PUBLIC PLAY SPACE

PUBLIC PLAY SPACE SYMPOSIUM

PROCEEDINGS

Co-funded by the Creative Europe Programme of the European Union

Iaac Institute for advanced architecture of Catalonia

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Breda University of Applied Sciences

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ISBN: 978-84-120885-4-0

Published in the framework of the project Public Play Space, co-funded by the Creative Europe Programme of the European Union.

First edition, 2021

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Published by
Institute for Advanced Architecture of Catalonia
Pujades 102 baixos, Poblenou
08005 Barcelona, Spain
www.iaac.net

Online-version of the Proceedings is available for free at: https://www.publicplayspace.eu/
Printed in the European Union

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14-15 JULY 2021
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PAPERS: INTERACTIVE AND COMMUNITY-BASED STRATEGIES FOR THE CO-DESIGN OF PUBLIC SPACE

POSTERS: INTERACTIVE AND COMMUNITY-BASED STRATEGIES FOR THE CO-DESIGN OF PUBLIC SPACE

Mind Games

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ABSTRACT

This paper describes the preliminary stages and the theoretical and methodological inspiration for the design of UrbanCraft, a gamified activity based on Kevin Lynch's mental maps and aiming at enhancing youth participation and inclusion in urban co-design and governance. This activity draws on previous local experiences on participation and social inclusion, held in the Southern Italian city of Palermo, in an attempt to mix urban studies, serious games and artificial intelligence methodologies. In this experiment, we designed a gamified activity conceived for nine- to twelve-year-old primary and secondary school children, due to our previous cooperation with several primary and secondary schools in Palermo. Overall, the goal of this proposal is to adapt Lynch's notions of imageability and public images to a serious game and lead the players to an enhanced spatial awareness of their neighborhood and the entire city. Although UrbanCraft is still in its early design stages, the existing network of public institutions, research centers and schools provides a fertile ground for developing the project.

KEYWORDS

Mental maps, youth participation, serious games, NLP, Palermo

1. MAPPING NEIGHBORHOODS: PREVIOUS EXPERIENCES AND FUTURE PERSPECTIVES

Starting in 2013, the city of Palermo hosted a project aimed at involving students of primary and secondary schools and increasing their social awareness of the role of neighborhoods and communities in the contemporary city, with particular attention to participation and the active involvement of young people in the processes of urban co-design. This project, called 'La scuola adotta e progetta il quartiere' (The school adopts and designs the neighborhood) merged the more technical themes of urban planning with the qualitative approach characterizing most social sciences (Figure 1). Thanks to a memorandum of understanding with the Municipality of Palermo, several innovative activities related to the 'adoption' of neighborhoods were carried out (Picone, Schilleci, 2020).

Public spaces had a pivotal role in the project. Its final goal was to redesign several public spaces close to the schools involved in this experience. Young people were led to imagine a renewed function for those public spaces they perceived as abandoned or misused.

From a theoretical point of view, the project drew on the relationships between urban studies and education studies. In Italy, in addition to the well-known work of Tonucci (2005), the most recent contributions to this field have been provided by Malatesta, 2015 and Giorda and Zanolin, 2019. Similar approaches are common in other European countries: see Deinet (2017) for the German-speaking area (with a very interesting analysis on the relationships between pedagogy and urban planning) and Dickens (2017) for the United Kingdom.

Figure 1: Poster of the final event of the Palermo project in 2017.

Throughout all the project, mental maps—as theorized by Lynch (1960) and later revised by Gould and White (2002)—played a key role in helping schoolchildren to express their ideas on the spatial organization of the neighborhood, on what it lacked and needed (Figure 2). Mental maps were used as tools for the support of participation (Picone and Lo Piccolo, 2014; Pánek, 2016) and often linked to the development of qualitative cartography, especially qualitative GIS (Cope and Elwood, 2009).

Figure 2: Mental map of the Arenella neighborhood in Palermo, drawn by a 12-year-old student of the Sileno school in 2014.

