



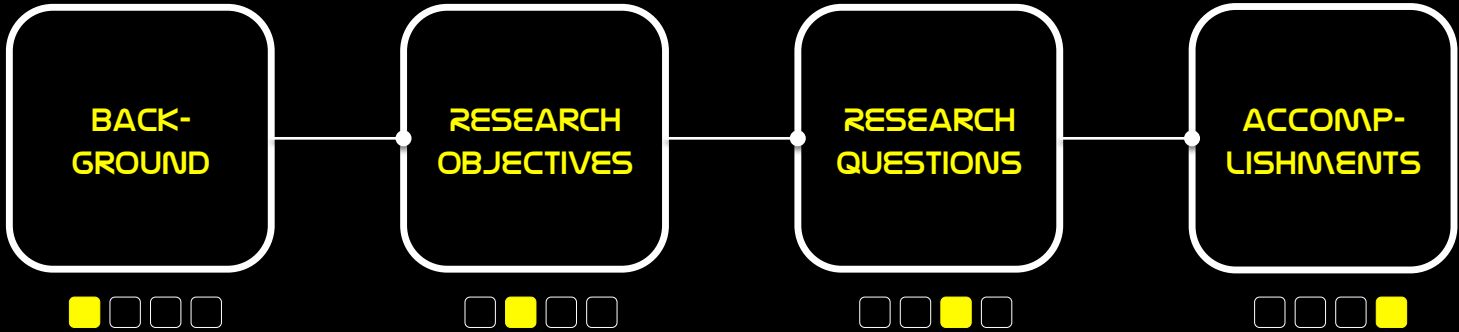
# URBAN INTERACTIVE SYSTEMS

UBIQUITOUS COMPUTING-BASED PERFORMATIVE CITYSCAPES

# PhD Candidate: **Achilleas Psyllidis** #

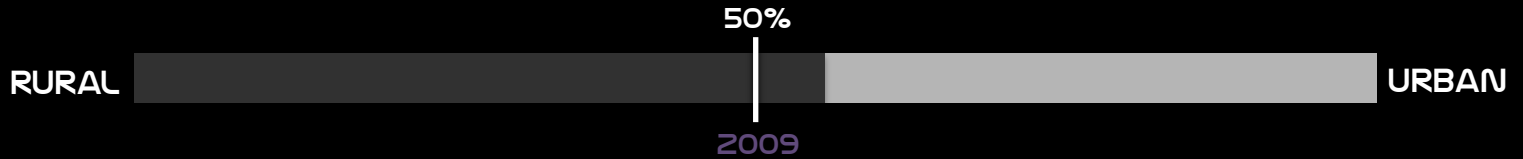
// Promoter: Prof. ir. Kas Oosterhuis

// Co-promoter and Daily Supervisor: Asst. Prof. Dr. Nimish M. Bitoria



# BACKGROUND :: MAJOR MILESTONES

# 1



# 2



# 3

INTERNET OF THINGS → PERVASIVE

# RESEARCH OBJECTIVES

## Main Objective

# to explore and develop a **methodological framework** for real-time interactive urban systems, incorporating sensor-actuator network technologies.

// establishing **correlations** among strategic urban sectors  
*(i.e. mobility, environment, community, citizen participation)*

// addressing corresponding **challenges**  
*(congestion, energy losses, rising urban populations, (pro)active engagement)*

## Sub-Objectives

# To **broaden** and **advance** the theoretical framework of Urban Informatics;

# To **facilitate** data interoperability amongst heterogeneous sensor networks;

# To **establish** the essential characteristics of interaction-driven urban systems;

# To **devise** methodologies for data mining, parsing and feedback;

# To **develop** performance assessment frameworks for multiple KPIs\*.

\*key performance indicators

# RESEARCH OBJECTIVES

## Main Objective

# to explore and develop a **methodological framework** for real-time interactive urban systems, incorporating sensor-actuator network technologies.

