The case for including senior citizens in the playable city

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ABSTRACT

The topic of "playable cities" has recently emerged as a variation on *smart cities*, focusing on ways to make urban spaces more playfully interactive and fun by incorporating digital technology. Existing work in this field has largely focused on explorative design and case studies. As of yet, there are barely any design guidelines specific to the context. In this paper, we motivate the need for urban interaction designers to consider the restrictions of senior citizens, give a broad overview over interaction design recommendations for older adults as relevant for urban spaces, examine selected published "playable city" case studies for their suitability regarding this population group, and propose some preliminary design guidelines for future work.

CCS CONCEPTS

• **Human-centered computing** → **Accessibility**; Accessibility design and evaluation methods

KEYWORDS

Joy of use, playable cities, urban interaction, accessibility, seniors

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1 INTRODUCTION

Although information technology is now thoroughly entrenched in people's personal and work environments, the introduction of digital content into the urban space is an ongoing process that is still in its infancy. One of several currents towards this goal is the *smart cities* field, which aims to develop and deploy various kinds of interconnected digital sensors, actors, and infrastructure in order to match the physical space of a city to a corresponding digital space, which can then be used by stakeholders to augment and redefine the systemic processes within a city [7].

Another recent development within this space is the emergence of the *playable cities* research field, which unifies varied experimental and artistic approaches under the shared goal of making the urban space more interactive, joyful, and accessible. To that end, physically anchored systems or installations, usually powered by digital technology, are employed to invite the inhabitants of the urban space to experience, to play, to share, and to connect [22]. Some advocates of the playable city see themselves in a kind of dichotomy with parts of the existing body of work related to smart cities, consciously emphasizing bottom-up creativity over top-down structure, self-determined urban citizens over the algorithmification of daily life, and hackable patchwork infrastructure over standardized and unified components secured against any outside tampering – Nijholt [22] gives an overview of this apparent conflict while seeking a conciliatory tone for the future.

Among the inhabitants of urban spaces, seniors are one of the fastest-growing population groups [14]. They are increasingly technologically savvy [6,12,15], they wish to connect with their city environment [11], and they hold a considerable amount of buying power [3,19]. Digital interaction design has a long history of tackling the topic of accessibility head-on [17] and most western countries already have legislation on the books mandating that newly built public infrastructure must fulfill the needs of seniors and people with disabilities [2]. Yet, accessibility concerns have seemingly not been a consideration for most existing work on playable cities. We argue that this is a challenge the community needs to face now, during its formative stages, rather than as an afterthought.

As an initial contribution aiming to stimulate conversation, this paper summarizes existing work on interaction design for senior users particularly in public and social contexts, examines three playable city case studies regarding their accessibility, and makes a preliminary list of design recommendations based on existing guidelines and results as well as our own experiences.

2 EXISTING DESIGN GUIDELINES FOR SENIORS

When designing aspects of the urban space with inclusivity in mind, existing laws and corresponding accessibility guidelines

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(such as [26]) should form the baseline. They provide information on how to design objects and information in such a way that people with disabilities can make use of them as well. This includes minimum movement widths and maximum slopes for wheelchair access, recommendations for readable text displays, and avenues for making spaces accessible for the visually or hearing impaired, to name just a few points. For example, the *Bundesarbeitsgemeinschaft für Rehabilitation e.V.* (German federal working group for rehabilitation) summarizes their *five guiding principles* as such: "User-friendly design, walk-and-roll principle, two-senses principle, use of visual, acoustic and tactile contrasts, language that is easy to understand." [5]

If we look at existing research on what seniors might specifically value in urban technology, there are fewer settled recommendations to draw from, but we summarize selected research results below:

