Toward Co-Creative Tools for Tactical Urban Revitalization

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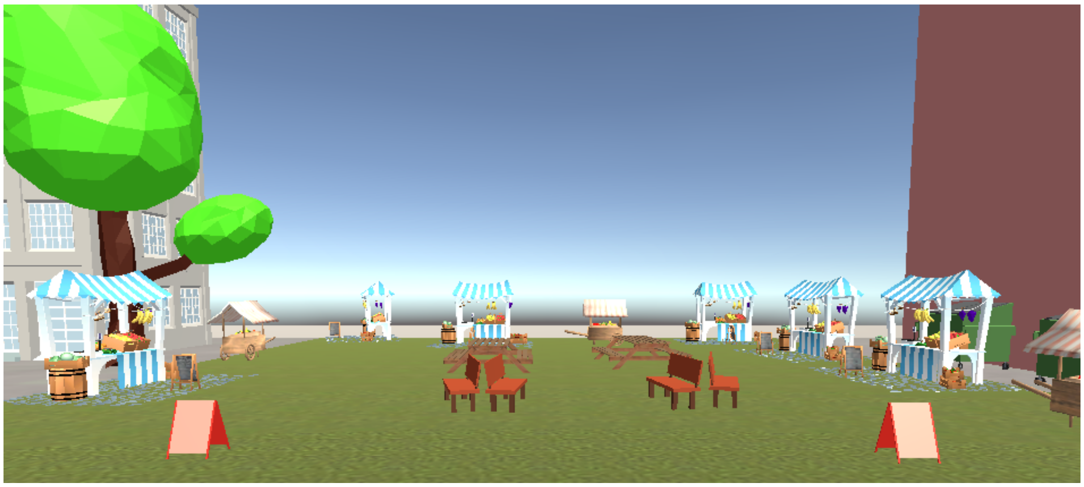

Figure 1: A design for a small farmers market on an abandoned lot created using the PatternPainter design tool.

ABSTRACT

The physical urban environment has been shown to play a large role in community resilience and well-being, but processes to plan for, revitalize, and repair these environments often show the goals of local residents to be at odds with official agendas. My research focuses on building co-creative design aids for ordinary citizens to help them create expert-level visualizations to communicate plans for tactical, urban revitalization projects in their communities. I rely on a variety of both technical and qualitative methods to build tools and algorithmic techniques as well as understand the scope of design knowledge of novice community members.

CCS CONCEPTS

• **Human-centered computing** → *User interface management systems*; User models; • **Applied computing** → Sociology.

KEYWORDS

tactical urbanism; city planning; participatory design; grassroots activism; co-creative agents

ACM Reference Format:

Sarah Cooney. 2021. Toward Co-Creative Tools for Tactical Urban Revitalization. In *CHI Conference on Human Factors in Computing Systems Extended Abstracts (CHI '21 Extended Abstracts), May 8–13, 2021, Yokohama, Japan.* ACM, New York, NY, USA, 5 pages. https://doi.org/10.1145/3411763.3443426

CHI '21 Extended Abstracts, May 8–13, 2021, Yokohama, Japan

ACM ISBN 978-1-4503-8095-9/21/05.
https://doi.org/10.1145/3411763.3443426

1 MOTIVATION

Research shows that the physical infrastructure and design of a community can have enormous impacts on its residents' health and well-being [13, 15, 16, 25, 30]. Therefore, it is very important that residents have a say in the design of their neighborhoods. However, participatory design (PD) in urban planning, the process by which residents have their voices heard, has long suffered from a variety of problems making it far less democratic than theory suggests [14]. Four of the major issues are as follows:

Money. Running public meetings and listening sessions is expensive. One design expert with whom I have spoken said ideally he would be able to have at least three community meetings just dedicated to listening to community comments and concerns before beginning any design exercises or workshops [34]. However, running meetings and hiring design experts costs money, and in the reality of today's municipal budgets this is almost never feasible.

Time. Public meetings or comment periods can add time to the project at hand, which often raises costs. Furthermore the meetings themselves are often scheduled at times that are not convenient for citizens to participate. Consider the instance of a Chicago community that put together a digital petition to protest the addition of a fifth pawnshop to their neighborhood. Despite knowledge of the petition and its widespread support, local officials approved the shop, because not enough people showed up to the meeting to dissent in person—a meeting that was held on a Wednesday at 10 am [10]. There hardly seems to be a less convenient time to hold a public meeting in a poorer, primarily working class neighborhood than mid-morning on a weekday.

