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# Tending a Virtual Garden: Exploring Connectivity between Cities

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**Abstract**

This paper introduces a new experience-driven design concept to public spaces, such as bus stops, to strengthen connections between cities and their citizens. With the prototype described here we are provoking inquiry into whether the "technology" that is a bus stop, with high tech augmentations can engender civic engagement and more interconnected cities. Our preliminary user studies showed that people, while waiting for the bus, do not interact with each other, and as such are "alone together". Our concept is to connect people in the city, and also between two different cities by utilizing their waiting time. 'Virtual Garden' creates the experience of 'being connected' by providing users with the possibility to 'grow' a collaborative garden using a smartphone and natural gestures as the control interaction. Lo-fi prototypes were used to gather user feedback which informed the design of the 'Virtual Garden'.

**Author Keywords**

Experience-driven design; urban space; ubiquitous computing; civic engagement; collaboration; public displays.

**ACM Classification Keywords**

H.m. Information Systems: Miscellaneous

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## **Introduction**

Urban technology for citizen engagement has increasingly gained interest in HCI [e.g. 3]. However, prior ubiquitous computing research has mainly focused on technical aspects [e.g. 5, 6]. We argue that experienced-based design may bridge the gap between engagement, and technological development. Heckert et al. [1] define experience-driven or experience design as a design activity, which takes an intended user experience as the primary aim of a design process.

Technology may be able to facilitate citizen-to-citizen connections, as well as city-to-city connections, beyond simple communications. This paper is concerned with one specific context: bus stops. The reason why a bus stop is our context is multi-faceted. First, a bus stop quite literally, as well as metaphorically connects people to places. Second, based on our field observations and interviews, people do not have anything engaging to do while waiting. Third, it was an interesting exercise from both experience design and civic engagement perspectives. This paper focused on the infrastructure for a provocative socio-technical virtual garden, collaboratively tended by local and remote citizens.

## **Concept Design Process**

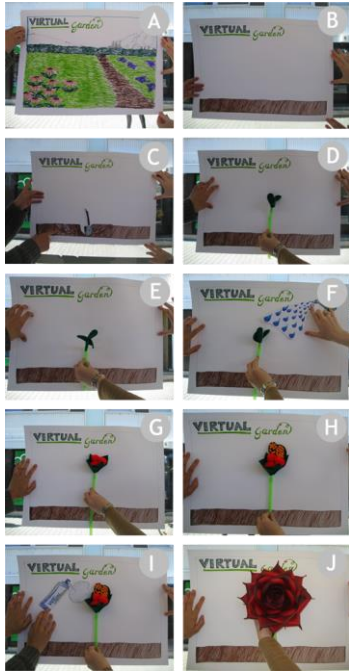
We commenced the design process by observing and interviewing bus travelers in Oulu, Finland. The initial user study indicated that either a) people waiting at the bus stop were browsing applications on their mobile devices, or b) are passively waiting (i.e. idling). We observed no interaction between individuals at the bus stop. During our scoping exercise, many interviewees noted that games might be a good distraction while waiting, so the notion of playfulness was considered

throughout our design phase. The implications of working at bus stops needed to be taken into account, we discovered a few restrictions. These include: users are liable to be interrupted, thus they cannot be too focused on any interactions that lead to missing their bus connections; users must be able to interact with the system in public space in different seasons and weather; users' needs to be able to leave tasks unfinished and other users should be able to continue these tasks afterwards. Keeping these restrictions in mind, we moved to the design phase.

### *Concept Design*

Four brainstorming methods were used as part of the experience design process: PLEX cards [8], Legos, Six Thinking Hats [2] and collage techniques. PLEX cards are used for designing with experience at the core. We worked with three PLEX experience themes: thrill, humor and subversion. Together these experiences make the meta-theme 'excitement'. The cards inspired us to create a playful and provocative game, designing the display for attraction [7]. The dichotomy of designing for excitement, with the unexciting nature of bus stops was an interesting design challenge. By working through the ideation methods, keeping our PLEX themes in mind, and based on interviews we arrived at the 'Virtual Garden' concept.

