

Supporting Architectural Design for Technological Homes through Activity Visualization

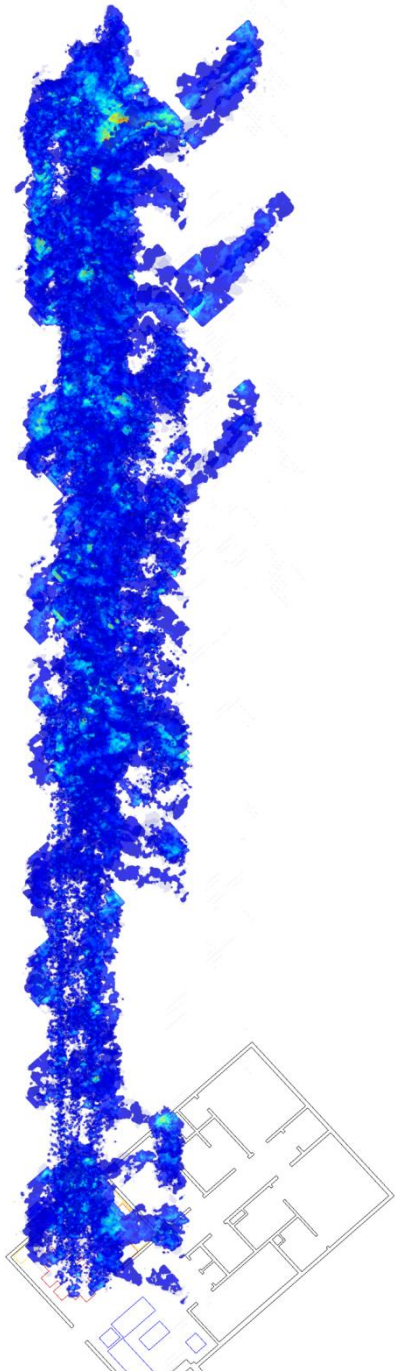
Mario Romero

2009/07/29

UW MSR Summer Institute 2009

Unraveling the Technological Knot in Homes

Adapting to Users and Other Lessons Learned



Motivation

- Systems
- Networking
- HCI
- AI
- Security
- Ubiquitous Computing

Anyone else (not from computing)?

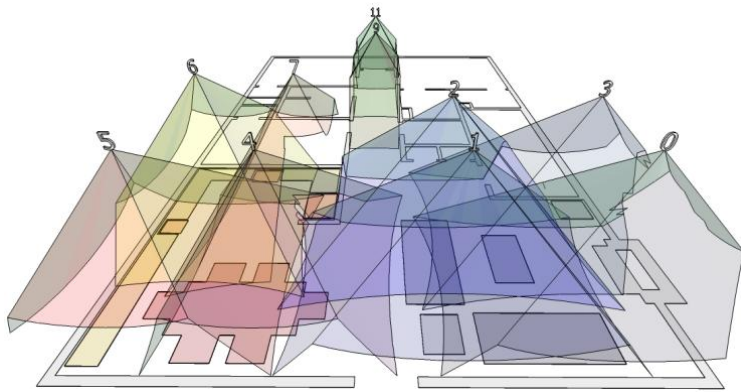
Anyone else (not from computing)?

- Designers
 - Interior
 - Industrial
 - Furniture
- Sociologists
- Psychologists
- Medical Doctors
- Civil Engineers
- **Architects**
- ...

