HuddleLamp: Exploring Community Data with Co-located Mobile Screens

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Abstract
In this position paper I briefly summarize some of my work on HuddleLamp, a new low-cost technology for community engagement with multiple spatially-aware mobile screens. HuddleLamp can be used by members of local communities to collaboratively explore community data with their personal mobile devices. I briefly describe the underlying technology and potential uses for local communities, e.g., for meetings of different stakeholders or for exhibitions or interventions in public or semi-public spaces.

Author Keywords
Mobile screens; collaboration; data exploration; spatial-awareness; cross-device interaction.

Introduction
In this position paper I briefly summarize some of my work on HuddleLamp, a new low-cost technology for community engagement based on multiple spatially-aware mobile screens. This work is a result from my time at the Intel Collaborative Research Institute for Sustainable Connected Cities at UCL and happened in close collaboration with Roman Rädle from the Human-Computer Interaction Group at the University of Konstanz [2][3] and Nicolai Marquardt of the UCL Interaction Centre [2].

My motivation for working on HuddleLamp was that interactive tables or large displays can be a powerful tool for collaborative exploration and sensemaking of data [1] and that they could also be used for data of local communities, for example during meetings of different stakeholders or for exhibitions or interventions in public or semi-public spaces (**Figure 1**). Ideally such technologies turn exploring and working with annotated maps, crowd-sourced sensor data, demographics, or other community data into a social and sometimes even fun experience.

Figure 1: ESRI's "Urban Observatory" installation for community engagement (Source: smbtechnologies.com).

However, such interactive tables or large displays are also expensive – much too expensive for bottom up initiatives whose budgets are typically small and who often meet in community centres, public libraries, schools, coworking spaces, or in similar improvised settings where such technologies are unavailable.

We therefore asked ourselves whether we could not use the many tablets and smart phones that are typically idling away in users' pockets and bags during meetings to compose a low-cost but powerful multi-user and multi-device system.

Can we enable users to temporarily contribute their personal devices to build a joint cross-device system from many mobile screens for a social and fun data exploration?

Introducing HuddleLamp

Our result is HuddleLamp, a desk lamp with an integrated low-cost depth camera (e.g. the Creative Senz3d by Intel). HuddleLamp enables users to compose a large interactive surface or similar collaborative multi-device user interfaces from their tablets and smart phones just by putting them under this desk lamp (**Figure 2**).

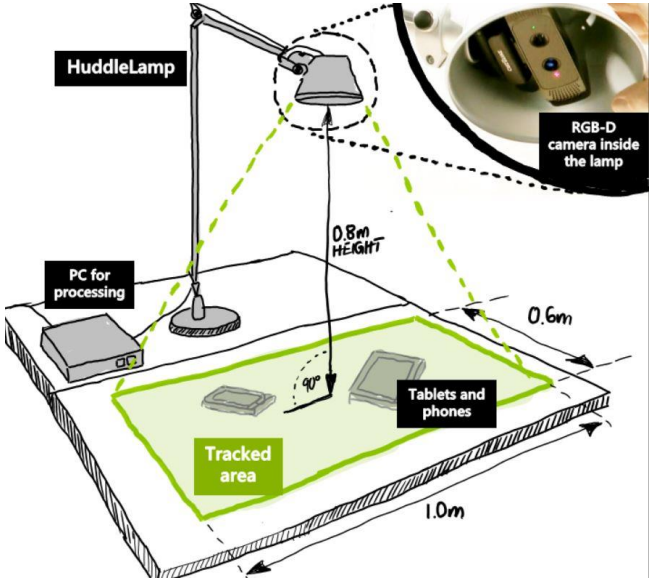

Figure 2: HuddleLamp has the shape of a desk lamp and tracks and connects mobile devices on a table.

HuddleLamp is connected to a PC or laptop that runs a free and open source computer vision software (http://huddlelamp.org). It continuously tracks the presence and positions of devices on the table with sub-centimetre precision. At any time, users can add or remove their mobile devices and reconfigure them in space without the need of attaching markers or installing apps. Additionally, users' hands are tracked to detect interactions above and between mobile devices.

Device positions can be accessed using our Web API that enables writing cross-device Web applications for HuddleLamp. With the API it is easy to let these applications also become "spatially-aware", so that they can react to how the devices are arranged or moved.

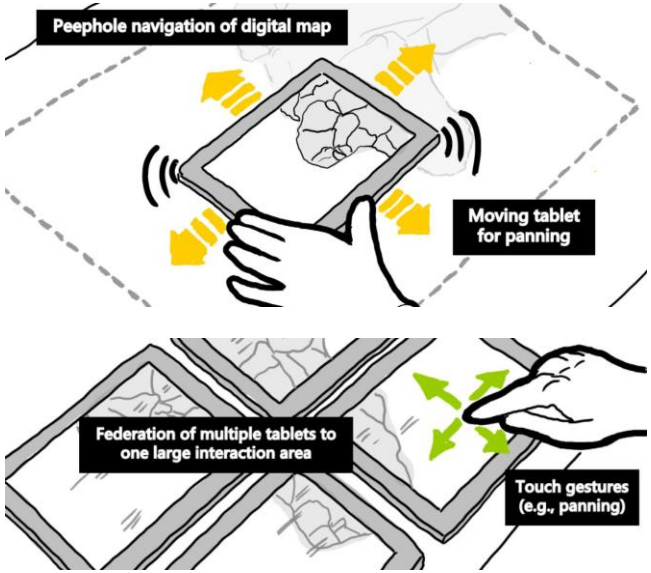

Figure 3: Peephole navigation (top) and using multiple tablets as one tiled display (bottom).

For example, physically moving or rotating a tablet on a desk can also pan and rotate the content of its screen, so that the tablet appears to be a kind of peephole through which users can physically explore a spatially-situated virtual workspace, e.g., a map (**Figure 3** top). When putting multiple tablets or phones side-by-side, these peepholes turn into one huddle or federation of devices and users can interact with them as if they were just one large display or tabletop (**Figure 3** bottom). For further examples of spatially-aware interaction techniques (e.g. cross-device pick-and-drop) please see our video on http://huddlelamp.org.

Potential uses and future directions

After having answered key questions of technological feasibility [2] and eliciting user-defined gestures and interaction techniques [3], we are now interested in creating and studying real-world examples of use together with local communities. Our goal is to support community members in creating their own bottom up applications for community engagement and urban activism and to observe their use in spaces such as community centres, public libraries, or museums.

A further aspect we want to explore is that HuddleLamp can be considered a first step towards a "sharing economy" for excess display and interaction resources. Members of local communities can add or remove their personal mobile technology in an ad-hoc fashion without explicit setup or pairing. Instead this happens almost effortlessly as a by-product of natural use in space, for example, by bringing multiple devices to the same room, placing them side-by-side on a table or desk, and moving them around as needed. Ideally this low threshold for sharing of personal devices will enable a new kind of ad-hoc co-located collaboration.

References

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