Source: www.nsgt.org

Towards Socially-Aware Learning Spaces

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Learning Spaces
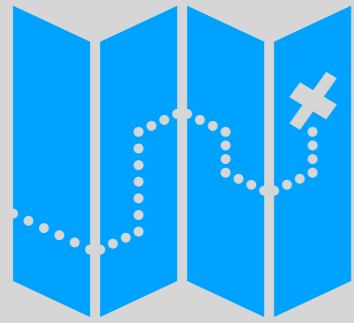
Source: studybreaks.com

Source: bath.ac.uk

Tools have changed, form and function remain

Can we say that our learning spaces have become *smart*?

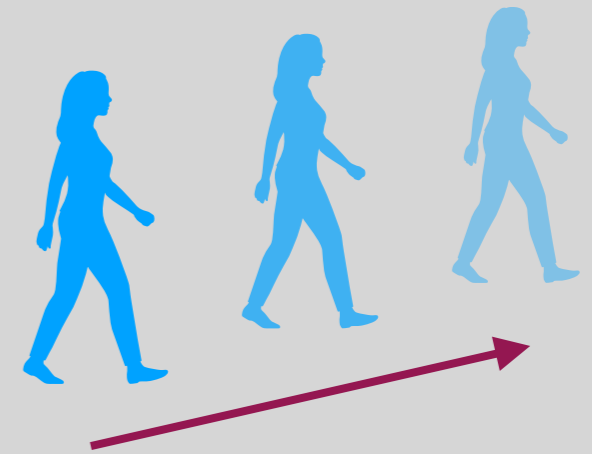Does retrofitting "smart" artifacts makes the environments smart?
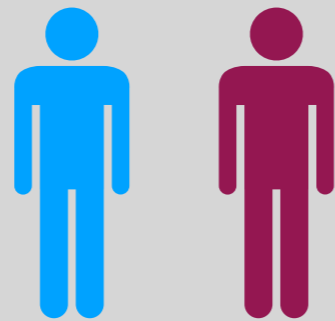
Distance

Orientation

Movement

Identity

Location

Greenberg, S. *et al.*, 2011. *Proxemic Interactions: The new ubicomp?*. interactions 18(1).

Ubicomp / Context-Aware Technologies

Source: The Boston Globe

Social context is *subtle*

How can we better support the
socio-cognitive processes
in learning spaces?

Designing for Social Awareness

How can we better support the *socio-cognitive* processes in learning spaces?

By assimilating *subtle* and *latent* aspects of social context in the future conceptions of Ubiquitous Computing.

Designing for Social Awareness

Recurrent and short-term *physical* and *physiological* indicators of human behavior and socio-cultural practices.

Subtle Contextual Cues

Recurrent and short-term *physical* and *physiological* indicators of human behavior and socio-cultural practices.

"With-me-ness"
Sharma *et al.* (2014)

"Sleeper's Lag"
Raca *et al.* (2014)

"Latent Social Information"
Verma & Dillenbourg (2015)