Who participates. Whether it is due to time constraints or other factors, the citizens who regularly show up to public meetings are not generally a representative sample of community demographics. with research showing participants tend toward those who are whiter and wealthier [9]. These residents often represent the status quo—typically representing the NIMBY, meaning "Not in my Backyard," perspective—and since they show up (per the previous, are able to show up) they have their voices heard the the status quo often stands.

Bias. Not only is there bias in who shows up, the officials themselves are sometimes biased (explicitly or not), meaning the desires of wealthier, whiter communities are often prioritized. In the same study as the pawnshop example, researchers found in observing regular community policing meetings that while the local officials and police chief often showed up themselves to meetings in the wealthier, whiter community, they usually sent representatives with no actual decision making authority to meetings in the poorer, blacker community [10].

In response to the issues surrounding participatory processes in urban planning, some citizens have taken matters into their own hands, in a movement that has come to be known as *tactical urbanism* [20]. However, even DIY-urbanism costs both time and sometimes money. Furthermore, it requires a certain level of vision to imagine new uses for urban spaces; for instance, turning parking spaces into small parks (parklets) [2].

I believe that *all* residents should have the power to affect change in the physical design of their cities. To that end, my research agenda focuses on building technological tools to help ordinary citizens envision improvements to their urban environments and to come together to take action. Specifically, my focus is building co-creative agents based on expert design knowledge to help residents re-imagine their urban surrounds.

2 BACKGROUND

My dissertation work sits at the intersection of two research topics that have been explored in the HCI community—urban planning and creativity.

There is a large body of work in HCI exploring various aspects of urban planning [5, 17, 29, 33, 36, 37]. However, a large portion of this work focuses on augmenting or improving the traditional participatory design process [6, 7, 22]. In contrast, my work looks to subvert this process entirely, by placing total control into the hands of citizens. While there has been some work in the context of grassroots movements with regard to urban issues [4, 8, 12], as far as I can find it has not been directly connected to the tactical urbanism movement, and often focuses more on upkeep tasks [23, 28] than the complete re-design or re-programming of public space.

Creativity has also been explored in a number of contexts by the HCI community, including in group work [35], with children [39], and in music and poetry [3, 31]. In fact, it is included in the seven grand challenges of HCI [32]. In the last decade or so, a great deal of the work in creativity has focused on co-creative systems, which leverage the power of machine learning to enhance or expand support for the creative process in some domain [11, 24]. The

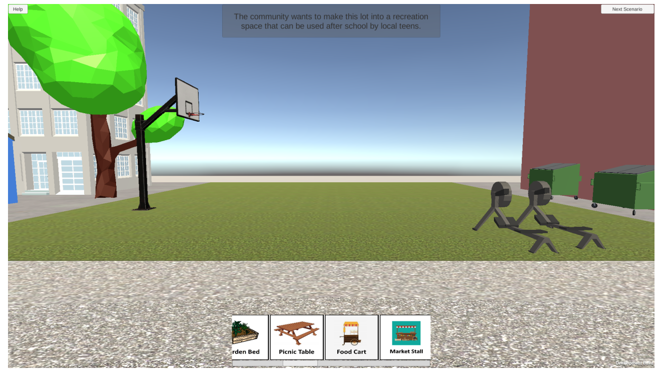

Figure 2: The PatternPainter user interface with a partially completed design for a recreation space for teens.

HCI community has explored co-creative systems in a variety of contexts, such as sketching [26], journalism [21], music creation [19], and even recipe creation [27]. However, aside from work producing digital street art [18], we have seen very limited examples of co-creative systems being leveraged in the urban context, and not at all in the context of helping novice users redesign their urban environments.

3 PROJECTS

My dissertation work currently consists of three main projects. Each of these projects is a stepping stone to toward the overarching goal of producing a complete co-creative system to create designs for tactical, urban revitalization.

3.1 PatternPainter

PatternPainter is a system to allow ordinary citizens to redesign their urban environments. Specifically, it focuses on the case of revitalizing an abandoned lot, one of the simplest projects in the tactical urbanism space, but shown to be highly effective in improving the well being of near-by residents [13, 25, 30]. Figure 1 shows a design for a farmers market produced using PatternPainter.