// establishing **correlations** among strategic urban sectors  
(i.e. mobility, environment, community, citizen participation)

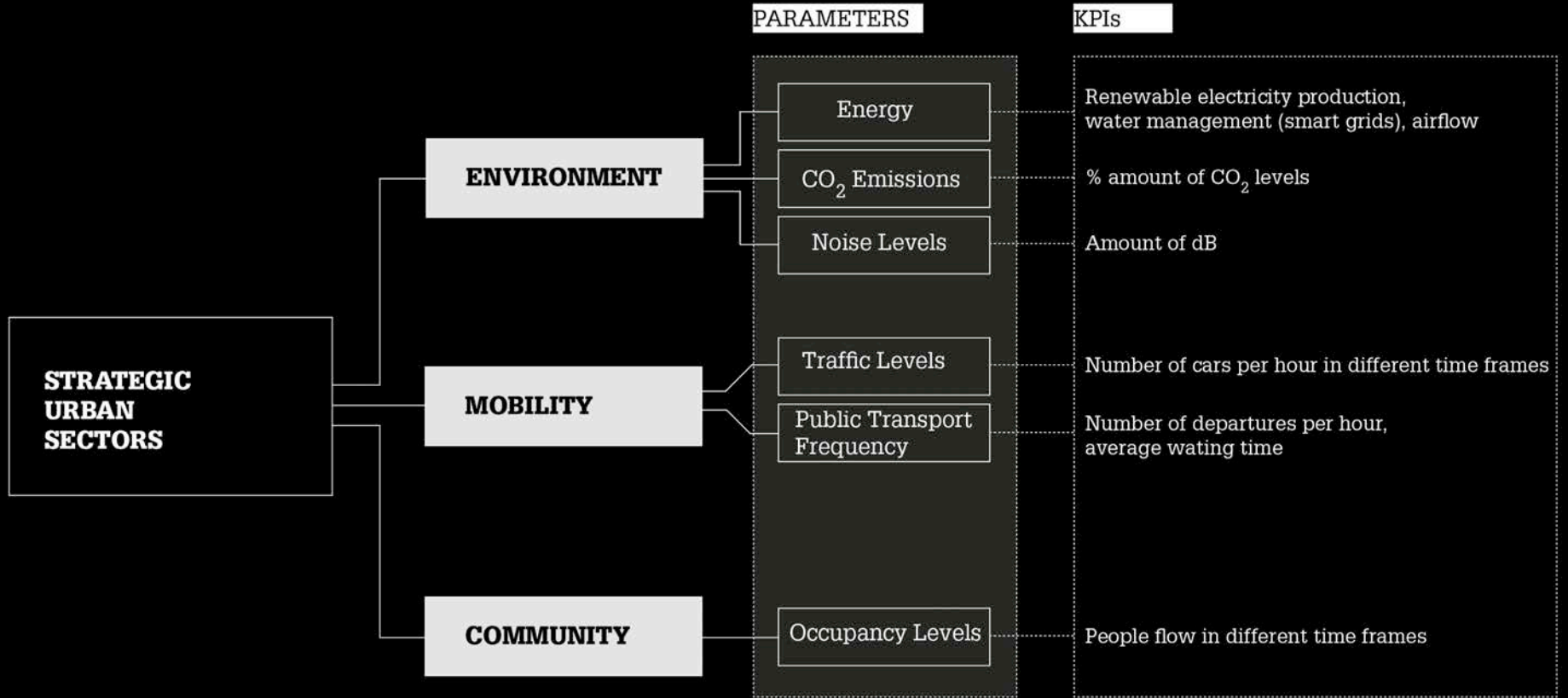
// addressing corresponding **challenges**  
(congestion, energy losses, rising urban populations, (pro)active engagement)

## Sub-Objectives

- # To **broaden** and **advance** the theoretical framework of Urban Informatics;
- # To **facilitate** data interoperability amongst heterogeneous sensor networks;
- # To **establish** the essential characteristics of interaction-driven urban systems;
- # To **devise** methodologies for data mining, parsing and feedback;
- # To **develop** performance assessment frameworks for multiple KPIs\*.

