audience; participation becomes an integral part of content; and the manner by which the materiality of experience shapes that content.*[b]

The constant shift of the focus of the experience according to user's preference changes is the central methodological persistence of the work presented to us. An agent collaboration was introduced, one in which

neither the locomotional and perceptual processes of the humans were dominant nor the algorithmic language of the software could accurately measure and depict them. Instead, a narrative project emphasized in a rather clear way the cognitive activity of the participants in fitting the reader-generated content of the digital layer into images, schemata or associated memories, and in trying to correspond its individual parts to aspects of the physical surroundings. The cognitive review of Bristol's case study provides us with an assessment of how people understand space when provided with a non-definite narrative strategy. Such a review is rather useful when serving as a basis for the further development of a technologically mediated space that supports human/human interaction instead of establishing merely human/machine relationships.

The synergistic nature of the Playful City with its *reader-generated content* defers in some fundamental aspects from the algorithmic counting or positional ontology of the previous case studies. The case study consisted of three^{vii} participant groupings (with approximately 15 researchers each) that made use of different interactive electronics and location tracking technologies aiming to create user engagement and dialogue. The groups were multidisciplinary in nature, with participants representing a broad spectrum of sciences and arts. In all three workshops, they evaluated what they learned out of their interaction with ICT and Bristol's public spaces. What follows is a cognitive review of the first workshop, this of Tom Abba's *Circumstance*.

B. Case study review: Provisioning complex construction tasks for outdoor users.

During this workshop, researchers were engaged with a collection of mobile micro-experiences as *performance agents* while they were able to interact and shape the spatial experience of their own outdoor walk in a dynamic, non-conventional way. All 15 researchers completed the *Circumstance* task under different real-time periods, considering the fact that they were free to choose the speed and intervals of the story told upon their own interpretations and reflections on images, memories and concepts associated with actual or imaginary spaces. The first major difference that researchers identified at the end of the task was that the narrative logic of the digitized tool (the story told via smart telephones and headphones) in terms of shaping and shifting individual responses was bound by cognitive constraints. From the discussion followed, we noted a variety of approaches on

^{vii} The first one, *Circumstance*, was led by Tom Abba and it is elaborated in this paper as forming the basis of our app's cognitive review. The second one was Miriam Delogu's *The Bearpit*. A large public space with a flat paved area, surrounded by embankments, with a high footfall of people passing through, and with great potential for a variety of activities. Such activities include trading, art, performances, informal play and even as a meeting space for community groups. In this way, the workshop was about exploring the area as both a space for people passing through and dropping by,

and also a space for people of all ages to go to. The third group was led by *Tine Bech*. The workshop attempted to push forward the exploration and understanding of audience interaction. The shift between doing and looking was where Tine Bech's workshop was positioned. Working with the properties of materials and affordances of technology to create audience engagement and dialogue, Tine's practice presented an aesthetic in which sculpture merges with the digital language of technology to create sculptural interaction. [b]

how users navigated the “immaterial” spaces of the continuous digital content with the help of a physical book and, as termed by Abba, the intermedium of an “ambient literature”. If compared with the barely physical and bodily necessities of Lisbon and Barcelona’s tasks, this time a human-agent strategy was linked to how people could develop their own understanding of and appreciation for synergistic possibilities. Another significant difference is that in this synergistic approach, the user’s preferences, choices or decisions to follow a specific narrative platform that would guide him/her within the city became in fact the medium-specific features of the ICT implementation highlighting critical aspects of a new hybrid mode of man/machine/space communication. In the cognitive template proposed by Tom Abba’s Circumstance, this dependency from synergies between the user and the mobile micro-experiences as enhancements of his/her cognition

... recognizes the value of the physical, personal experience; [it evolves] processes by which experiences can be embodied by audiences in a ‘safe’ environment. The roles the audience/participants play occasionally challenge expectations and blur the line between author and audience; the maxim of the work is stated as ‘we create cinematic experiences in unexpected environments’ [b]

From the above we can say that a cognitive-based strategy that learns people how and what to decide/choose/prefer while they move in public and wireless spaces should at least leave them free to reconsider their own roles in the action-sensitive environments of the CyberPark as a possible tool to understand the role of the digital information found within (Table 01). However, we think that this is not enough. A crucial requirement for an adequate synergistic framework is that it protects the user from the conventional structuring of CyberPark’s physical experience and from downloading a contiguous pre-determined digital content. It was for this reason the

initial insistence of the project that CyberParks are not at all about configuring wireless sensor network spots or about designing green landscapes accessorised with wireless internet access spots. In order to meet these requirements, the framework should facilitate a performative public environment integrating strategies that are adaptive not only in both human and software agent interaction but also be responsive to the engagement of participants among themselves, a crucial aspect that contributes to fostering citizen engagement and participation in open public spaces.