Viz-A-Vis

Visualizing Activity through Vision

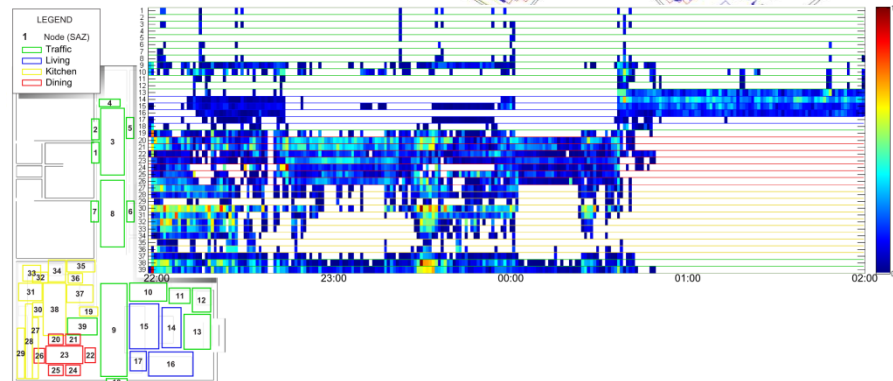
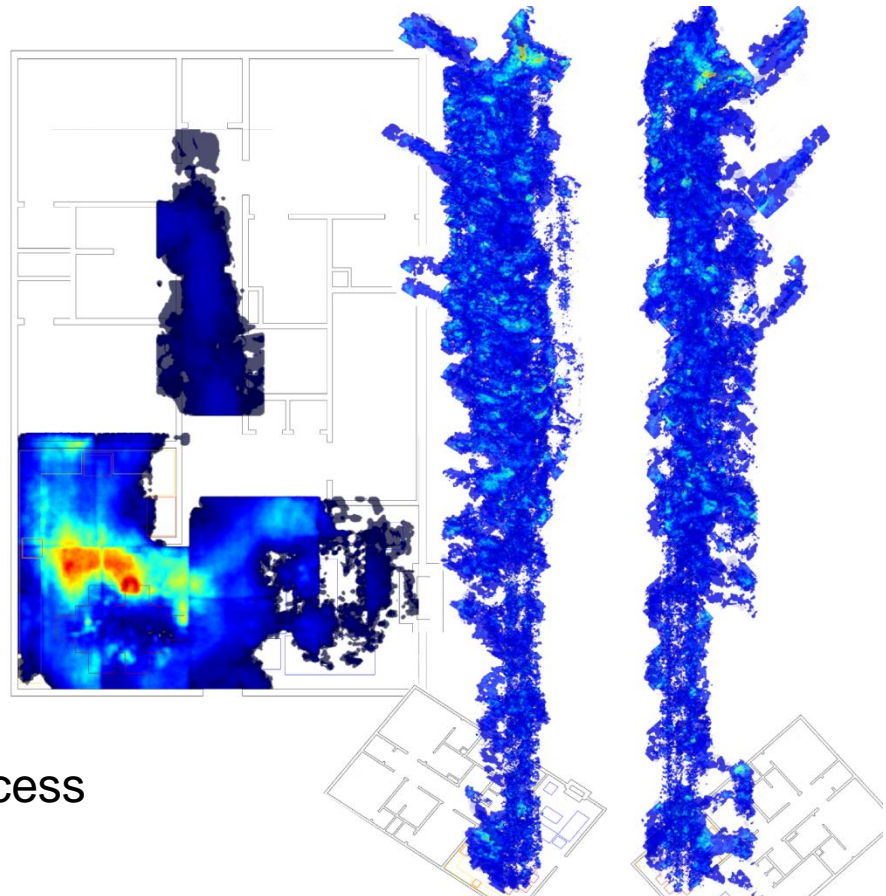
Viz-A-Vis: Visualizing Activity through VISION