However, mental maps can be more than simple tools providing qualitative data to insert in a GIS framework. Mental maps—especially when employed with young people—can also inspire a playful approach to urban planning (Poplin, 2011). This consideration, along with the cooperation on other projects based on serious games (Spotorno, Picone and Gentile, 2020), brought the authors of this paper to the idea of designing a serious game.
To the best of our knowledge, there are no games explicitly focused on Lynch's mental map and the processes behind its realization.

For this reason, in this paper, we present a proposal of an urban game relying on artificial intelligence methodologies designed to support children in the co-construction of a shared mental map. The proposed game, which we are tentatively calling UrbanCraft, will support a collaborative knowledge-building process, facilitating the negotiation of subjective points of view related to the perception of public spaces, which is the core of Lynch's discourse.

The idea behind this proposal is to stimulate a shared exploration of how spatial elements relate to each other and to analyze their functions, leaving their 3D graphic representation only as the final step of a process that is primarily cognitive and social, rather than strictly architectural.

From this point of view, the shared mental map that is the output of the co-design process supported by the game can represent a valuable starting point for the graphic representation process of public spaces.

2. SERIOUS GAMES FOR PARTICIPATORY URBAN DESIGN PROCESSES

As highlighted in the literature (Redondo et al., 2020), there are several examples of serious games used to facilitate citizen participation in urban design processes (Majury, 2014; Tan, 2020) or to educate/encourage young people to participate in the design of public spaces (Westerberg and Von Heland, 2015; de Andrade et al., 2020).

Broadly speaking, two main types of serious games can be identified:

- Games for fostering the comprehension of public systems dynamics, like cities;
- Games to facilitate the architectural design of spaces.

The first category of games includes all those experiences in which construction and management games such as SimCity have been adopted to facilitate the understanding of decision-making processes at the basis of public administration management.

The second group comprises all those experiences that rely on the possibilities offered by some games to provide a graphical (generally 3D) representation of public spaces. Within this group, some experiences leverage the realism of the virtual representations produced by the system (IAAC, 2021), often exploiting the possibilities offered by tools such as 3D-visors, that enhance user experience (Fonseca, 2020).

On the contrary, when the games have a more explicit educational goal, the realistic representations are replaced by simplified representations like block worlds, typical of some game environments such as Minecraft (Majury, 2014; Westerberg and Von Heland, 2015; de Andrade et al., 2020).

A notable exception to this broad classification is the experience gained in the Play the City project, in which the role-playing technique typical of games such as Dungeons & Dragons was adopted to generate creative processes of co-design of spaces (Tan, 2020).
Artificial Intelligence methodologies have been successfully used in serious games (Westera et al., 2020) and at the same time have been also proposed to support collaborative urban planning processes, for example to understand the emotional state of citizens, using sentiment analysis, as well as to facilitate data categorization and reasoning by exploiting semantic/cognitive models (Meza et al., 2021; Urban et al., 2021).

Intelligent virtual agents have been used in simulation games to recreate real world scenarios where players (citizens or policy makers) can explore the effects of administrative decisions (Pilato et al., 2011).

To the best of our knowledge, there are no serious games exploiting AI to support children in the construction of shared mental maps, as Lynch describes them. Hence our proposal of a still-to-be-fully-developed serious game, UrbanCraft.

2.1. URBANCRAFT

The goal of our serious game is to support school children in the collaborative creation of a shared mental map of their neighborhood. The game will foster the production of a map according to Lynch's model, starting from the individual student's perception of the space around them. These shared mental maps are what Lynch used to call public images: "Each individual creates and bears his own image, but there seems to be substantial agreement among members of the same group. It is these group images, exhibiting consensus among significant numbers, that interest city planners who aspire to model an environment that will be used by many people. Therefore this study will tend to pass over individual differences, interesting as they might be to a psychologist. The first order of business will be what might be called the public images, the common mental pictures carried by large numbers of a city's inhabitants: areas of agreement which might be expected to appear in the interaction of a single physical reality, a common culture, and a basic physiological nature" (Lynch, 1960, p. 7).