PatternPainter was built using the Unity game engine, and has a simple user interface that allows objects to be added to the scene and manipulated using simple mouse controls and keyboard commands. The PatternPainter UI can be seen in Figure 2. The objects in PatternPainter were inspired by patterns from Christopher Alexander's classic planning book, *A Pattern Language: Towns, Buildings, Construction* [1]; in particular, those patterns describing varied uses for public space.

Ideally, PatternPainter would be evaluated in situ, working with community partners to help facilitate the redesign of a neighborhood space. However, due to constraints posed by the Covid-19 pandemic, this type of study is infeasible at this time, so in order to do an initial evaluation of PatternPainter I recently conducted a series of online experiments using Amazon's Mechanical Turk. In the first experiment, participants created designs based on twelve scenarios detailing different uses for the space, including the one shown in Figure 1. Other scenarios included a family park, a community garden, outdoor entertainment space, and recreation space for

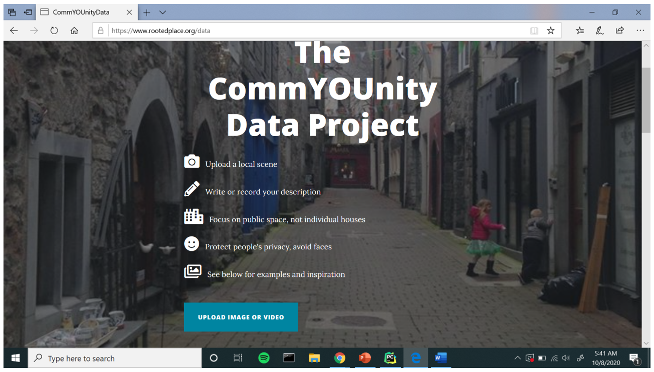

Figure 3: The CommYOUnity Data Site, where people can upload images or videos of their neighborhoods along with descriptions of what they love and what they would like to see changed.

the elderly. In the second experiment, these designs were rated on a series of eight metrics, including play (the availability of activities for children), access to nature (the inclusion of elements of nature such as trees, flowers, gardens, or animals), and sociability (a space conducive to socializing with friends and neighbors). Participants also described each design in terms of what they felt its primary use or purpose and audience would be. The experiments showed that PatternPainter allowed users to communicate the intended designs, and create highly social spaces.

Currently, PatternPainter contains one scene, based on a common urban revitalization scenario. Our plans for the future are to create a gamified, mobile version of PatternPainter that will allow users, in particular we hope to target young people, to iteratively and collaboratively create designs to revitalize spaces in their neighborhoods. This will include embedding PatternPainter in the real world using GIS technology an expanding the types of available revitalization projects to include settings beyond abandoned lots. We also intend to make PatternPainter open source to allow it to remain accessible to all users.

3.2 CommYOUnity Data Project

In order to create co-creative agents for urban design and revitalization, it is important to first capture the "design-knowledge gap" between ordinary citizens and design experts, and this is the purpose of the CommYOUnity Data Project.

Currently, we are in the data capture phase, which consists of three distinct tasks. The first task is to collect data from ordinary people about how they view their physical environments. We created a simple site, shown in Figure 3, to allow people to upload images or videos of their neighborhoods, along with a short description of "the elements of the image you'd like to see improved and / or what you love about the space." To date, we have collected nearly 40 image-caption pairs. We have found that while some captions contain an analysis of the landscape and suggestions for improvement (see Figure 4 Top), most are merely descriptive (see Figure 4 Bottom), indicating a lack of "design thinking" from ordinary people.

The second data collection task consists of interviews with design experts centered around the following questions:
1) *What do you think differentiates thinking from a design or planning perspective compared to someone without design or planning training / experience?*
2) *Describe an example of something in physical space you might see in a different way than someone without design or planning training.*

Currently, I have conducted three interviews, and am in the process of scheduling several more.

The third task will ask design experts to caption and manually annotate some of the image submissions from the CommYOUnity site. The second phase will be analysis of these three data types, to determine what the main gaps in design knowledge are.

Preliminary analysis suggests that one of the main differences between designers and lay-people is that designers see the world through a prescriptive lens while lay-people's worldview is more descriptive. We will explore this insight more deeply, and hope to glean additional understanding with further data and analysis.