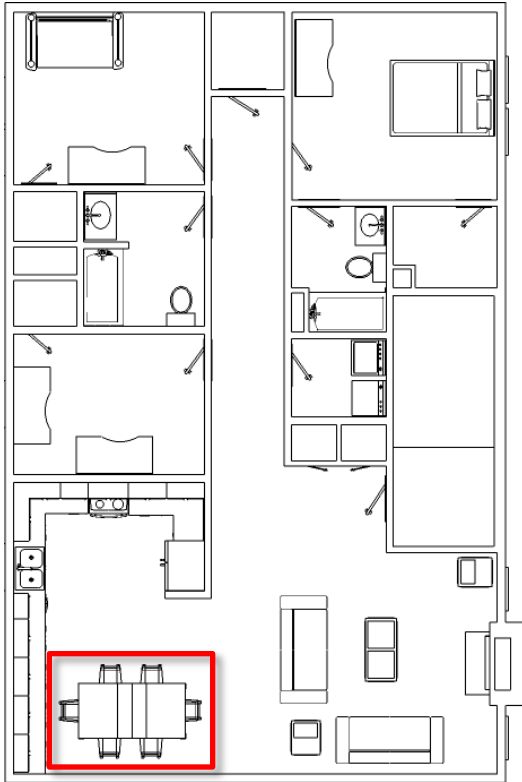
Capture



Access



Overhead Cameras



Architecture



Overhead Camera FOVs



Image Space

Compute and Aggregate Motion



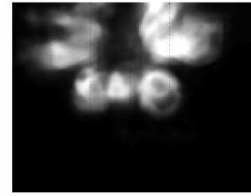
Frame



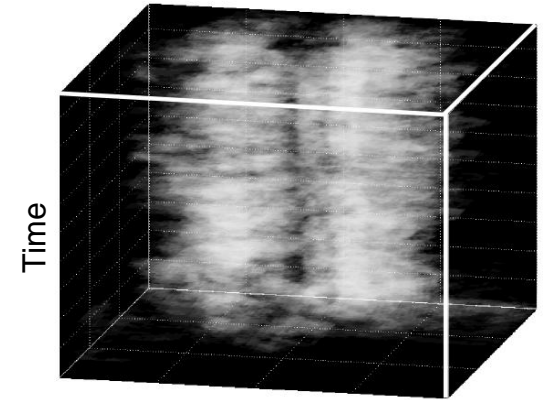
Adjacent
Frame



Adjacent
Frame
Difference

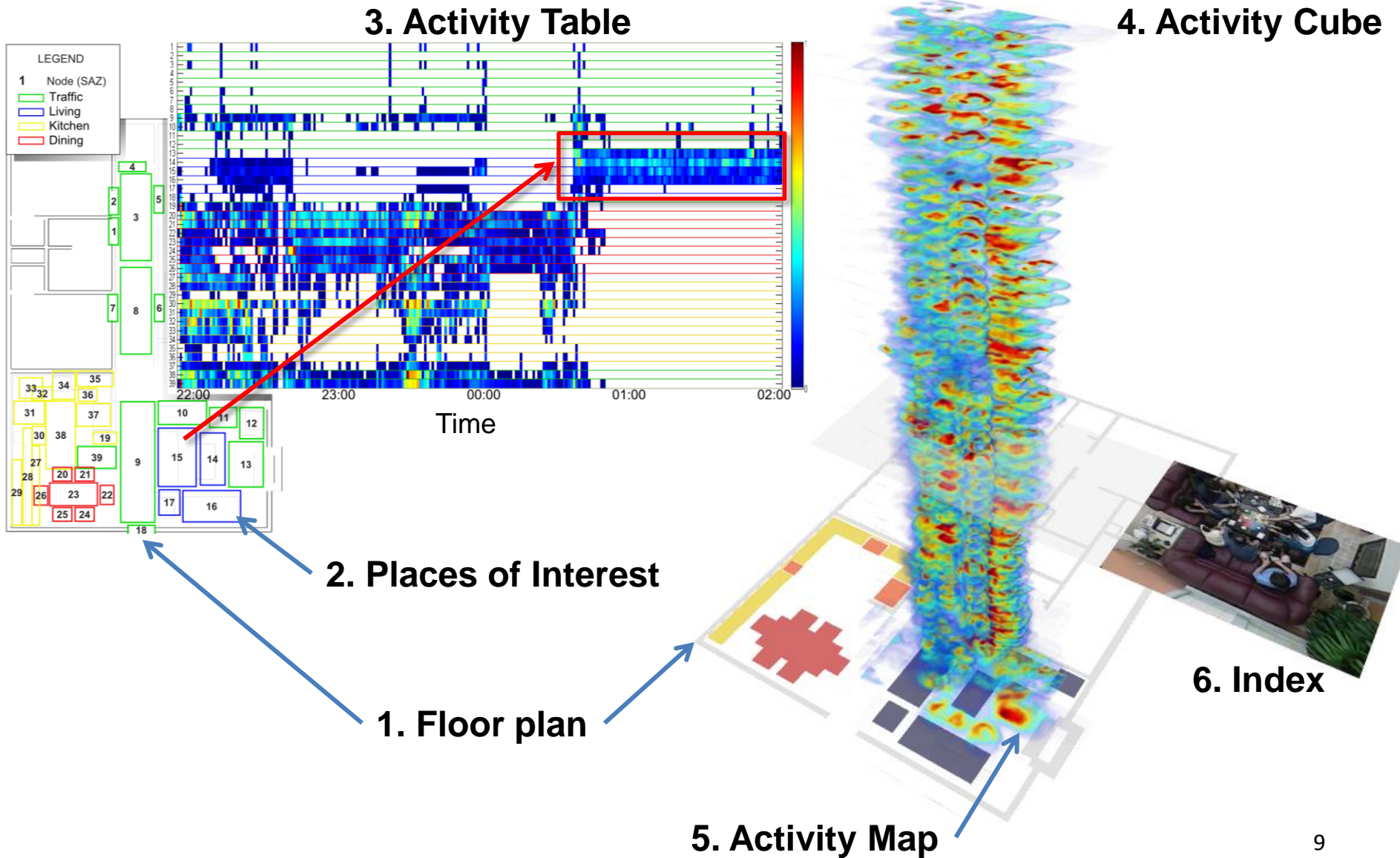


Aggregate
Motion



Layers of
Aggregate
Motion

Viz-A-Vis: Visualizing Activity through VISion



Viz-A-Vis: Visualizing Activity through VISION

Visualizing Activity

Mario Romero



Study with Architects

Goals & Measures

- Opportunity for methodical discovery
 - Architectural design sessions and focus groups
- Effects on design
 - Architectural Moves
- Feedback from domain experts
 - Focus groups