The game is accessible through a simple graphical interface, where the student can build an abstract spatial representation by selecting and placing items from an inventory.
A virtual assistant facilitates the process of collaborative building of the map, by providing explanations and exploiting semantic modules to analyze the students' activities. The activities concern the shaping of the neighborhood (or district, in Lynch's terms) with the items picked out from the inventory, and the description of the inserted items by choosing and setting features tags and by annotating the items with words or sentences. The semantic modules allow the virtual assistant to refine and merge the students' contributions in a shared mental map.

3. ENVIRONMENT AND GAME MECHANICS

The student accesses an inventory composed of a simplified version of the typical mental map concepts. It is simpler than the graphical differentiation proposed by Lynch, since only three basic shapes are displayed in the inventory:

- Circles, representing Nodes and Landmarks.
- Lines, representing Paths.
- Squares, representing Districts and the related Edges.

The choice of avoiding the explicit distinction between Nodes and Landmarks, and between Districts and Edges is motivated both by the need to provide greater freedom to the players in the interpretation of the elements to be selected and by the will to not overburden them with a bunch of information.

Moreover, the students can select specific instances (see below for a few examples) that characterize the area of interest from the inventory. The teacher/tutor could list these specific instances in the setup phase of the classroom activity.

The student can characterize the elements with feature tags and textual descriptions. Feature tags are considered from spatial, social or functional points of view and allow to capture what Lynch calls imageability, "that quality in a physical object which gives it a high probability of evoking a strong image in any given observer" (Lynch, 1960, p. 9).
Examples of physical features can be shape, dimension, color, arrangement, building type. Examples of social features can be utility, importance, popularity, pollution, pleasantness, dangerousness. Each feature has a proper icon representing it. Examples of functional tags are play, walk, meet, sit, listen.

Students can provide a value for each feature, and that value will influence the appearance of the element in the map. They can also choose among the features displayed in the interface or create new ones, by selecting the value type.
Apart from explicitly giving a connotation to the elements by setting or creating features, students can also provide a textual description. Their choices will influence the graphics of the map and will at the same time feed a semantic network that will constitute the structured knowledge base of the virtual assistant.

The user can 'play' with Lynch's elements to build the map in a playful and fun way, according to a specific goal proposed by the school teacher. A classic example is to invite students to describe the path that leads them from their home to school, as well as the main urban features (i.e., landmarks) they can find along this path.

Using a real-time approach, the students working on their assignment will see items entered by their classmates appear on their map.

Through this real-time integration, supported by both the virtual assistant and the teacher, students will be challenged to find new connections between these elements or improve their description of the elements.

3.1. THE VIRTUAL ASSISTANT

A virtual agent assists the students in the creation of the map. It provides suggestions and explanations by displaying messages on the interface, and supports the process of refining and merging the contributions of the students. It exploits Natural Language Processing (NLP) modules that analyze the available knowledge to (1) put in relation the activities made by the different users, contributing to the definition of the shared map, and (2) detect meaningful concepts and the presence of emotional content in the textual descriptions.

The agent's knowledge is composed of a symbolic component, represented by a semantic network and a semantic vector space. The semantic network represents the conceptual representation of the neighborhood that emerges from the students' activities (it is updated from time to time with the different choices made by the students).
The semantic vector space is a sub-symbolic representation of the district created by means of a data-driven methodology by the analysis of:

- Textual objective data about the place (e.g., information extracted from a GIS system);
- Documents describing the element of the district.

It is well-known how semantic spaces make it possible to obtain a 'sub-symbolic' representation of natural language elements, such as words, sentences, and documents in a high-dimensional vector space. According to the so-called 'geometric metaphor of meaning,' elements close in the space can be considered semantically similar (Landauer et al., 1998; Sahlgren, 2006).

After a pre-processing of the text (removal of punctuation, reduction of words to their lemmas), the descriptions of the map items are mapped in the semantic vector space and compared according to their distance.
Such a choice allows to capture the associations between the different textual descriptions and clarify the relationships between the information entered by the students. Consequently, the agent can propose suggestions to refine the map (e.g., for merging elements).

