Computer Supported Urban Gardening

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Abstract

In this working paper, we present first results from ethnographic research into common issues faced by Urban Gardening groups such as coordination or awareness problems. Based on our preliminary analysis, we then propose first design mockups for supportive ICT systems consisting of stationary, solar powered and radio connected devices in the Garden, a mobile app and a web-based backend.

Author Keywords

Urban/Community Gardening, community building, information technology, computer supported

cooperative work, maker, bottom-up culture, DIY

ACM Classification Keywords

H.5.3. Group and Organization Interfaces

Introduction

Urban Gardens are small spaces in city areas where regional communities pursue agriculture with a focus on edible produce. Those gardens are open to the public and embrace a democratic, bottom-up culture, quite similar to (and sometimes associated with) groups from the Maker- or Do It Yourself (DIY)-scene[1,5]. The spaces are usually fallow grounds and the organizations owning them don't utilize them for extended periods of time, instead either giving or loaning them for gardening [5]. Urban Gardens can provide a sustainable and local food source, work as an educational counterpoint against processed foods and promote healthy diet. They can foster urban microclimate and appearance, beneficial physical activity for gardeners, provide a psychological contrast in life as well as form and strengthen communities [3].

We are currently conducting empirical studies with the aim to obtain a detailed understanding of the challenges faced by Urban Gardening groups in order to inform potential concepts for supporting them using ICT by following the research framework of design case studies introduced by Wulf et. al [6], which consists of an initial empirical study, a concept an implementation

of prototypes based on the study's findings as well as a later evaluation of the prototypes in practice. As of now, we are in the phase of translating our first empirical findings to a design concept. In this paper, we present first mockups as well as a system architecture based on preliminary ethnographic observations of a local Urban Gardening group (see fig. 1), informal interviews with Gardeners and observations of a state-wide round table about Urban Gardening and its issues hosted by a German state parliament.

ICT Challenges in the Urban Garden

An ICT- focused view on Urban Gardening might seem strange at a first glance. However, there have already been also some impulses from the scientific community suggesting the relevance of ICT in this area [1,2]. In the next subsections, we present findings that relate to categories presented in the literature [1,2] and / or resulted from our preliminary analysis.

Communication and Coordination

Urban Gardens are always open and accessible. Our findings show that this goes along with differing attendance times of peer groups and temporal distribution of activities. This openness and lack of formalisms was generally welcomed by the participants. There were, however, issues which required coordination and communication, especially given the democratic founding of an Urban Garden. In our study, those issues included e.g. watering schedules, discussions on what, when and where to plant or build, general task coordination and financial decision making.

Gardening Expertise

We found that while Urban Gardeners in our community were often enthusiastic and motivated, but did not necessarily possess a deep knowledge about agriculture since they had very different backgrounds. They were generally intrinsically motivated and focused on an open ideology of growing and providing food and community building besides the gardening itself.

Awareness and Community building

In our study, the gardeners were often not aware of what happened in "their" garden during times they were not physically present and if somebody else was currently in the space. This was reported by the gardeners to be relevant information especially for people who did not want to garden alone. This issue hampered the goal of beneficial encounters, collaborations and general community-strengthening.

Garden Monitoring and Automation

Due to irregular attendance, we observed differing levels of knowledge about coordinated tasks (*"Did somebody already fertilize this plot?"*). We found that e.g. optimal water and nutrient levels for the plants were often not achieved. Security monitoring is of the open space was an issue, too. There were also ongoing discussions about automating aspects of the gardening process, especially the time consuming irrigation.