Conditions and Participants

- Current design practices
 - Group 1
 - 5 Architecture PhD students
- Current design practices **plus Viz-A-Vis**
 - Group 2
 - 6 Architecture PhD students

Group 1 and 2: Task & Materials

- Individual remodeling of the public spaces of the Aware Home



Group 1 and 2:

Requirements and Constraints

- Clients
- Requirements
 - Shared parallel activities
 - Meals
 - Entertain friends
 - Library
 - Media
- Constraints
 - No structural changes

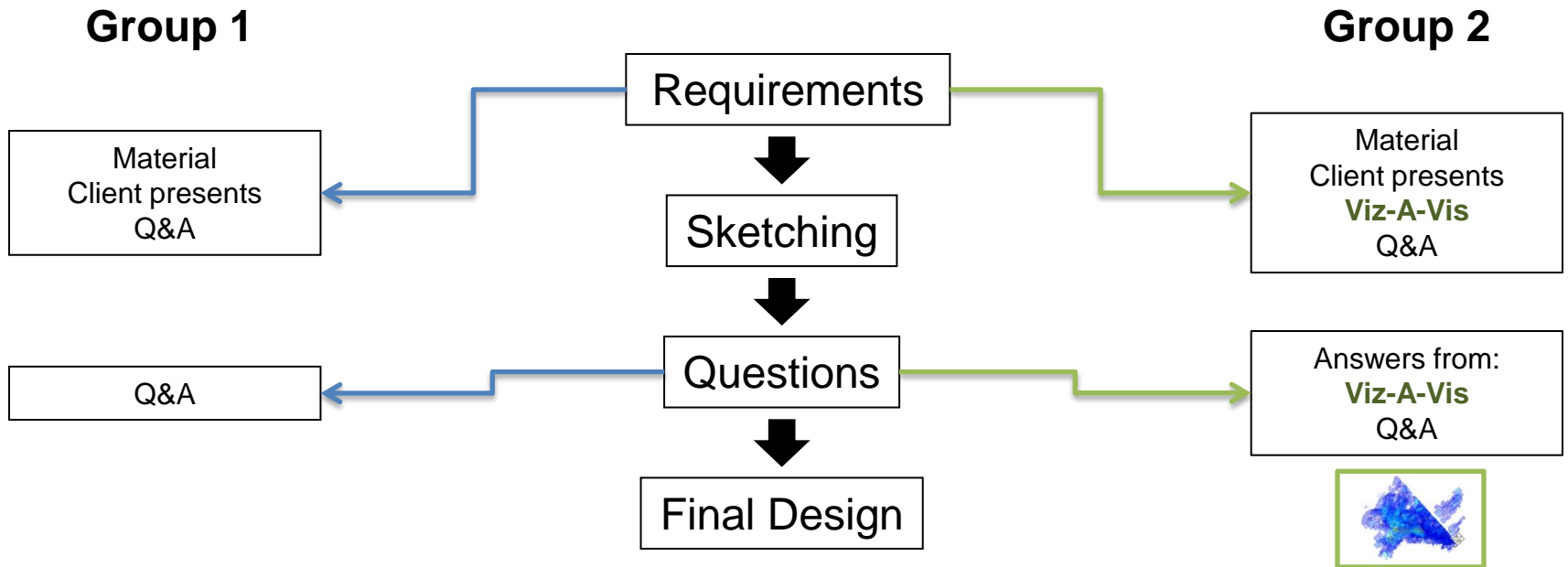
Group 2:

Activity Data for Analysis

- 9 days of everyday living
 - Friday March 17, 2006
 - Sunday March 26, 2006
- 2 people
- 4 guests
- Everyday living
- 200 Hrs.