- Bright & Coventry [4] outline requirements for assistive technology for seniors, concluding that it should elicit curiosity, activate counter-stereotypes, and avoid stigmatizing elderly users by minimizing its design overlap with medical devices (so as to make it less obvious to bystanders that a user may have movement or sensory restrictions).
- Genaro Motti et al. [20] conduct a literature review of studies regarding touch screen use by older adults, noting that diminished capability for precise pointing, continuous dragging, or complex gestures should be considered when designing touch screen interactions for seniors. They also note that many previously published findings likely have undocumented dependencies on concrete parameters like screen size, location etc.
- Lee et al. [18] examine the needs of seniors in community centers for technology focusing on social interactions, and summarize their results in three points: "need for activity/event discovery support, need for personality sharing support, need for activity circle support" [18]
- Nunes et al. [23] evaluate user interfaces for use on TV screens with older adults. In addition to general usability recommendations that mirror settled interaction design principles [16], they recommend that systems use high-contrast color schemes and simple language, give users ample time to read text, and be cautious of using screen scrolling because it can be disorienting for senior users.

This list is not comprehensive, but we find that there are very few interaction design recommendations concerning senior citizens, let alone geared towards urban/public contexts. However, the adjacent field of HCI for people with disabilities can to an extent offer related guidelines [1,21,25].

3 EXISTING CASE STUDIES

In the following we briefly present three previously published projects by other authors, all describing experimental implementations of playable interactive systems for urban environments, and briefly examine how well they serve the needs of older adults and where problems may emerge.

3.1 SMSlingshot

In this project by Fischer et al. [10] a handheld public interface for embodied interaction is built. A comically oversized slingshot contains an embedded mobile device that provides a keyboard and a screen, which the holder can use to type a message. This message is then symbolically "fired" at a designated wall via pulling back and releasing the slingshot's rubber band, the result being that the message is enlarged and displayed on the wall as projected "graffiti".

The authors behind the project note that the physical action of pulling back and releasing the rubber band serves a double purpose: it is a joyful and satisfying tangible interaction for the user, tapping into childish desires to play around with paint, while also being an eye-catcher for passers-by, the unusual stance and movement of the user making it more likely for onlookers to take notice and become curious [9]. From the perspective of creating joyful interactions with technology and connecting people through playable urban spaces, it appears to be highly successful.

However, it bears pointing out that the very same movement – pulling and releasing the oversized slingshot – seems to require an amount of upper body strength and coordination that some seniors may not have at their disposal. To our knowledge, SMSlingshot does not make any concessions towards users who may not have the capability to execute its core input gesture.

While it may be tempting to argue that the mode of interaction is a core part of its design and appeal and that providing alternative means of interaction would undermine the concept, this line of thinking is not productive. Instead, we should consider how to expand the design to make it more inclusive.

The easiest way to remove the barrier introduced via the rubber band mechanic would be to (re-)introduce a manual "send" action accessible via button press – however, this may inadvertently be mistaken by users as the only intended way to shoot the message, depending how the interaction is designed. Alternatively, were we tasked with adjusting the design, we would suggest a voice recognition module that would allow users to shoot their messages via a voice command ("Fire!") in addition to the rubber band. This additional input method would provide a different, but also fun, interaction. The same technology could even be used to simplify the input of the message itself, given that some users may have trouble typing on the mobile keyboard or reading the small screen.

3.2 Take a Seat

Designed and implemented by the Happy City Lab [13], this interactive park bench is outfitted with sensors and LEDs. The designers describe its functionality as such: "Take A Seat is an LED, sensor covered bench placed on a public square. Alone, it shines and blinks to attract people's attention. When someone

comes and sits down, it comes to life – encouraging movements from the person sitting, attracting other potential sitters, and getting them to interact." [13]

Benches and other seating accommodations are crucially important to seniors in particular [27], so the concept for this project already places it in a promising position. Some of the interactions proposed by the designers – being invited by visual signals to sit down and to share the space with others – fit the needs and use cases of seniors just fine.

We have not personally seen this project in real life and the description is somewhat sparse, but the point that the bench is "encouraging movements from the person sitting" is potentially worrisome. A citizen who sits down on the bench may not necessarily be able or willing to engage in spurious body movement, and the interaction design should be very carefully considered to make sure that *encouraging movement* does not unintentionally result in the *shaming of non-movement*.

While light-based cues are certainly popular, other modalities should be examined for simultaneous use in order to make the bench's special properties accessible to the visually impaired. Audio cues, or even tactile feedback (movement or vibration), may offer interesting design opportunities here.