3.3 Structurally Consistent Style Transfer for Streetscape Images

As a stepping stone toward the complete co-creative system, I am currently working on neural style transfer algorithms for adapting streetscape images.

The goal of the complete system will be to encourage the creation of *tactical* designs. In other words, they should be able to realistically be realized by a small group of motivated residents. Thus, there are certain structural elements of the scene that should remain untouched. For instance, we should assume that buildings and roads may not be removed. Therefore, we need the algorithm to have some level of feature-awareness.

I first explored methods for *semantic style transfer*, but the issue with current methods is that that strictly separate features of interest—those that we wish to change—from the "background" features—those that are to remain unchanged. In contrast, we would like to allow changes to the pixels of the structural features that do no compromise the underlying structure. For example, we might allow a new tree to be added to the scene and placed in a way that partially occludes a building without changing the building structure. This will require additional coordination between the feature and structure layers. Thus, I am now exploring the use of scene graphs and graph convolution, as opposed to working directly on the images. This work is inspired heavily by the work of Want et al. in [38].

This is work is still in the exploration phase, and does not yet have any results.

4 CONCLUSIONS

By the end of my dissertation, I hope to have produced a complete co-creative system for designing tactical urban revitalization projects. My work will contribute to two threads of research in HCI, creativity and urban planning. In the creativity space, it will represent a new application for co-creative systems and add insights regarding creativity and design thinking from the perspective of professional urban planners. In the urban planning space, my work

Figure 4: CommYOUnity Data Site submissions captioned: (Top)*This is a classic Levittown-type neighborhood where there are two basic floor plans that alternate. I love that there was enough 'space' on each lot for owners to modify their houses as needed. I love that the houses were built into the existing landscape instead of flattening the land to build the neighborhood. I love that this street is a hidden gem in an otherwise industrial are. I would like sidewalks so we don't have to walk in the narrow street. I would like more street lamps.* (Bottom)*Crowded beach on a weekend with the ocean waves crashing. Some people are swimming or playing in the waves while others sit or stand on the sand. Lots of colorful umbrellas catch the eye along with some orange flags. Beach houses follow the shore all the way to the visible peninsula in the background with a hint of clouds on top of it. The beautiful blue sky completes the view.*

steps beyond current research on the traditional participatory process to empower ordinary citizens to envision and complete grassroots, tactical revitalization projects in their communities. Thus far, I have worked on three projects, each representing a specific step toward the complete system.

5 RESEARCH SITUATION

I am a fourth year PhD candidate at the University of Southern Californiam having completed my qualifying examinations in June of 2020, and am advised by Dr. Barath Raghavan. During the first two years of my PhD I was supervised by another professor who subsequently left the university. At this time I transitioned to working with Prof. Raghavan and moved to working in HCI. While I am still relatively new to HCI, my previous research in behavioral game theory and AI for social good has prepared me to begin my dissertation research on technological tools for tactical urban revitalization. I expect to complete my PhD sometime in 2022.

My general research interest has always been computing for social good. Under my previous advisor's supervision I worked on a variety of interdisciplinary projects in behavioral game theory and AI for social good. However, I found that in the AI community, while a concern for social good might drive the choice of problem, the overall focus was still on the technological advancement, and there was little to no space in publications for reflection on the ramification of the work. I was drawn to the HCI community, because I wanted the opportunity to dig more deeply into the implications of the technology, and to be able to conduct research using more human-centered methodologies like ethnography and qualitative studies.

REFERENCES

[1] Christopher Alexander, Sara Ishikawa, Murray Silverstein, Max Jacobson, Ingrid Fiksdahl-King, and Shlomo Angel. 1977. *A pattern language.* Oxford University Press, New York.

[2] American Society of Landscape Architects. 2019. Celebrate PARK(ing) Day with ASLA. https://www.asla.org/contentdetail.aspx?id=46872.

[3] Mark Amerika, Laura Hyunjhee Kim, and Brad Gallagher. 2020. Fatal Error: Artificial Creative Intelligence (ACI). In *Extended Abstracts of the 2020 CHI Conference on Human Factors in Computing Systems.* 1–10.

[4] Mariam Asad and Christopher A Le Dantec. 2015. Illegitimate civic participation: supporting community activists on the ground. In *Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing.* 1694–1703.