Design Sessions

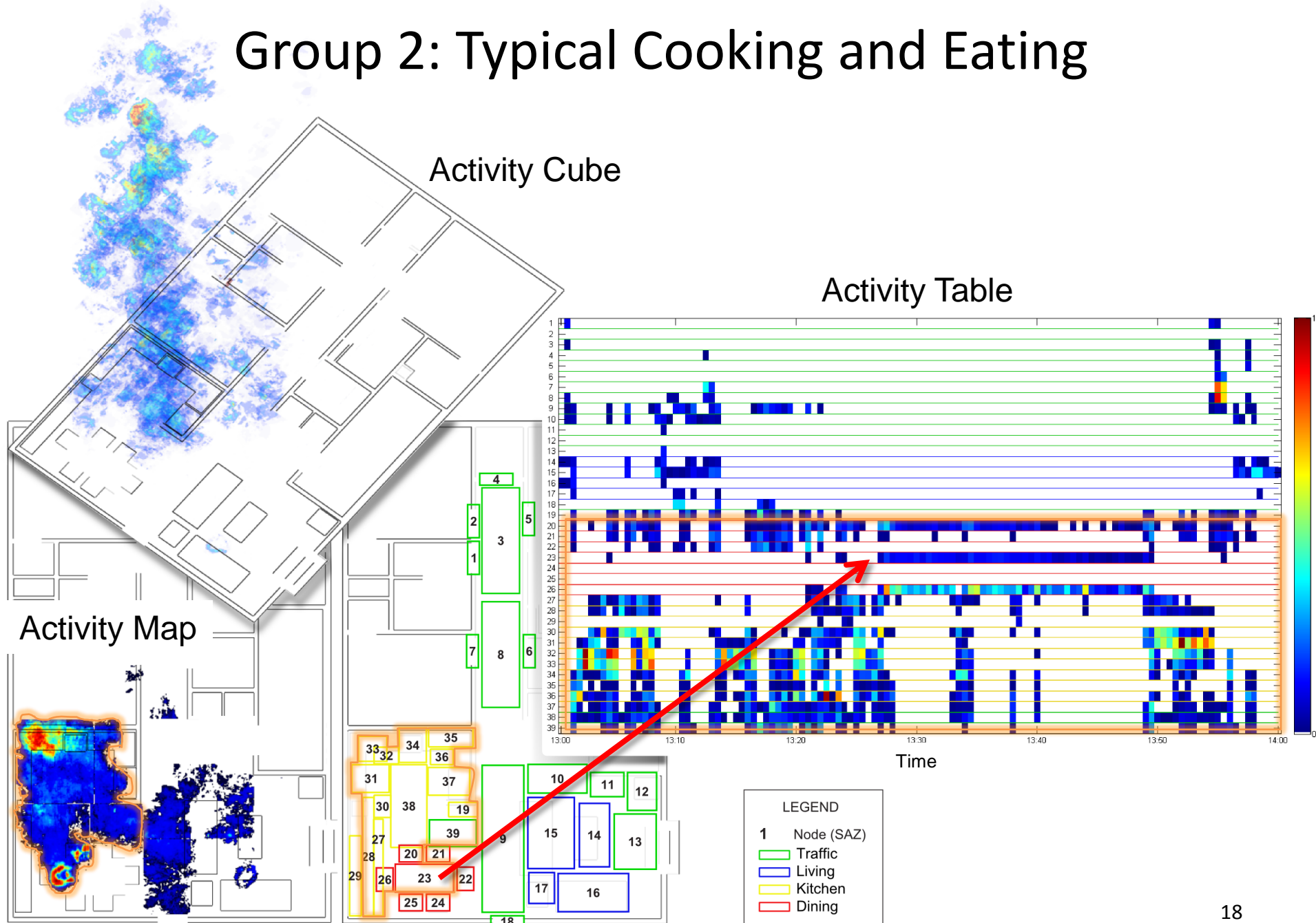


Group 2: Typical Cooking and Eating

Activity Cube

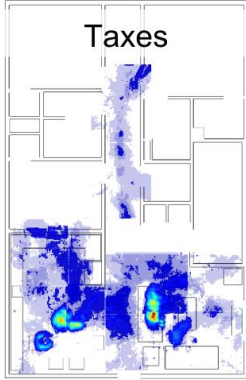
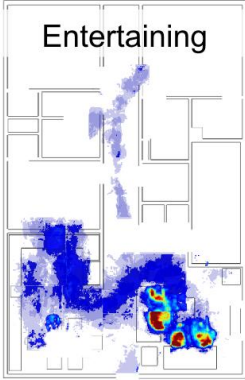
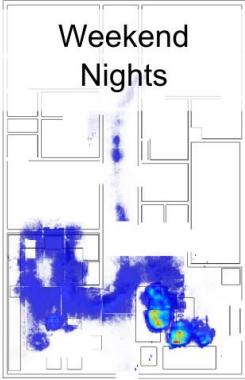
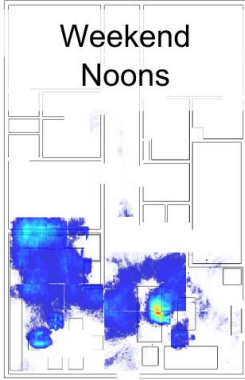
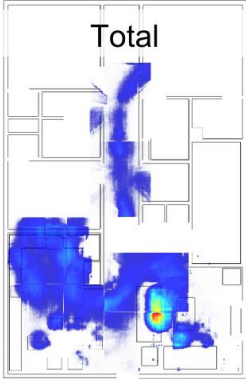
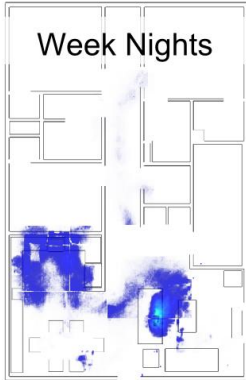