Moreover, with the support of ad hoc lexicon and the information codified in the semantic space, the agent searches for the presence in the text of nouns that can be associated to strategic elements of the neighborhood, and of verbs that can be associated to the main city activities.

This analysis allows the agent to better identify the typology of the items and the relations with other elements of the neighborhood that were not depicted by the students. If the result of this analysis leads to an interpretation shared by many students, the agent can suggest a refinement of the map, by making explicit a distinction between Nodes and Landmarks and reshaping Landmarks with a triangle to be compliant with Lynch's traditional graphical notation. If the analysis leads to few subjective interpretations, the agent can highlight them to open a discussion in the class (for example to clarify the point of view of students and let the class decide whether a change must be performed, for example the introduction or removal of an element on the map).

Moreover, a sentiment/emotion analysis module searches for the presence of emotional content in the text to estimate the emotional relationship between the individuals and the urban space.

The identification of a shared emotion associated with a place is obtained by combining the characterization of the items performed by the students setting the feature tags with an emotional connotation available in the inventory and the results of the sentiment/emotion analysis module.

The items in the map will be then colored according to the emotions they evoke most strongly in students (Figure 3).

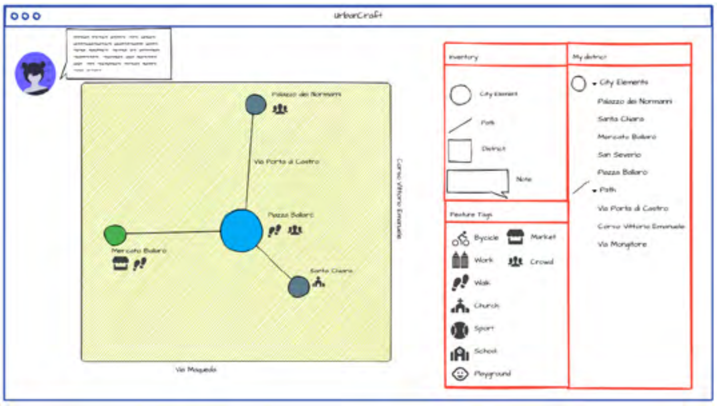

Figure 3: Sketch of the game interface.

4. CONCLUSIONS

Although UrbanCraft is still in its early design phase, we are quite certain of its ability to be introduced and used in primary and secondary schools. Given the previous cooperation with several local schools and the existing network with the Municipality of Palermo and its council members, our goal is to test UrbanCraft in 5 to 10 schools next year. Naturally, the impact of (hopefully) post-Covid regulations will have to be taken into account and will determine the kind of experimentations we will implement. In any case, we believe that Lynch's approach to subjective spatial perception can become an essential tool for gamifying the school children's notions of neighborhoods and cities and empower them as active citizens, by involving them in all the stages of participatory techniques aimed at urban decision-making processes. There is still a lot of work and implementation to do, but we believe UrbanCraft could easily become a powerful tool to be used in all primary and secondary schools, since it will be extremely easy to adapt it to several local contexts outside of the specific case of Palermo.

REFERENCES

Cope, M. and Elwood, S., 2009. Qualitative GIS. A Mixed Methods Approach. London: SAGE.de Andrade, B., Poplin, A., and Sousa de Sena, Í., 2020. Minecraft as a tool for engaging children in urban planning: A Case study in Tirol Town, Brazil. ISPRS International Journal of Geo-Information, 9(3), p. 170.

Deinet, U., 2017. Appropriating Spaces as a Form of Urban Education. In: A. Million, A.J. Heinrich, T. Coelen, eds. Education, Space and Urban Planning. Education as a Component of the City. Cham: Springer, pp. 139–146.

Dickens, L., 2017. World Making, Critical Pedagogies, and the Geographical Imagination: Where Youth Work Meets Participatory Research. Antipode, 49(5), pp. 1285–

1305.