\*key performance indicators

# RESEARCH OBJECTIVES



# RESEARCH QUESTIONS

## Central Question

# To what extent embedded interactive urban systems, utilizing urban informatics and Semantic Sensor Network (SSN) **improve** key performance indicators (KPIs) in major strategic urban sectors (mobility, environment, community) and, further, **facilitate** human engagement in decision-support procedures?

## Associated Sub-questions

- # What **technological** and **governmental enablers** are required for the development of real-time interactive urban systems?
- # What **physical** and **technical aspects/attributes** is a real-time interactive urban system required to incorporate, so that it entices people to actively get involved with it?
- # What is the **state-of-the-art approaches** regarding real-time data sensing and how can their analyzed feedback (actuation), in the physical space, be associated with performance-driven urban mechanisms?
- # What **preventive/security protocols** need to be developed in the methodological design framework against commercial, authoritative and/or surveillance abuse of the urban systems?


# RESEARCH QUESTIONS

## Central Question

# To what extent embedded interactive urban systems, utilizing urban informatics and Semantic Sensor Network (SSN) **improve** key performance indicators (KPIs) in major strategic urban sectors (mobility, environment, community) and, further, **facilitate** human engagement in decision-support procedures?

## Associated Sub-questions

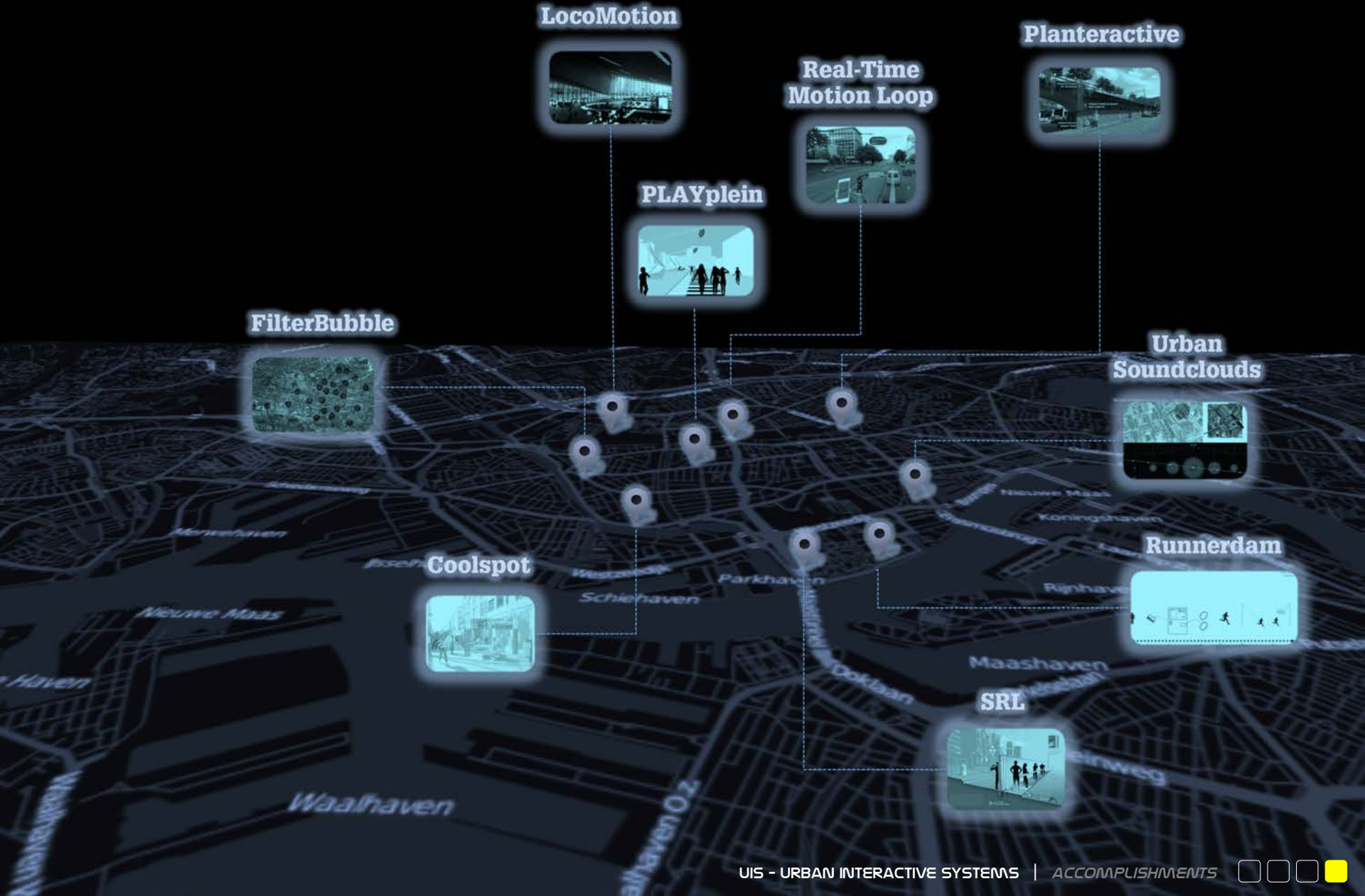
- # What **technological** and **governmental enablers** are required for the development of real-time interactive urban systems?
- # What **physical** and **technical aspects/attributes** is a real-time interactive urban system required to incorporate, so that it entices people to actively get involved with it?
- # What is the **state-of-the-art approaches** regarding real-time data sensing and how can their analyzed feedback (actuation), in the physical space, be associated with performance-driven urban mechanisms?
- # What **preventive/security protocols** need to be developed in the methodological design framework against commercial, authoritative and/or surveillance abuse of the urban systems?