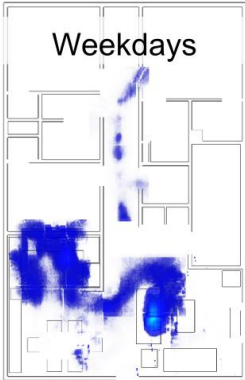
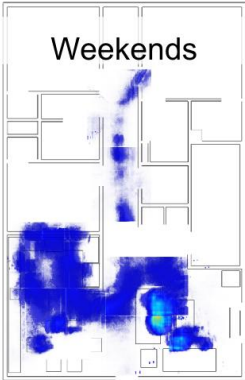
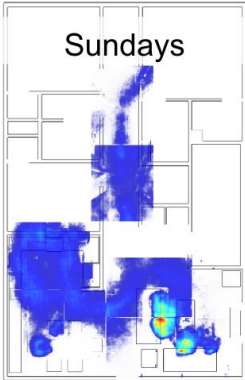
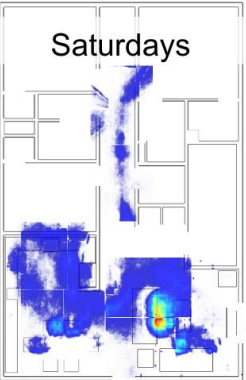
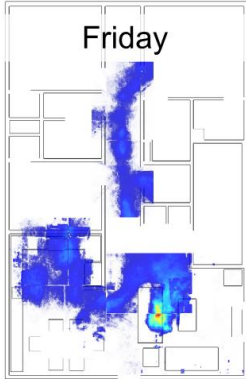
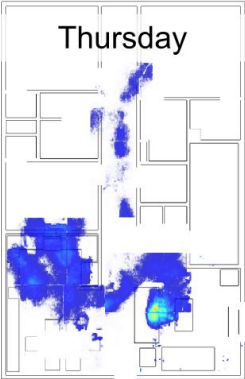
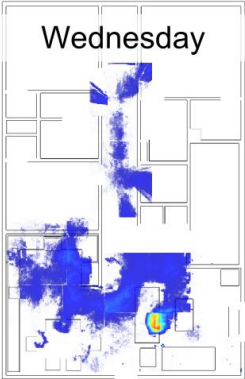
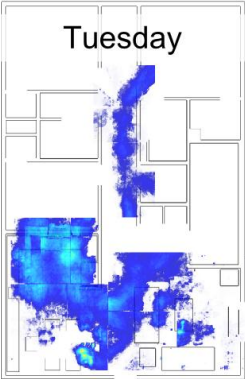
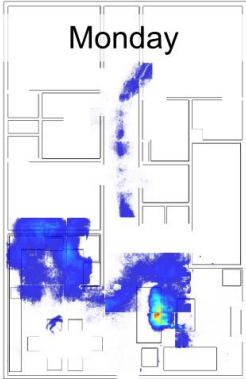
Activity Table