'Virtual Garden' provides small tasks for people to perform while waiting the bus to arrive. Each task involves some aspect of tending the garden. One way of building playfulness into our prototype was through the use of gestures inspired by real gardening. The initial sketches were quickly developed into a workable lo-fi prototype. Figure 1 shows the lo-fi prototype, which was used for user-evaluation.



**Figure 2.** System steps while a user is interacting with it.



**Figure 3.** A user begins with the 'planting' exercise using the Lo-fi prototype at a bus stop.



**Figure 1.** a) a bus stop display, b) elements that appear on the screen when a user is interacting with the system, c) examples of a smart phone user interfaces (UI).

Cardboard was used for building the mock-up of the interactive screen design and additional elements. We created drawings of the smartphone UI (in our tests these were presented on an actual smartphone). Additional 3D materials such as straws, felt and artificial silk flowers to represent plants were also used.

#### *User Evaluation*

User evaluation of the lo-fi prototype was conducted 'in the wild' at a bus stop in Oulu, Finland. We employed the Wizard-of-Oz interview and observation methods. Altogether, six bus travelers (3 males and 3 females) participated in the interviews. At the start of each evaluation, we provided an overview of the virtual garden to the participants: the public display for the virtual garden will be mounted on the back wall of a bus stop in Oulu. A similar display will be available at a

bus stop in other city across the world such as Vancouver or Paris. The two cities are connected through a display (Figure 2A). Users will be responsible for co-creating and co-maintaining a garden that is shared between the two cities. Then, we asked participants to take part in the following three tasks:

1) Grow a mystery plant (see figure 2B for the system start window) - User clicks on the UI with a digging icon. It asked the user to create a hole by 'digging' (figure 1C on the right) with the smart phone (system feedback is shown in figure 2C). Then the user was asked to select a plant from the list. A plant appears (figure 2D), and soon it starts to look thirsty (figure 2E).

2) Water the plant. Smart phone UI instructed the user to water the plant (system feedback is shown in figure 2F). A plant started to grow (figure 2G) but a bug appears (system feedback is shown in figure 2H)

3) Pest control - Smart phone UI instructs the user to spray pesticide by pressing a selected button on the phone (system feedback is shown in figure 2I).

At the end of the evaluation, participants were asked to fill out an AttrakDiff [1] inspired word pairs list to indicate their attitudes and satisfaction with the system. See Table 1 for the word pairs' results.

#### **Findings**

Surprisingly, our findings indicated that while interacting with the public display, people did not hesitate to make digging movements and other funny gestures in public. Participants appeared to enjoy themselves as they were laughing while doing various

tasks. The elements such as the watering can, bugs, shovel, were perceived as humorous and whimsical. Participants said that having this display would be entertaining at a bus stop.

Easy to use	1	2	3	0	0	Difficult to use
Natural	2	1	1	1	1	Artificial
Captivating	3	3	0	0	0	Dull
Creative	5	0	1	0	0	Unimaginative
Simple	3	2	1	0	0	Complicated
Novel	3	2	1	0	0	Old fashioned

**Table 1.** Word pairs' results.

Overall, the word pairs' answers are positive. Users perceived the Virtual Garden concept as creative, captivating, simple, and novel. One slightly negative result was that the concept was not perceived as easy to use as it should be. It was worth noting that within the word pair 'natural-artificial', participants' responses varied considerably. They stated that while the interaction such as the shoveling motion was natural, the screens were artificial.

## Discussion and Conclusion

In this paper, we introduced a new experience-driven design concept titled 'Virtual Garden' to bus stops, to strengthen the contact between citizens and cities across the world. The 'Virtual Garden' provides an experience of connecting people by giving them a chance to garden together, using natural gestures as interaction input. Lo-fi paper prototypes were used to generate user feedback, and the results were very positive. Interaction with natural gestures was perceived usable and funny. One slight negative aspect was the usability of the mock-up.

It was impossible to demonstrate the connection to another city in a meaningful way with just a paper prototype. Therefore, we need to take that into consideration in our future studies. Collaborative activities such as merging two floral designs, and the notion of how a garden/ecosystem could evolve over time could also be part of the design in the next iteration of the system. Furthermore, based on user feedback, we learned that it would be more intuitive to interact with the garden based on touch gesture.

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