Fonseca, D., 2020. 'Gamification' for Teaching Collaborative Urban Design and Citizen Participation. Graphical Heritage: Volume 3–Mapping, Cartography and Innovation in Education, 7, p. 431.

Giorda, C. and Zanolin, G. eds., 2019. Idee geografiche per educare al mondo. Milan: FrancoAngeli.

Gould, P. and White, R., 2002. Mental Maps. London: Routledge.

IAAC. SuperBARRIO. [online] Available at: <https://iaac.net/project/superbarrio/> [Accessed 14 June 2021].

Landauer, T.K., Foltz, P.W., and Laham, D., 1998. An introduction to latent semantic analysis. Discorse Processes, 25(2–3), pp. 259–284.

Lynch, K., 1960. The Image of the City. Cambridge: The M.I.T. Press.

Majury, K., 2014. Imagination made real in Blockholm. GeoInformatics, 17(1), p. 10.

Malatesta, S., 2015. La geografia dei bambini. Luoghi, pratiche e rappresentazioni. Milan: Guarini.

Meza, J., Vaca-Cardenas, L., Vaca-Cardenas, M.E., Teran, L., and Portmann, E., 2021. A Human-Machine Collaboration Model for Urban Planning in Smart Cities. Computer, 54(6), pp. 24–35.

Pánek, J., 2016. From Mental Maps to GeoParticipation. The Cartographic Journal, 53(4), pp. 300–307.

Picone, M. and Lo Piccolo, F., 2014. Ethical E-Participation: Reasons for Introducing a 'Qualitative Turn' for PPGIS. International Journal of E-Planning Research, 3(4), pp. 57–78.

Picone, M. and Schilleci, F., 2020. La scuola adotta e progetta il quartiere. Un'esperienza di progettazione partecipata a Palermo. In: L. Lazzarini and S. Marchionni, eds. Spazi e corpi in movimento. Fare urbanistica in cammino. Florence: SdT Edizioni, pp. 185–201.

Pilato, G., Augello, A., and Gaglio, S., 2011. Modular knowledge representation in advisor agents for situation awareness. International Journal of Semantic Computing, 5.01, pp. 33–53.

Poplin, A., 2012. Playful public participation in urban planning: A case study for online serious games. Computers, Environment and Urban Systems, 36(3), pp. 195–206.

Redondo, E., Giménez, L., Navarro, I., and Fonseca, D., 2020. "Gamification" for Teaching Collaborative Urban Design and Citizen Participation. In: Congreso Internacional de Expresión Gráfica Arquitectónica. Cham: Springer, pp. 431–441.

Sahlgren, M., 2006. The Word-Space Model: Using distributional analysis to represent syntagmatic and paradigmatic relations between words in high dimensional vector spaces. Diss. Stockholm University.

Spotorno, R., Picone, M., and Gentile, M., 2020. Designing an Online Dungeons & Dragons Experience for Primary School Children. In: I. Marfisi-Schottman, F. Bellotti, L. Hamon, and R. Klemke, eds. Games and Learning Alliance. Cham: Springer, pp. 207–217.

Tan, E., 2020. Play the City. In: A. Gerber and U. Götz, eds. Architectonics of Game Spaces. Bielefeld: Transcript Verlag, pp. 265–276.

Tonucci, F., 2005. La città dei bambini. Un modo nuovo di pensare la città. Rome: Laterza.

Urban, A., Hick, D., Noennig, J.R., and Kammer, D., 2021. With a Little Help from AI: Pros and Cons of AI in Urban Planning and Participation. International Journal of Urban Planning and Smart Cities, 2(2), pp. 19–33.

Westera, W., Prada, R., Mascarenhas, S., Santos, P. A., Dias, J., Guimarães, M., and Ruseti, S., 2020. Artificial intelligence moving serious gaming: Presenting reusable game AI components. Education and Information Technologies, 25(1), pp. 351–380.

Westerberg, P., and von Heland, F., 2015. Using Minecraft for Youth Participation in Urban Design and Governance. Nairobi: United Nation Human Settlements Programme.

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