New Approaches for Prototyping Interactive Applications in Urban Environments

Alexander Wiethoff[1], **Martin Tomitsch**[2], **Marius Hoggenmueller**[2], **Luke Hespanhol**[2], **Linda Hirsch**[1], **Beat Rossmy**[1], **Stewart Worrall**[3]

[1]LMU Munich, Munich, Germany
{firstname.lastname}@ifi.lmu.de

[2]Design Lab, Sydney School of Architecture, Design and Planning
[3]Australian Centre for Field Robotics
The University of Sydney, Australia
{firstname.lastname}@sydney.edu.au

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Abstract
Urban interfaces play an important role in the field of media architecture and smart cities. They enable citizens to access the digital layer of the city, to interact with urban applications, and to make more informed decisions about how they utilise the urban infrastructure. As the field of media architecture is diversifying, urban interfaces can also take on new forms, from advanced projections to robotic installations. These interfaces are complex to develop and in many cases difficult to test in real-life situations with users. This workshop invites people working in this field to submit new approaches for prototyping such interfaces in urban environments. The aim of the workshop is to take stock of the status quo and to inspire new approaches that have the potential to accelerate and support future work on designing and evaluating emerging urban interfaces.

Author Keywords
Urban prototyping, urban interfaces, urban interactive applications, media architecture

CCS Concepts
•**Human-centered computing** → **Ubiquitous and mobile computing;** Ubiquitous and mobile computing theory, concepts and paradigms; Ubiquitous computing;

Figure 1: Illustrating the increasing complexity of urban interfaces: from simple traffic lights, to mediated city infrastructure, large-scale media facades, robotic urban displays and AV interfaces.

Introduction

Prototyping has been an ongoing challenge in the field of media architecture, a challenge that extends to the development of interactive urban applications building on smart city technology [12]. While technological advancements make way for new types and forms of urban interfaces as gateways to media architecture and smart city applications, their sophistication also increases the complexity of prototyping these experiences. Previous work has investigated the use of toolkits for creating small-scale representations of media architecture interventions such as media facades [13], using electronic bricks to create models [7], and recreating elements of an intervention in a controlled environment [4].

Much of this work builds on knowledge from the field of human-computer interaction (HCI), which has a long history of investigating and proposing new ways of prototyping approaches, such as paper prototyping wizard-of-Oz prototyping, and video prototyping [1]. At the same time, it borrows from approaches used in architecture, which has a long history of using prototypes, for example to created abstracted representations of specific urban environments. As fields are developing and intersecting, new opportunities may arise for re-conceptualising how to prototype urban interfaces in a way that allows for a “real-life” evaluation of how people experience and interact with these interfaces.

Types of Urban Interfaces

Urban interfaces provide means for accessing information or interacting with applications [12]. For example, the traffic light push button is a simple urban interface that allows people to interact with the urban infrastructure. Urban interfaces can also take the form of responsive installations, where applications implicitly respond to the presence of people or other environmental factors [4]. For example, novel prototypes for smart bus-stop designs are able to respond to peoples preferences on transportation information [3].

New types of urban interfaces also emerge out of the intrinsic characteristics of urban robots, such as self-moving public displays, free-floating drone displays [6] or physicalised displays where content is produced by the robot directly manipulating the environment [5]. Such self-moving interfaces come with a new set of challenges due to their dynamic nature and level of autonomy which requires user’s trust in the system. Another example of this type of interface, is the use of low-resolution displays, projections or screens on autonomous vehicles to visualise the intent and awareness of vehicles [9].

A less explored area is the use of bio-hybrid materials [11] in urban interfaces, which opens up opportunities for speculative future scenarios, where information might be encoded through living organisms, thereby focusing on new forms of sustainable eco-design principles. For example, Holstius et al. [8] investigated the use of plants as interactive displays through adding various sensors and actuators, complemented by work that explored eco-feedback systems through artificial plant and tree interfaces in public places [2].

New developments in robotics [10] even allow architects and designers to imagine shape-changing and self-assembling structures in public or private urban spaces. Such structures could change the way that tiny houses can offer their owners not only multifunctional furniture but even adaptable spaces, or how public architectural structures respond to weather conditions by providing shade from the sun or protection from the rain. However prototyping such concepts in life-size scale is challenging.

Trends in Prototyping Urban Interfaces

While the aforementioned traditional prototyping techniques borrowed form the discipline of human-computer interaction (HCI) are able to spark imagination and getting feedback from participants, we consider tailored approaches being more suitable in the urban domain to test and prototype interfaces. These methods, we summarise under the umbrella term "urban prototyping" take into account (a) unforeseen situations and (b) are directly applied and performed in the environment over longer time-spans to tackle the problem of the "novelty effect" with urban interventions. In this MAB workshop we will explore and discuss how urban interfaces can be integrated seamlessly in the urban environment following an in-situ, simulated or hyper-real prototyping philosophy.

Call for Contribution

Through this workshop, we are calling for submissions that propose or document new approaches for prototyping the types of urban interfaces described above. This may include approaches that have been trialled and tested, concrete demonstrations of approaches, as well as conceptual proposals for what future prototyping approaches may look like.

Contributors are asked to submit a 4-6 pages paper in the CHI Extended Abstracts format outlining their work in this area and a detailed description of their proposed prototyping approach. The workshop offers an opportunity to receive feedback from others working in this field, to exchange ideas, to share challenges, and to get new perspectives. Contributors will be invited to submit an further version of their work to a magazine article on prototyping urban interfaces, convened by the workshop organisers.

We are interested in submissions that address one or more of the following topics:

- Urban prototyping and interfaces
- Case and field studies prototyping in the urban domain
- Challenges with studies "in the wild"
- Lessons learned in the trenches

Workshop Format

The proposed format for the half-day workshop is split up in four main sections, each workshop section lasting one hour:

- Presentation of position papers
- Demonstration session
- Practical breakout-session
- Summary and discussion round

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