Connecting Interaction with Smart Urban Objects for Individual Support in Neighborhood Participation

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ABSTRACT
Changing life in urban areas creates challenges for people who move and also for long-term inhabitants, who have to orientate themselves in new or changing environments. ICT has the potential to support people in orientating in urban neighborhoods as well as to foster participation when it comes to shaping future life in cities. We present results from a workshop on ICT in urban areas, which show the potential to connect interactive objects in public environments and to draw from community knowledge in order to support individual people in exploring their neighborhoods. In a use case we show how orientation help can be created in accordance to each person's comfort zone within the neighborhood. We conclude discussing further challenges in HCI research with focus on urban areas.

Author Keywords
Urban areas; comfort zone; urban HCI; smart urban objects; multi-device; older adults; orientation; assistive technology.

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION
Urban neighborhoods are characterized by rapid changes in population, leading to the re-organization of space and social structures. Since cities in Europe are also confronted with higher migration rates (e.g. due to changes in employment frequency), people encounter a demand of mobility and flexibility considering their living environment. Every move to a new neighborhood leads to the need to orientate oneself in the surrounding area but also in social structures. In addition, the ability to partake in one's environment is related to the level of knowledge of the neighborhood environment.

Information and communication technology (ICT) offers supportive means to orientate oneself in such situations. Examples include navigation systems for routing [4] as well as community knowledge on places in the vicinity [3] which help people to explore their environment. However, current ICT requires users to be experts in technology usage, including the need to choose hard- and software and interpret its utility concerning own requirements. Also, the built environment as well as implicit structures of urban space are unknown to immigrants, which is not yet adequately considered in support systems for orientation.

In this poster we describe how connected smart urban objects can support spontaneous social interactions and provide information on social life in urban space. First we present relevant aspects of urban space and its inhabitants when designing ICT. Then we argue that in order to provide useful support when orientating oneself in novel and changing environments, ICT must analyze a user's current comfort zone [1], gather community knowledge on the spatial and social environment, and adapt its support in accordance to user requirements and context. Finally, we present a use case for an assistance system that helps people orientate themselves in new neighborhoods, which connects interaction with multiple smart urban objects [2].

CONNECTED INTERACTION IN URBAN AREAS
To gather information about relevant aspects of urban space and its inhabitants when designing ICT, we conducted a workshop with 12 HCI researchers at the annual German HCI conference. In the workshop we discussed the need to support people who want to take part in shaping future cities and the role of ICT in this process. According to our workshop participants, when providing interaction for users in cities, we have to consider aspects of the individual person as well as the context. Thus, HCI has to take into account that (1) target users are heterogeneous and are likely to have specific individual requirements for ICT, (2) perceived barriers for participation are highly individual and depend not only on cultural considerations, but also personal characteristics, and (3) users' activities and their associated route networks will show strong variability. In regard to activities in urban space, design approaches not only need to analyze the surrounding area, but also social structures, mobility, pace of movement, as well as information on places and routes.

The inclusion of spatial and social parameters in digital technology can only be achieved when drawing from different sources and collating information meaningfully. If many different devices situated in various contexts are able

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to connect and cross-reference data they store about user interactions, then such an IoT network would solve the problem of data availability and collation in order to support people with various orientation requirements.

A prerequisite for such multi-device interaction is that suitable inter-device information channels need to exist. To that end, we propose the creation of smart urban objects [1] that are themselves part of the urban structure, but can communicate with users' personal devices and with each other. This would also allow for tracking and data acquisition when people do not carry personal devices with them at all times. Therefore, applications that provide support for users in urban environments need to include several steps of data gathering, analysis, and presentation:

1. Collect data on the individual comfort zone (e.g. location, time, health and well-being)
2. Contextualize information (e.g. interaction, activities)
3. Transfer data from different sources (e.g. connect personal device profiles and urban object sensor data)
4. Store and analyze community data (e.g. identify movement patterns for specific activities)
5. Match data and use case (e.g. person knows environment but needs to re-orientate in order to perform activity)
6. Support individual according to comfort zone (e.g. present information for older adults with low vision)

USE CASE: EXPLORING NEIGHBORHOODS

One use case of ICT in urban areas is support in (re-) orienting oneself in one's neighborhood. Not only immigrants from different countries need to explore new environments, but also students starting to study at a university, employees who take a job in a different town, as well as older adults moving to a home with disability access. During their orientation within the social and built environment, they might encounter different exploration stages, which we envision to be adaptively supported.

On the first level, people need to find a way to perform activities of daily living, e.g. visiting doctors. Therefore, the first level of support contains simple navigation support based on familiar and unfamiliar ways. The second level of support includes ways that other people go and that might cross with the own ways. Thus, support on this level suggests interesting paths along own activity patterns, e.g. neighbors visit a park on their way to the supermarket, encouraging spontaneous interaction. As soon as basic paths in the own neighborhood are explored, people get the chance to explore new possibilities. The third stage also addresses people who have been living in a place for a longer time, but need to re-orientate due to changing environments. Support on this level proposes tasks, e.g. to visit and rate a new restaurant in the vicinity. On each stage, information about the user's movement as well as the interaction with smart urban objects along the way is recorded. Using this community-based tracking, patterns of interaction and movement in urban space can be analyzed to support users with varying needs.

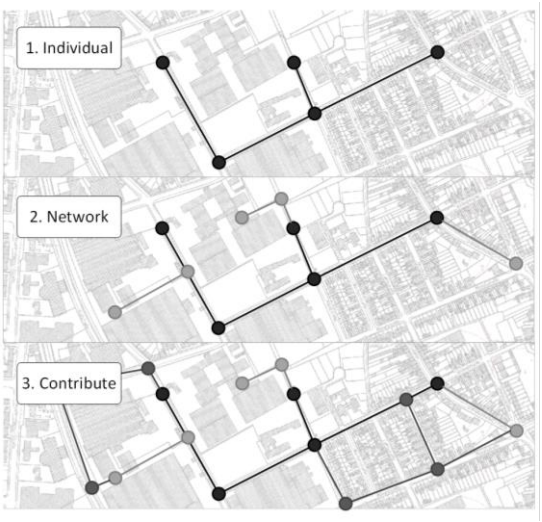

Figure 1. Stages of support according to knowledge of urban neighborhoods: (1) Individual, (2) Network, (3) Contribute.

CONCLUSION

In this contribution, we showed, that IoT in urban space has the potential to help people to orientate within their neighborhood environment. However, ICT shows much more potential of engaging people to participate in shaping future city life. Within our workshop we discussed, that ICT implemented in urban environments has the potential to provide help in problematic situations, to motivate people to take part in neighborhood activities, and to enable networking in changing environments.

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