[5] Nimish Biloria and Dimitra Dritsa. 2018. Social Robotics and Human Computer Interaction for Promoting Wellbeing in the Contemporary City. In *International Conference on Human-Computer Interaction.* Springer, 110–124.

[6] Emma Chow, Amin Hammad, and Pierre Gauthier. 2011. Multi-touch screens for navigating 3d virtual environments in participatory urban planning. In *CHI'11 Extended Abstracts on Human Factors in Computing Systems.* ACM, 2395–2400.

[7] Nektarios Christodoulou, Andreas Papallas, Zona Kostic, and Lennart E Nacke. 2018. Information Visualisation, Gamification and Immersive Technologies in Participatory Planning. In *Extended Abstracts of the 2018 CHI Conference on Human Factors in Computing Systems.* ACM, SIG12.

[8] Carl DiSalvo and Tom Jenkins. 2017. Fruit are heavy: a prototype public IoT system to support urban foraging. In *Proceedings of the 2017 Conference on Designing Interactive Systems.* 541–553.

[9] Katherine Levine Einstein, Maxwell Palmer, and David M Glick. 2019. Who participates in local government? Evidence from meeting minutes. *Perspectives on Politics* 17, 1 (2019), 28–46.

[10] Sheena Erete and Jennifer O Burrell. 2017. Empowered participation: How citizens use technology in local governance. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems.* 2307–2319.

[11] Jonas Frich, Lindsay MacDonald Vermeulen, Christian Remy, Michael Mose Biskjaer, and Peter Dalsgaard. 2019. Mapping the landscape of creativity support tools in HCI. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems.* 1–18.

[12] Sucheta Ghoshal, Andrea Grimes Parker, Christopher A Le Dantec, Carl Disalvo, Lilly Irani, and Amy Bruckman. 2019. Design and the Politics of Collaboration: A Grassroots Perspective. In *Conference Companion Publication of the 2019 on Computer Supported Cooperative Work and Social Computing*. 468–473.

[13] Justin E Heinze, Allison Krusky-Morey, Kevin J Vagi, Thomas M Reischl, Susan Franzen, Natalie K Pruett, Rebecca M Cunningham, and Marc A Zimmerman. 2018. Busy Streets Theory: The Effects of Community-engaged Greening on Violence. *American journal of community psychology* 62, 1-2 (2018), 101–109.

[14] Bernie Jones. 1990. *Neighborhood planning: A guide for citizens and planners*. American Planning Association.

[15] Eric Klinenberg. 2015. *Heat wave: A social autopsy of disaster in Chicago*. University of Chicago Press.

[16] Eric Klinenberg. 2018. *Palaces for the people: How social infrastructure can help fight inequality, polarization, and the decline of civic life*. Broadway Books.

[17] Christopher A Le Dantec, Mariam Asad, Aditi Misra, and Kari E Watkins. 2015. Planning with crowdsourced data: rhetoric and representation in transportation planning. In *Proceedings of the 18th ACM conference on computer supported cooperative work & social computing*. 1717–1727.

[18] Zhuying Li, Yan Wang, Wei Wang, Stefan Greuter, and Florian'Floyd' Mueller. 2020. Empowering a Creative City: Engage Citizens in Creating Street Art through Human-AI Collaboration. In *Extended Abstracts of the 2020 CHI Conference on Human Factors in Computing Systems*. 1–8.

[19] Ryan Louie, Andy Coenen, Cheng Zhi Huang, Michael Terry, and Carrie J Cai. 2020. Novice-AI Music Co-Creation via AI-Steering Tools for Deep Generative Models. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*. 1–13.

[20] Mike Lydon and Anthony Garcia. 2015. *Tactical Urbanism: Short-term Action for Long-term Change*. Island Press, Washington, DC, USA.

[21] Neil Maiden, Konstantinos Zachos, Amanda Brown, George Brock, Lars Nyre, Aleksander Nygård Tonheim, Dimitris Apsotolou, and Jeremy Evans. 2018. Making the news: Digital creativity support for journalists. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems*. 1–11.

[22] Thomas Maskell, Clara Crivellaro, Robert Anderson, Tom Nappey, Vera Araújo-Soares, and Kyle Montague. 2018. Spokespeople: Exploring Routes to Action through Citizen-Generated Data. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems*. ACM, 405.