IV. CONCLUSIONS ON HUMAN AND SOFTWARE AGENT-BASED STRATEGIES

The CyberParks project attempts to reverse weak aspects emerging from the outdoor use of ICT to the extent that the design of a technologically mediated urban space can motivate people to follow a more active lifestyle leaving the sedentary routine of staying home while promoting physical activity, a higher degree of sociability in our public spaces, etc. To achieve this, it approaches digital tools (the application and the web service) as an interface between the public space and its users.

From the above, the paper evaluated the first results from the ongoing program demonstrating the WAY CyberParks application as an attempt to employ ICT opportunities for human-to-human interaction and with a level of cognitive benefits. The project started by investigating how people combine public open spaces and screen action while exploring some crucial elements to be responded by design, research, and policy making aiming to produce more responsive, stronger, safer and inclusive cities. While open public space is the main object of study, and analysis carried out in Lisbon and Barcelona referred to ICT that enable innovative outdoor social practices, the WAY CyberParks aspires to develop further a useful tool of interface between public space and its users on a level where human interpretation can enable user learning and understanding. To achieve this,

Contribution to structuring relationships between man/space/ICT

Framework	Level of Interaction Needed	Cognitive Value	Data value
Position Informatics	Data are automatically registered by GIS-enabled machine mediation. No further interaction is needed.	No cognitive-based learning.	Archival data value.
Sensory Informatics	Data are selected through preference-based inner mechanisms. Individualized interaction with portable machines is needed.	Basic learning mechanisms are facilitated.	Indexing data value for further retrieval.
Synergistic Interface	At any time, the generation of new data is determined by the interaction of the user with sets of already pre-structured datasheets and the decisions made by others to similar datasheets.	Correlations are gradually developed through understanding the role of the Other’s presence. The development of cognitive critical arguments are highly encouraged.	A network of correlations is facilitated to foster awareness of interaction patterns as a value-added means for technologically mediated public spaces.

Table 01. Cognitive value of frameworks of informatics.

different kinds of features will be further tested and evaluated.

Software-based agents focusing on locomotional data capturing have already been used to examine users' behaviour within technologically enhanced public spaces. At any moment, this kind of behaviour (move and rest) is determined by the surveyor's own interpretation and cognitive schemata he/she develops while observing spatial characteristics. We identified that this state presents a strong separation between the human and the recorded data, mostly due to the fact that the reason of these interpretative mechanisms are unable to be traced and recorded. When a machine-learning environment was attempted (Barcelona) by the simple personification of user's preferences and observations and the uploading of significant and meaningful material (images, videos etc.), a human-based agent network revealed that the shared digitised content wasn't just changing how people move. It shifts the focus of the discussion about what it means to use outdoor ICT possibilities to cultivate learning and understanding through user interaction to a cognitive-based approach that should be further explored.

As we discussed above, the neo-analogue experiences of Bristol's case study based on performance-agent strategies, proved to reduce significantly the conventionality and intentionality of the digital content found within public spaces. Neo-analogue experiences are meant to be different each time one accesses the digital material. Computational methods, like recording, filtering, grouping or sharing different opinions and preferences, can provide new pathways for generating enhanced modes of outdoor knowledge and human-to-human interaction, contrasted to the conventional post-digital human-to-machine examples (Table 01). Cognitive-based ICT solutions where machines can effectively correlate the diverse human reasoning or parametric relationships emerging during the sharing of digital content, can be proved much more productive and sustainable approaches for CyberParks' future development.