Activity Map

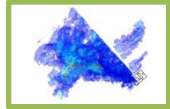


RESULTS

Discovery of Behavioral Patterns



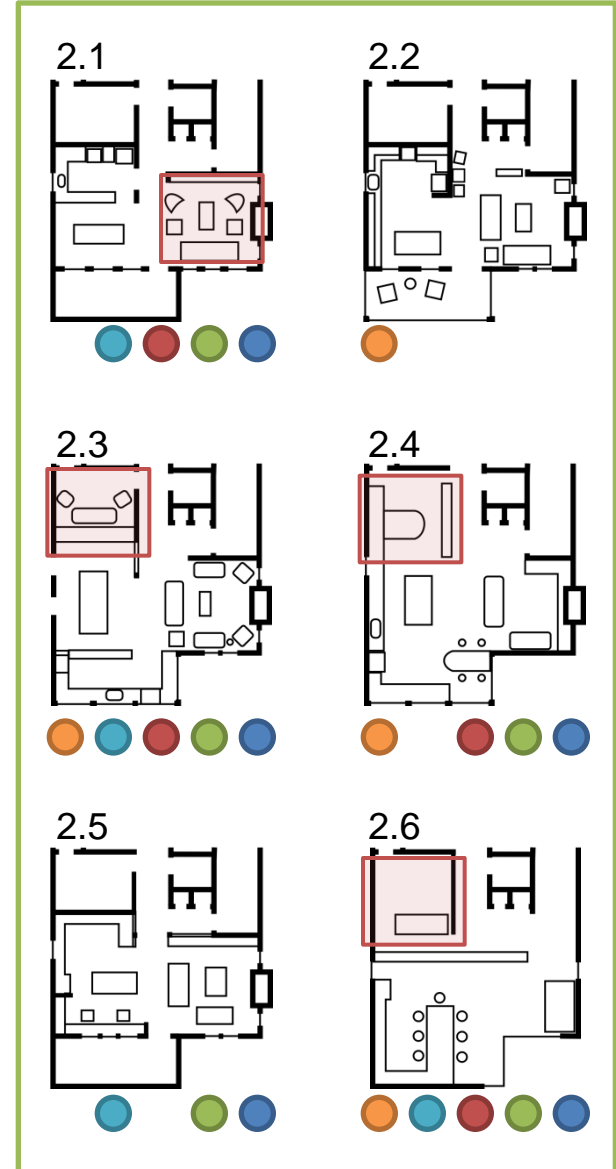
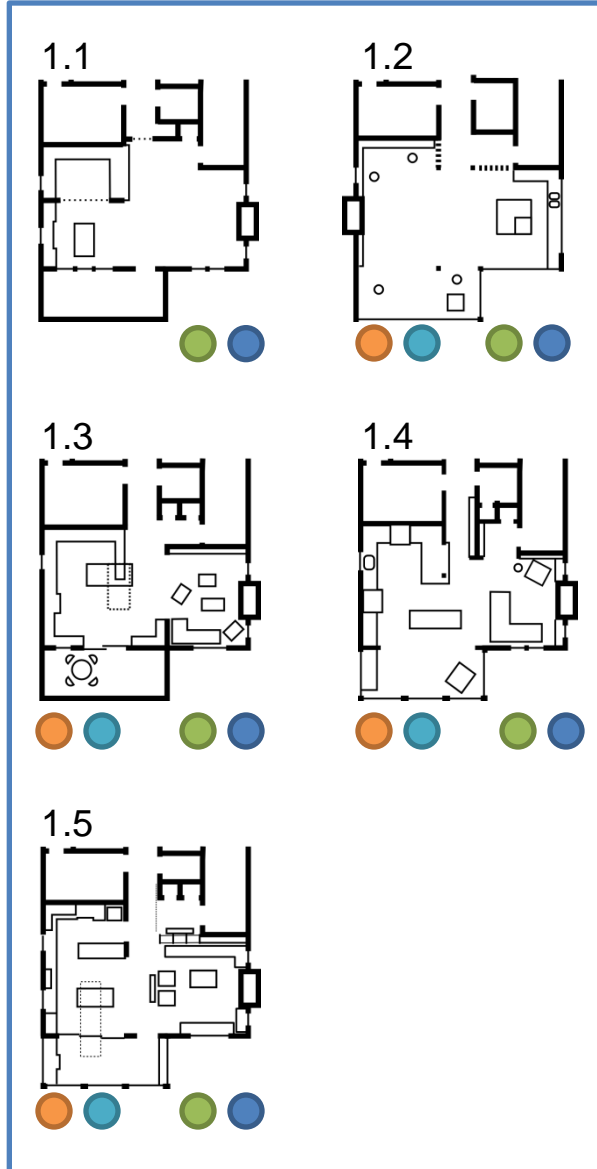
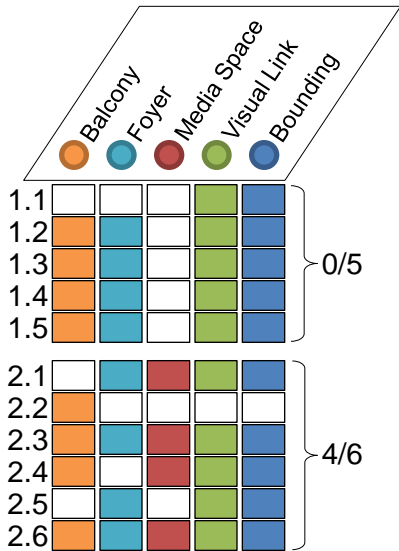
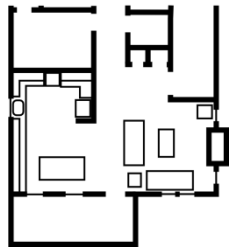
Architectural Moves



