An Exploratory Study into the Public and Situated Visualisation of Local Data in Urban Communities

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ABSTRACT
While data visualisations are being used increasingly often in news reports, mobile applications and the like, visualisations designed specifically for public settings are still largely uninvestigated. My thesis is an exploratory study, looking into the role public and situated visualisations can play in revealing local data to urban communities – and how such visualisations can connect the members of these communities.

Author Keywords
Public visualisations; urban communities; social connectedness; urban informatics.

ACM Classification Keywords
H.5.m. Information Interfaces and Presentation (e.g. HCI): Miscellaneous

BACKGROUND
Within the domain of HCI, there has been a growing interest in studying how technology can be used to enhance civic engagement and community building (e.g. Foth et al. [2]). Such technology is generally deployed in public spaces that were originally designed for people to gather and socialise, including market squares and village halls. While technology-mediated playful interactions have been encouraged extensively, particularly via the deployment of interactive displays, far less is known about the use of visualisations to connect people. Previous work in the area of public visualisations has focused primarily on the topic of sustainability (e.g. [1, 3, 4]). Findings from these studies have shown the potential public visualisations have for bringing together the members of a community to reflect upon and talk about the presented data, by offering both a location for people to gather, as well as a talking point between locals and passers-by.

IN-THE-WILD STUDIES
To explore how public and situated visualisations of local data can connect members of urban communities, I have conducted two initial in-the-wild studies – together with Dr Vaiva Kalnikaitė and Prof. Yvonne Rogers. Short descriptions of the designs of these studies can be found below.

Study I: Visualising Mill Road
Over a 24-day period, we conducted an in-the-wild study on Mill Road, a street in southeast Cambridge (United Kingdom). Despite having multiple community groups and a series of festivities, residents feel Mill Road consists of two different areas. With one part of the street built by the University of Cambridge, and the other built for railway workers, the socio-economic differences between the two areas have historically caused an urban divide. Though these differences are far less prominent nowadays, many people still consciously decide not to go over the railway bridge that connects the two parts of the street. To provoke discussion on this perceived divide, and to allow people on and around Mill Road to learn more about their fellow community members, we deployed simple voting devices in 18 different shops along the street. The devices enabled people to vote on topics relating to Mill Road, by pressing either a happy, neutral or sad smiley. Topics were generated together with members of the local community groups and included safety on the street, how well people know their neighbours and the future of Mill Road. Every other day, the question was changed, and the results from the previous question were publicly visualised outside the participating shops, using chalk graffiti (see Figure 1). In addition, a summary visualisation was sprayed onto the railway bridge towards the end of the study, comparing the happy votes for each question for the two different areas. By creating simple devices and visualisations, and making use of a variety of shops to gather data, we hoped to engage a large number of people from the local community. A mixed methods approach was used to evaluate the study, making use of observations in situ, informal chats with shopkeepers and passers-by, semi-structured interviews with shopkeepers and the logged votes from the devices. The devices and visualisations successfully managed to grab people's attention and provoke discussion; during the observations and from the interviews, it emerged people started exchanging anecdotes, comparing the results between shops and sharing their explanations for similarities and differences in the votes. Furthermore, it encouraged people to visit areas they would not usually go to, to learn more about the perceptions held there.

Study II: Fair Numbers
While Visualising Mill Road focused on connecting a community in a day-to-day setting, we also wanted to investigate

DIS '14, Jun 21-25 2014, Vancouver, BC, Canada ACM 978-1-4503-2903-3/14/06.
http://dx.doi.org/10.1145/2598784.2598791