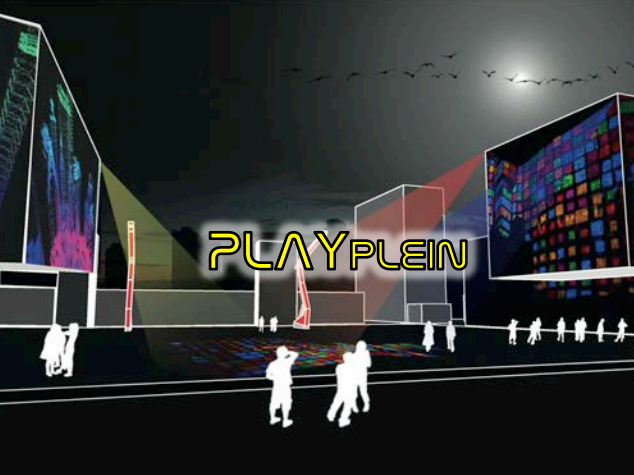


# REAL-TIME CITY

The city as an ambient interface

# ACCOMPLISHMENTS :: TEACHING & SUPERVISION





# PLAYPLEIN



# PLANTERACTIVE



# RUNNERDAM



# LOCOMOTION



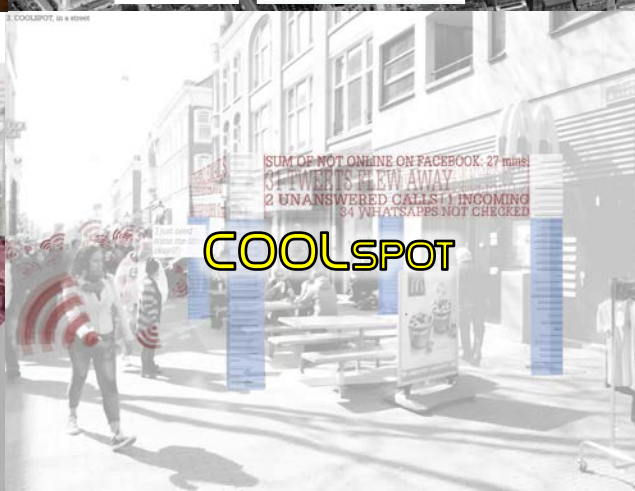
# URBAN SOUND CLOUDS



# FILTERBUBBLE



# REAL-TIME MOTION LOOP



# COOLSPOT



# SR LANE STRESS RELIEF LANE

data projection

CO<sub>2</sub> RUNNERDAM Routing System

See all Emotional m...  
Genders  
Seasons  
Time of the day  
Set a time interval  
00:00-00:00 00:00-00:00  
00:00-00:00 00:00-00:00