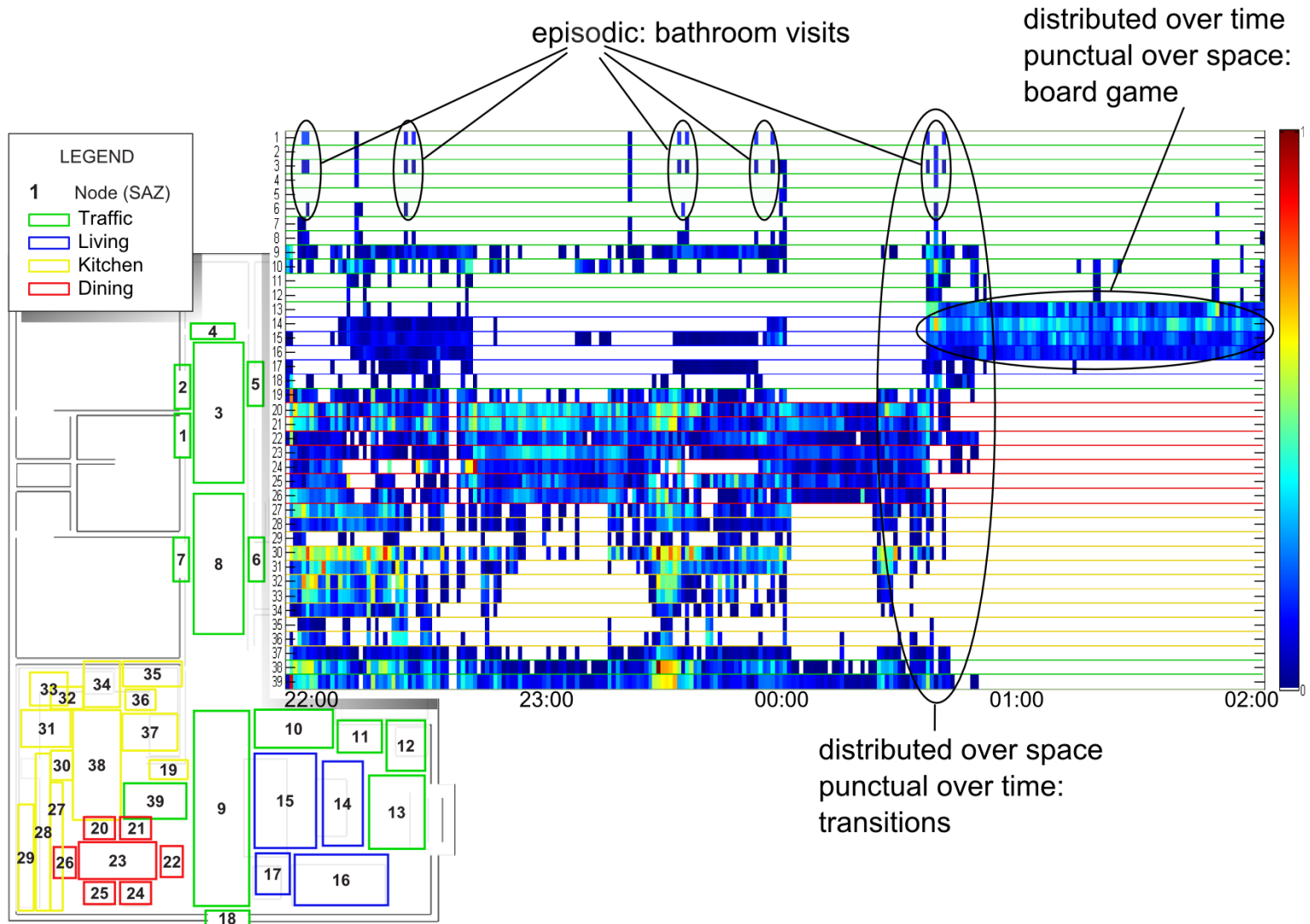
Group 1

Group 2

Original



Activity Characterization



Feedback

- Different Types of Motion
 - Vibrations vs. Translations
- Identity
 - Individual vs. Group Behavior
- Complex Environments
 - Real vs. Simulation

THANK YOU