Public Relations (PR)

The loose community of gardeners we studied lacked in managing PR. Quite often nobody really seemed to feel motivated to write newspaper or blog articles, promote in social networks or conduct other PR activities which would be beneficial for the garden. This was often either due to a focus on the main activities in the space (*"I'd rather plant or build something than sit on my computer"*) or to a negative inclination towards working with computer technology.
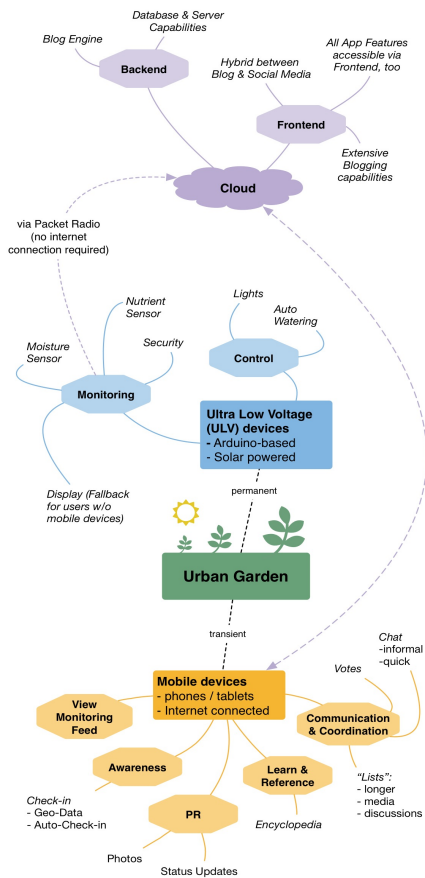

Fig. 1. Impressions of the local Urban Garden where we are conducting our research.

Fig. 2. System Outline

Current ICT-related Practice

The Urban Gardening group we studied, like many others already employs ICT systems like Wikis, Mailing Lists and blogs or other web pages. However, all those systems are often not well integrated with each other (see also [2]) which leads to loss and disarray of information and can pose issues like requiring technical knowledge. Users also reported that mailing lists can become confusing and do not provide enjoyable User Experiences. Mobile access (as in situ from the Garden) was also reported as awkward and not pleasurable.

Special requirements and constraints

Designing ICT solutions for Urban Gardening groups is a challenging field. Urban Gardens often do not provide Internet access and more often than not, they are not connected to the power grid. There is also ideological motivation to waste as few things as possible, to act in a sustainable manner and to spend as little money as possible. The last aspect is also supplemented by the fact that Urban Gardens are usually completely open spaces, resulting in high risk for thefts or vandalism. A non-material constraint is that gardeners seem to derive satisfaction from manual low-tech work, however there is also evidence that carefully crafted and designed augmentative ICT tools may be well received [1,2]. Those constraints and our findings inform the design concept, mockups and system architecture we will now present.

Potential ICT-Prototypes

The system we propose consists of three components: (1) A web-based system with (2) permanent Ultra-Low-Voltage (ULV) devices in the garden and (3) a mobile "Garden App" app, see fig. 2.

ULV devices

An Arduino-based central unit could collect information from different sensors (e.g. moisture) in the garden. This unit could also control additional systems like automated watering or security measures like an automated access log or automatically taking pictures if anyone accesses the Garden after a certain time at night. The power for the systems and sensors could come from small and cheap solar panels. Internet connection however is another matter. Permanent mobile access via 3G is expensive and complicated but the solution can be found in the past – old radio transmitters. Very cheap (and legally allowed) ones have a maximum range of about 2km, which is enough in urban areas. There would have to be a receiver located in a Gardener's home which in turn is connected to the Internet for forward signals to the other Gardeners. In a sense, this connection would make the garden itself a "talking" part of an Internet of Things.