SUM OF NOT ONLINE ON FACEBOOK: 27 times  
01 TWEETS PLEW AWAY  
02 UNANSWERED CALLS+1 INCOMING  
04 WHATSAPPS NOT CHECKED

tubes providing artificial sunlight

touch screen handrail

THE PERFORMANCE-INSTANCE 2

COOLSPOT in a street

central database & server

EMULATORS OF THE APPLICATION

© COOLSPOT, in a street

# ACCOMPLISHMENTS :: INVITED TUTOR

URBANISM WEEK 2013: DIGITAL CITIES :: MASTER CLASS

**#ACHILLEAS PSYLLIDIS#**  
WEDNESDAY, OCTOBER 9TH 2013 | 14:00 - 17:00  
BERLAGEZAAL 1, BK CITY, TU DELFT

path finder  
city routes  
events  
management

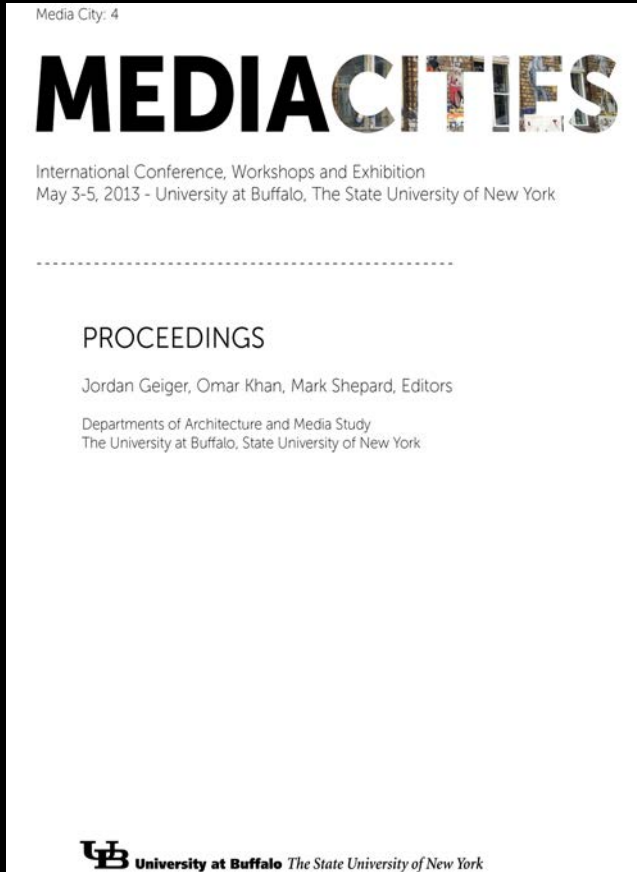
**SMARTSCAPES**

**#BIG DATA AND URBAN INFORMATICS FOR PERFORMATIVE CITIES#**

[www.urbanismweek.nl](http://www.urbanismweek.nl)  
**UrbanismWeek**  
8<sup>th</sup> until 11<sup>th</sup> October 2013