REFERENCES

- [1] Hampton, K. N., Livio, O., & L., Sessions G. (2010). The Social Life of Wireless Urban Spaces: Internet Use, Social Networks, and the Public Realm. *Journal of Communication*, 60(4), 701-722. doi: 10.1111/j.1460-2466.2010.01510.x
- [2] Cramer, F. (2014). What is 'Post-digital'? A Peer Reviewed Journal About Post-Digital Research. Retrieved 03.09.2014, from <http://www.aprja.net/?p=1318>
- [3] Hampton, K. N. (2007). Neighborhoods in the network society the e-Neighbors study. *Information Communication and Society*, 10(5), 714-748. doi: 10.1080/13691180701658061
- [4] Ishida, T., & Isbister, K. (2000). *Digital Cities: Technologies, Experiences, and Future Perspectives*: Springer.
- [5] Mossberger, K., Tolbert, C.J., & Franko, W.W. (2012). *Digital Cities: The Internet and the Geography of Opportunity*: Oxford University Press, USA.
- [6] Hampton, K. N. (2002). Place-Based and IT Mediated "Community". *Planning Theory & Practice*, 3(2), 228-231.
- [7] Frick, D. (2007). Spatial synergy and supportiveness of public space. *Journal of Urban Design*, 12(2), 261-274. doi: 10.1080/13574800701306369
- [8] Jennings, N. R., Moreau, L., Nicholson, D., Ramchurn, S., Roberts, S., Rodden, T., & Rogers, A. (2014). Human-agent collectives. *Communications of the ACM*, 57(12), 80-88. doi: 10.1145/2629559
- [9] Rapoport, A. (1990). *History and Precedent in Environmental Design*: Springer US.
- [10] Rapoport, A. (2013). *Human Aspects of Urban Form: Towards a Man—Environment Approach to Urban Form and Design*: Elsevier Science.
- [11] Minai, A. A., Perdoor, M., Byadarhaly, K. V., Vasa, S., & Iyer, L. R. (2010, 18-23 July 2010). A synergistic view of autonomous cognitive systems. Paper presented at the Neural Networks (IJCNN), The 2010 International Joint Conference on.
- [12] Klarqvist, B. (1993). *A Space Syntax Glossary*. Nordiskarkitekturforskning, 2.
- [13] Ioannidis, K. (2011). *Designing the Edge: An Inquiry Into The Psychospacial Nature of Meaning In The Architecture Of The Urban Waterfront*. Stockholm: KTH.
- [14] Ryan, M.L. (2006). *Avatars of story*: University of Minnesota Press.
- [15] Murray, J.H. (1997). *Hamlet on the Holodeck: The Future of Narrative in Cyberspace*: Free Press.
- [16] Lankshear, C., & Knobel, M. (2008). *Digital Literacies: Concepts, Policies and Practices*: Peter Lang.
- [17] Umaschi, Marina, & Cassell, Justine. (1997). Storytelling systems: Constructing the innerface of the interface. Paper presented at the Proceedings of the International Conference on Cognitive Technology.
- [18] Belegundu, A.D., & Chandrupatla, T.R. (2011). *Optimization Concepts and Applications in Engineering*: Cambridge University Press.
- [19] Jennings, N. R., Moreau, L., Nicholson, D., Ramchurn, S., Roberts, S., Rodden, T., & Rogers, A. (2014). Human-agent collectives. *Communications of the ACM*, 57(12), 80-88. doi: 10.1145/2629559, p.81.
- [20] Marshall, S. (2005). *Encyclopedia of Developing Regional Communities with Information and Communication Technology*: Idea Group Reference.
- [21] Paliou, E., Lieberwirth, U., & Polla, S. (2014). *Spatial analysis and social spaces: Interdisciplinary approaches to the interpretation of prehistoric and historic built environments*: De Gruyter.
- [22] Smaniotto Costa, C., Menezes, M., Mateus, D. (2014). *How Would Tourists Use Green Spaces? Case Studies in Lisbon. Project CyberParks – Cost TU 1306. Entretextos 52, CeIED. ISSN 2183- 2102. www.ceied.ulusofona.pt/pt/investigacao/publicacoes/entretextos/197-publicacoes/entretextos-2014.*
- [23] *Ibid.*, p.7.
- [24] Jennings, N. R. (2001). An agent-based approach for building complex software systems: Why agent-oriented approaches are well suited for developing complex, distributed systems. *Communications of the ACM*, 44(4), 35-41. doi: 10.1145/367211.367250

WEB LINKS

- [a] <http://wearecircumstance.com/project/short-films-for-you/>
- [b] Program of Bristol's Management Committee & Working Groups Meeting, Local organizer: Martin Rieser, <https://cyberparksproject.wordpress.com/>
- [c] <http://remesh.co/>
- [d] <http://blog.remesh.co/>
- [e] <http://services.cyberparks-project.eu/>