Furthermore, it would be an interesting question how the bench's encouragement of social interaction among strangers could be extended to wheelchair users.

It bears mentioning that research into actuated adaptive benches for seniors already exists [8], though not from a playable/joyful interaction point of view.

3.3 Hello Lamp Post

Designed by PAN Studio, Tom Armitage and Gyorgyi Galik [24], this project enabled the people in Bristol to engage in digital message conversations with street furniture – "lamp posts, post boxes, bollards, manholes, bins, or telegraph poles" according to the authors [24]. By texting "hello" followed by an ID number visible on the object to a specific phone number, they were able to playfully engage with that particular object via text messages, ask and answer simple questions, and read what previous visitors to that specific object had to say.

Because *Hello Lamp Post* is not a physical installation, the interaction constraints are very different from the above two projects. People use their own mobile devices to interact via text messages, so input/output accessibility concerns (display contrast and font size, text-to-speech and speech-to-text etc.) are outside the project's scope.

The system is designed for the use case where the user is typing, sending, receiving and reading messages while standing in front of the objects. Because there are no geographical restrictions placed on the interaction, users who may not have the ability to stand still in one spot for several minutes can still write down or photograph the ID number and engage with the object from home later.

The only potential issue could be the ID numbers on the objects themselves, which may be difficult to read from a distance, not accessible for the visually impaired, or located too high up for wheelchair users. An interactive map of the city, available on the user's mobile device and allowing them to navigate to a specific object digitally, may alleviate this issue.

Even though we are unable to identify any major accessibility problems for Hello Lamp Post, this does not mean that all playable city projects should try to emulate its approach. Compared to the other two projects, it lacks the aspects of embodied interaction and the social connection with bystanders through shared physical space. This omission is not suitable for all cases.

4 DESIGN RECOMMENDATIONS

We venture to propose a short list of preliminary design recommendations for the consideration of seniors in playable cities based on existing guidelines and experiences. In addition to the referenced work from section 2 and the case studies from section 3, these recommendations are also based on our ongoing work in the *UrbanLife+* project (from which further empirical analysis will follow).

This list should be considered a starting point, and we encourage the community to examine, reflect on, and extend the ideas presented here.

1. Consider common restrictions of perception and movement and how they relate to your design from a user's perspective. Make sure that any step can be taken using at least two different modalities, so that people who are unable to access one of them can still use the other.
2. Allow for short interaction loops and concise movements. Users who are capable of holding up their arm for a moment may not have the ability to do so for a minute.
3. Avoid time pressure. If timing-based tension is part of your design, consider how to adapt it to individual movement capabilities so everyone can have a fair chance.
4. Be mindful of a need for subjective and objective safety. Feelings of real-world danger, regardless of whether they are justified, can override the desire for playful activities.
5. If your design includes incentive systems, consider featuring extrinsic rewards. People who did not grow up with videogames may be less motivated by points and rankings, and may prefer a tangible reward for winning.
6. Keep the focus on social activities and shared moments, no matter whether your design features competition or cooperation. The presence of neighbors, friends or family is a strong motivator for outside activities, where shared experiences with strangers may additionally emerge [11].
7. Avoid stigmatizing the elderly or the disabled and do not treat them as fundamentally different. Instead, treat them as potential users with the same right and willingness for public social interaction as any other user group – not as an afterthought, but from the beginning.
8. Wherever possible, include senior citizens in your design process. Evaluate real user feedback early and often.

5 SUMMARY AND FUTURE WORK

In this paper, we have identified a need for a stronger focus on accessibility in the research field of *playable cities* by exploring the landscape of existing guidelines and examining three case studies in terms of their availability to senior citizens. As a starting point, we have provided a short list of design recommendations for accessible playable urban systems, based on previous guidelines and our own research.

Our future work in the *UrbanLife+* project will allow us to put our preliminary results into practical use, to implement different playful systems designed for seniors into urban spaces, and to evaluate them in detail. We encourage researchers, artists and designers working on playable cities projects to consider the needs of the elderly during all stages of the process and to add their own results to the conversation.

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