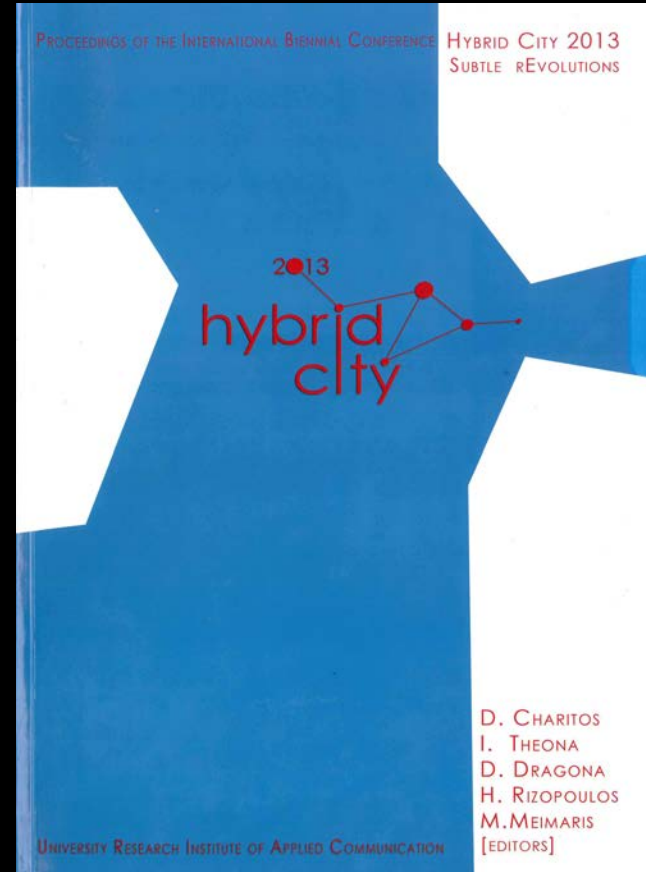
# ACCOMPLISHMENTS :: PUBLISHING & PRESENTING



## # Urban Media Geographies:

Interfacing Ubiquitous Computing with the Physicality of Urban Space

Presentation date: May 3, 2013



## # The Adaptive City:

A Socio-technical Interaction-driven Approach Towards Urban Systems

Presentation date: May 24, 2013

# ACCOMPLISHMENTS :: PUBLISHING & PRESENTING

Media Geographies: New Geographic Practices / Psyllidis / p.1

## URBAN MEDIA GEOGRAPHIES: INTERFACING UBIQUITOUS COMPUTING WITH THE PHYSICALITY OF URBAN SPACE

ACHILLEAS PSYLLIDIS

PhD Candidate

The Why Factory & Hyperbody, Faculty of Architecture  
Delft University of Technology (TU Delft), The Netherlands

Co-author: Nimish Bitoria

Assistant Professor and Research Manager

Hyperbody, Faculty of Architecture, Delft University of Technology (TU Delft), The Netherlands

### Abstract

This paper aims at establishing an associative relation between the proliferating digital technologies, the physical context of the urban fabric, its inhabitants and the multiplicity of their activities as an emergent phenomenon of contemporary urbanity. It introduces a methodological framework for the development of an interactive urban system, installed within urban open public spaces, in the form of a hybrid interface that can serve as a platform designated for both citizens and municipal planning authorities. This particular system harnesses and analyzes real-time, quantifiable traces of diverse everyday urban activities and subsequently feeds this analyzed information back in a looped manner to citizens via the proposed public interfaces. Subsequently they can observe, interact and declare their own activity-driven, customized spatial and infrastructural usage and transformation alternatives. In other words, the platform does not only imply interaction at an information exchange level, but rather aims to provoke a complex variety of inter-relations between the social and the technological via real-time spatial adaptation and customization possibilities. The proposal focuses towards a system that is perceived as an integral part of the urban environment and less on the development of a specialized application or website platform that only overlays an additional virtual layer to the already existing ones in the contemporary cities. By devising such a socio-technical interaction-driven approach towards urbanism, our proposal intends to deploy a trans-scalar understanding of the emergent relations between people, space and ambient technologies that can, further, enrich the urban pluralities within the twenty-first century city.