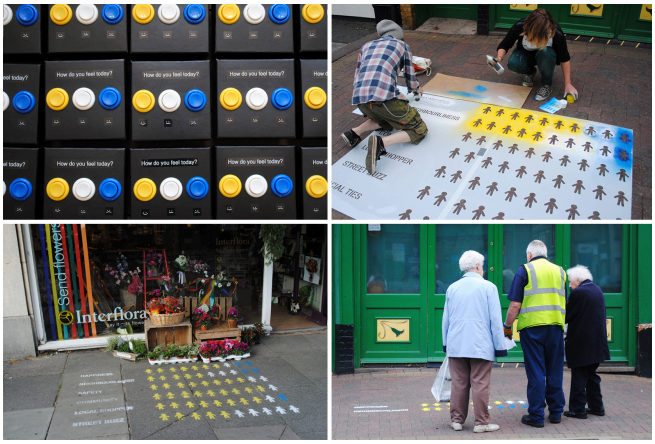

Figure 1. Visualising Mill Road study. Top-left: voting devices, top-right: spraying chalk graffiti visualisation, bottom: passers-by looking at and discussing both the shop visualisations and the summary visualisation.

if a similar public visualisation of local perceptions would be able to encourage people to discuss and learn in a very different setting: a one-day community fair. We, again, conducted an in-the-wild study on Mill Road, during an annual fair which attracts over 10,000 people. Our goal was to provoke attendees' perception of the event, by gathering and visualising two types of data. Two topics were selected, which both locals as well as visitors would be able to relate to: crowdedness and noisiness. For both topics, objective and subjective data was gathered – to compare how crowded and noisy the fair was perceived to be by the attendees, compared to how crowded and noisy it actually was. To gather objective data, sound sensors were deployed along the street, and a people count was conducted regularly. To gather subjective data, researchers along the street asked passers-by to indicate how crowded and noisy they thought it was, via a tablet application. The two topics and types of data were then publicly visualised on the railway bridge in the middle of Mill Road (see Figure 2). Again, a simple representation was created, to allow people from all backgrounds to interpret the results. Results were updated once every hour, to motivate people to return to the visualisation. A mixed-methods evaluation consisting of informal chats and observations was used, revealing the visualisation managed to get people to think about the crowdedness and noisiness, while being less successful at connecting people.

FUTURE WORK

The Visualising Mill Road and Fair Numbers studies have revealed a number of successful and less successful aspects of data gathering and public data visualisation, related to the representations, materials and technology used. Based on these findings, I will design a set of future studies, which will include an exploration of tangible interactive public visualisations. Furthermore, this future work will consist of comparative analyses between communities and visualisations.

PLANNED RESEARCH CONTRIBUTIONS

My thesis is an exploratory study, looking into the role public and situated visualisations can play in revealing local data to urban communities – and how such visualisations can connect

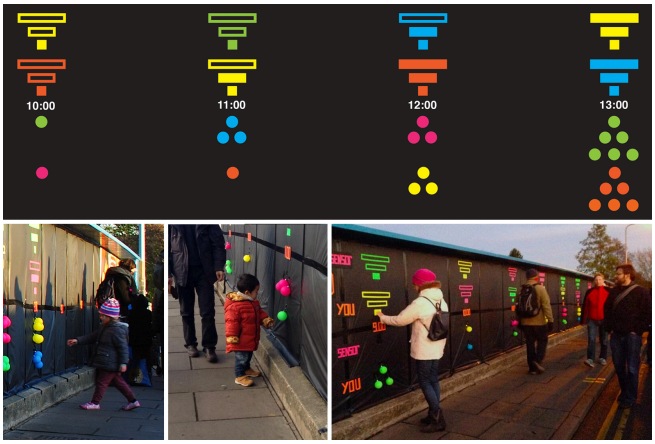

Figure 2. Fair Numbers study. Top: initial sketch of visualisation, bottom: kids and adults looking at and touching visualisation.

members of these communities. The research contributions will be threefold:

1. *Community visualisations:* a range of public visualisations will be created and evaluated, to analyse which visualisation methods and styles can successfully communicate local data to urban residents. The visualisations will be focused on the display of relative differences and social norms.
2. *Guidelines:* the findings from the in-the-wild evaluations will create a new understanding of how community-based visualisation can connect urban communities. This will be summarised in a set of guidelines, to allow others to build upon this work.
3. *Theory:* the findings from the in-the-wild studies will contribute to a new theory of technology enhanced engagement at the community level, using public visualisations.

ACKNOWLEDGEMENTS

This work is funded by ICRI Cities (Intel).

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