Mobile devices

Many of the described issues can be addressed in an integrated and easy-to-use "Garden App". We observed that the majority of gardeners already have smartphones and in the today's world, it seems that this trend will continue. Communication and coordination could be facilitated via an informal, unstructured chat system as well as "Lists" (*current working description*) which are data entities for specific topics and include media files, text, checklists and discussions. Messages from the chat could be turned into new Lists or attached to existing ones in order to conserve and enrich relevant information. Another idea is integrating a simple voting mechanism for decision making about future activities or tasks. Furthermore,
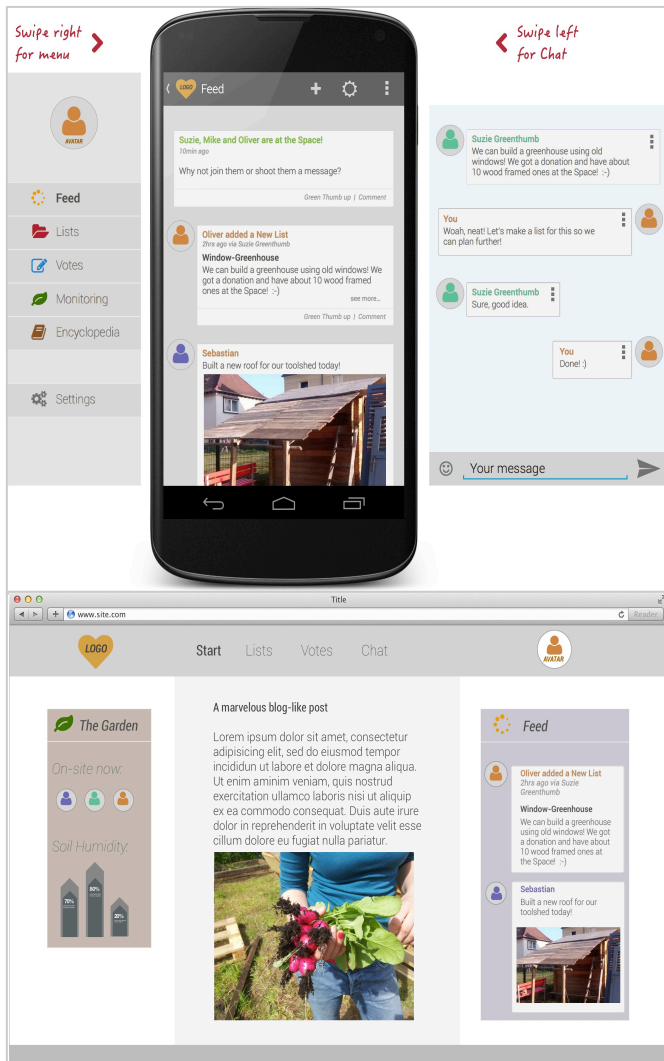
Fig. 3. Mockups app and web portal

there's an "Encyclopedia" (*current working description*) which is meant as a static reference for much needed information like when to plant what or in which sort of soil and contextual information for specific plants (via scanning a QR-Code attached to the planter). The App will also feature status updates (text, photo, video) similar to those found on social networks intended to engage gardeners in providing updates in an engaging, playful manner less cumbersome than writing blog or wiki entries. Another feature borrowed from social networks is the check in to inform others that somebody is at the garden and raise awareness. The last and most obvious feature of the app would be to monitor the data from the ULV sensors in the Garden.

Web

Since all the prototypes need to communicate, they will need a web based foundation consisting of a backend which aggregates data (sensor, status updates, etc.) and distributes it and a user-facing webpage. This page would be similar in appearance to a blog but also have additional features: A prominent, lively status update area from the users as well as from the garden itself and a similar area for

check-ins. It would also have a main area for more measured, long-form content like blog entries. It should furthermore support access to the chat for logged in users as well as the capabilities to display and edit lists and participate in votes.

Outlook

We are planning to develop and test our prototypes iteratively in situ together with the actual gardeners, starting with the ULV devices as actual functional prototypes and the app as semi-functional interactive prototypes for user testing and further iterations in a *research through design* frame of mind. Concurrently, we will deepen our ethnographic research in order to better understand the characteristics, practices and challenges of urban gardens we might help alleviate through ICT. A website to document our progress (www.gardenapp.de) is currently being created.

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