Keywords: Urban systems; Interaction design; Urban computing; Real-time city;  
Media geography; Ambient interface

MEDIA CITIES 302

## # Urban Media Geographies:

Interfacing Ubiquitous Computing with the Physicality of Urban Space

Presentation date: May 3, 2013

## The Adaptive City

A socio-technical interaction-driven approach towards urban systems

Achilleas Psyllidis

Faculty of Architecture, The Why Factory & Hyperbody  
Delft University of Technology (TU Delft)  
Delft, The Netherlands  
A.Psyllidis@tudelft.nl

Nimish Bitoria

Faculty of Architecture, Hyperbody  
Delft University of Technology (TU Delft)  
Delft, The Netherlands  
N.M.Bitoria@tudelft.nl

**Abstract.** This paper aims at establishing an associative relation between pervasive digital technologies, the physicality of the urban fabric and its inhabitants. It introduces a methodological framework for the development of an interactive urban system, installed within urban open public spaces, in the form of a hybrid interface that can serve as an interactive platform for both citizens and local planning authorities. This particular system apart from harnessing and visualizing real-time diverse quantifiable data, derived from everyday urban activities, aims to further provide the inhabitants with an agency via a continuous feedback loop processes to, ultimately, influence the physical and behavioural patterns of the city. In other words, the platform does not only imply interaction at an information exchange level, but rather aims to provoke a complex variety of inter-relations between the social and the technological via real-time spatial adaptation and spatial customization possibilities. The proposal focuses towards a system that is perceived as an integral part of the urban environment and less on the development of a specialized application or website platform that only overlays an additional virtual layer to the already existing ones in contemporary cities. Lastly, the paper deploys a set of critical issues that need to be taken into account regarding the evaluation of such systems in practice.

Keywords: Urban systems; Interaction design; Urban computing; Real-time systems; Adaptive urbanism; Ambient interface

### I. INTRODUCTION

The perception of cities as complex systems has been widely argued in the last two decades [1]. Urban complexity appears, though, to increasingly proliferate, triggered mainly by two pressing issues; on the one hand the rapid urbanization processes and, on the other, the perpetual pervasiveness of information technologies within the urban environments. The first contributes to the increase of complexity/density on the physical fabric of the city, while the latter augments it with a multiplicity of virtual layers in an unprecedented manner. Nevertheless, these two significant aspects of contemporary urbanity need not be treated as separate,

but as important parameters of an emergent hybrid urban geography.

Global urbanization processes have exceeded the milestone of the balance between rural and urban populations. Already since 2007, more than half of the world's population lives in cities and, according to UN predictions, by 2050 it is estimated that this percentage will rise up to 70% (United Nations, 2007). As a result, humans are already – and increasingly become – an “urban species” [2]. China represents a prime example of such procedures, since it is currently halfway into a major urbanization process, according to which by 2020 four hundred cities of one million inhabitants each are – and continue to be – built from scratch [3]. This can be translated in the creation of about twenty new cities per year, if we consider the fact that the program was announced officially in 2001. In other words, what has to be comprehended and accounted for, is the transition of an amount of people that equals to more than half of Europe's population from rural towards an urban state. Yet, these cities are still being planned within a top-down master-planning framework, which supersedes the emergent values of the 21st century. This rapid urbanization process further necessitates that the responsible design community, which gives shape to the inter-relationships between the social activities and the urban context, start devising systemic interactive processes, which provoke trans-scalar interrelations between the social and the technological; namely in an era where information becomes more and more pervasive.

A direct consequence of the perpetual technological ubiquity can be identified in the obvious shift from an industry-based economy to one driven by (digital) information and services, which we have experienced primarily during the last decade. Though the concrete repercussions of digital media on the city have been quite controversial [4], we can firstly acknowledge a clear influence of pervasive and situated technologies as regards the amounts of tangible patterns and traces of human urban activities. Industry-driven societies have been characterized by a plethora of visible activity patterns in the physical spaces of the city. Manchester, for example, the world's first industrial city – also

371

## # The Adaptive City:

A Socio-technical Interaction-driven Approach Towards Urban Systems

Presentation date: May 24, 2013