[23] Amanda Meng, Carl DiSalvo, and Ellen Zegura. 2019. Collaborative Data Work Towards a Caring Democracy. *Proceedings of the ACM on Human-Computer Interaction* 3, CSCW (2019), 1–23.

[24] Dan Morris and Jimmy Secretan. 2009. Computational creativity support: Using algorithms and machine learning to help people be more creative. In *CHI'09 Extended Abstracts on Human Factors in Computing Systems*. 4733–4736.

[25] Ruth Moyer, John M MacDonald, Greg Ridgeway, and Charles C Branas. 2019. Effect of remediating blighted vacant land on shootings: a citywide cluster randomized trial. *American journal of public health* 109, 1 (2019), 140–144.

[26] Changhoon Oh, Jungwoo Song, Jinhan Choi, Seonghyeon Kim, Sungwoo Lee, and Bongwon Suh. 2018. I lead, you help but only with enough details: Understanding user experience of co-creation with artificial intelligence. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems*. 1–13.

[27] Azzurra Pini, Jer Hayes, Connor Upton, and Medb Corcoran. 2019. AI Inspired Recipes: Designing Computationally Creative Food Combos. In *Extended Abstracts of the 2019 CHI Conference on Human Factors in Computing Systems*. 1–6.

[28] Tomoyo Sasao, Shin'ichi Konomi, and Ryohei Suzuki. 2016. Supporting community-centric use and management of vacant houses: a crowdsourcing-based approach. In *Proceedings of the 2016 ACM International Joint Conference on Pervasive and Ubiquitous Computing: Adjunct*. ACM, 1454–1459.

[29] Ronald Schroeter. 2012. Engaging new digital locals with interactive urban screens to collaboratively improve the city. In *Proceedings of the ACM 2012 conference on computer supported cooperative work*. 227–236.

[30] Eugenia C South, Bernadette C Hohl, Michelle C Kondo, John M MacDonald, and Charles C Branas. 2018. Effect of greening vacant land on mental health of community-dwelling adults: a cluster randomized trial. *JAMA network open* 1, 3 (2018), e180298–e180298.

[31] Anna Spagnolli, Diletta Mora, Matteo Fanchin, Valeria Orso, and Luciano Gamberini. 2020. Automation and Creativity: A Case Study of DJs' and VJs' Ambivalent Positions on Automated Visual Software. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*. 1–11.

[32] Constantine Stephanidis, Gavriel Salvendy, Margherita Antona, Jessie YC Chen, Jianming Dong, Vincent G Duffy, Xiaowen Fang, Cali Fidopiastis, Gino Fragomeni, Limin Paul Fu, et al. 2019. Seven HCI grand challenges. *International Journal of Human–Computer Interaction* 35, 14 (2019), 1229–1269.

[33] Yuichiro Takeuchi and Ken Perlin. 2012. ClayVision: the (elastic) image of the city. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. ACM, 2411–2420.

[34] Chris Tallman. 2020. personal communication.

[35] Lisa M Tolentino, Aisling Kelliher, David A Birchfield, and Rebecca P Stern. 2008. Creativity interventions: physical-digital activities for promoting group creativity. In *CHI'08 Extended Abstracts on Human Factors in Computing Systems*. 2841–2846.

[36] John Underkoffler and Hiroshi Ishii. 1999. Urp: a luminous-tangible workbench for urban planning and design. In *Proceedings of the SIGCHI conference on Human Factors in Computing Systems*. ACM, 386–393.

[37] Teija Vainio, Ilari Karppi, Ari Jokinen, and Helena Leino. 2019. Towards Novel Urban Planning Methods–Using Eye-tracking Systems to Understand Human Attention in Urban Environments. In *Extended Abstracts of the 2019 CHI Conference on Human Factors in Computing Systems*. ACM, CS30.

[38] Kai Wang, Yu-An Lin, Ben Weissmann, Manolis Savva, Angel X Chang, and Daniel Ritchie. 2019. Planit: Planning and instantiating indoor scenes with relation graph and spatial prior networks. *ACM Transactions on Graphics (TOG)* 38, 4 (2019), 1–15.

[39] Niloofar Zarei, Sharon Lynn Chu, Francis Quek, Nanjie'Jimmy' Rao, and Sarah Anne Brown. 2020. Investigating the Effects of Self-Avatars and Story-Relevant Avatars on Children's Creative Storytelling. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*. 1–11.