"Gaze Cross-Recurrence"
Richardson *et al.* (2007)
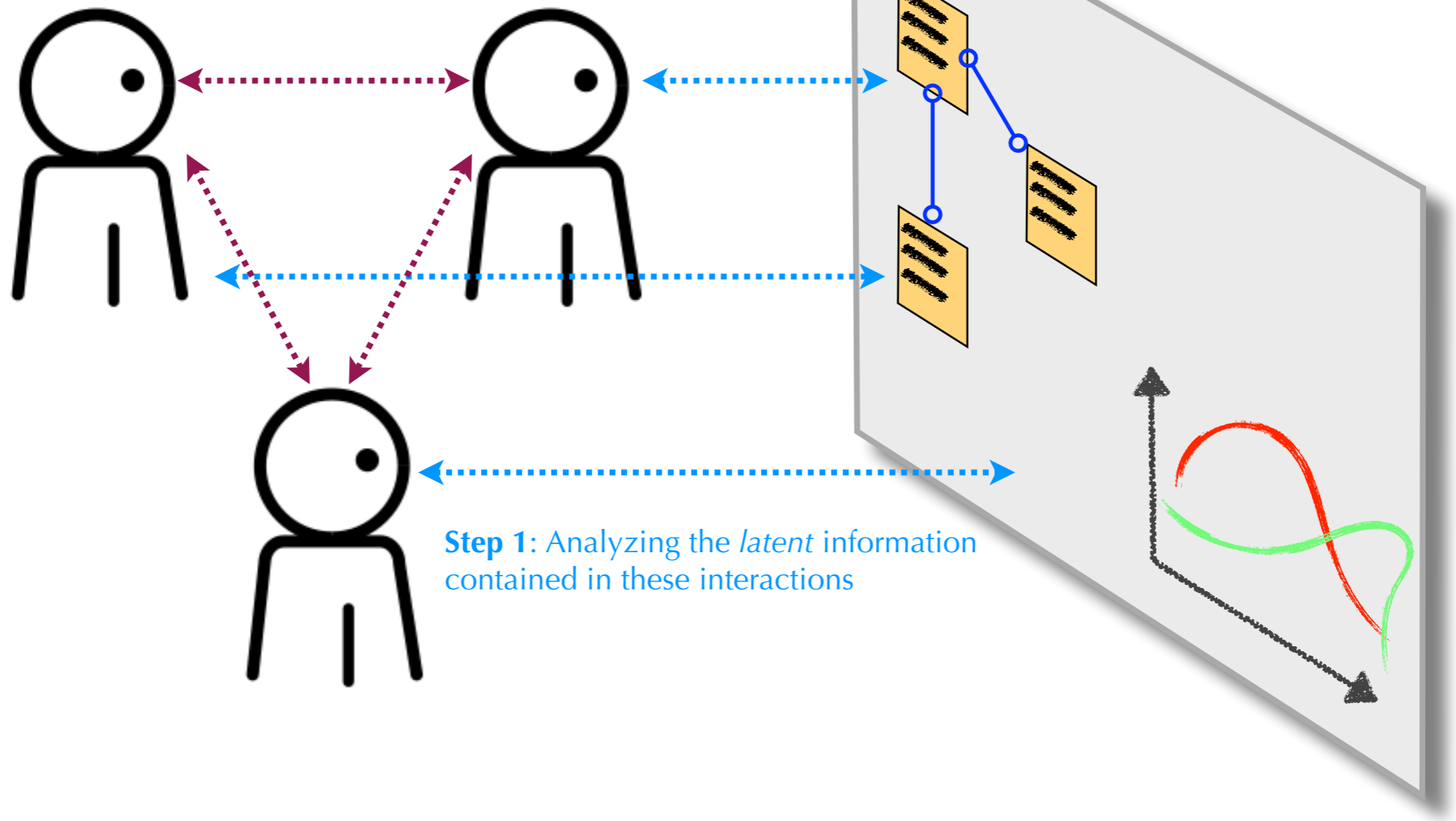Jermann & Nüssli (2012)

"Joint Visual Attention"
Pietinen *et al.* (2010)

"Social-Signal Processing"
Pentland (2007)

Subtle Contextual Cues

Step 2: Utilizing the *latent* information to model inter-personal collaborative processes.

Step 1: Analyzing the *latent* information contained in these interactions

Collaborators' interactions with content artifacts serve as a *proxy* for inter-personal collaborative processes.

Group Interactions with Content Artifacts

Transactions
Exchanging artifacts amongst collaborators

Nature of Interaction
Epistemic *vs.* Cosmetic

# Artifact Ownership
Individual *vs.* Sub-group *vs.* Collective

Activity Profile
Similarity *vs.* Intensity

Latent Social Information in Group Interactions

Transactions
Exchanging artifacts amongst
collaborators

Nature of Interaction
Epistemic *vs.* Cosmetic

Task Score &
Level of Mutual Understanding

Artifact Ownership
Individual *vs.* Sub-group *vs.* Collective

Activity Profile
Similarity *vs.* Intensity

Latent Social Information in
Group Interactions
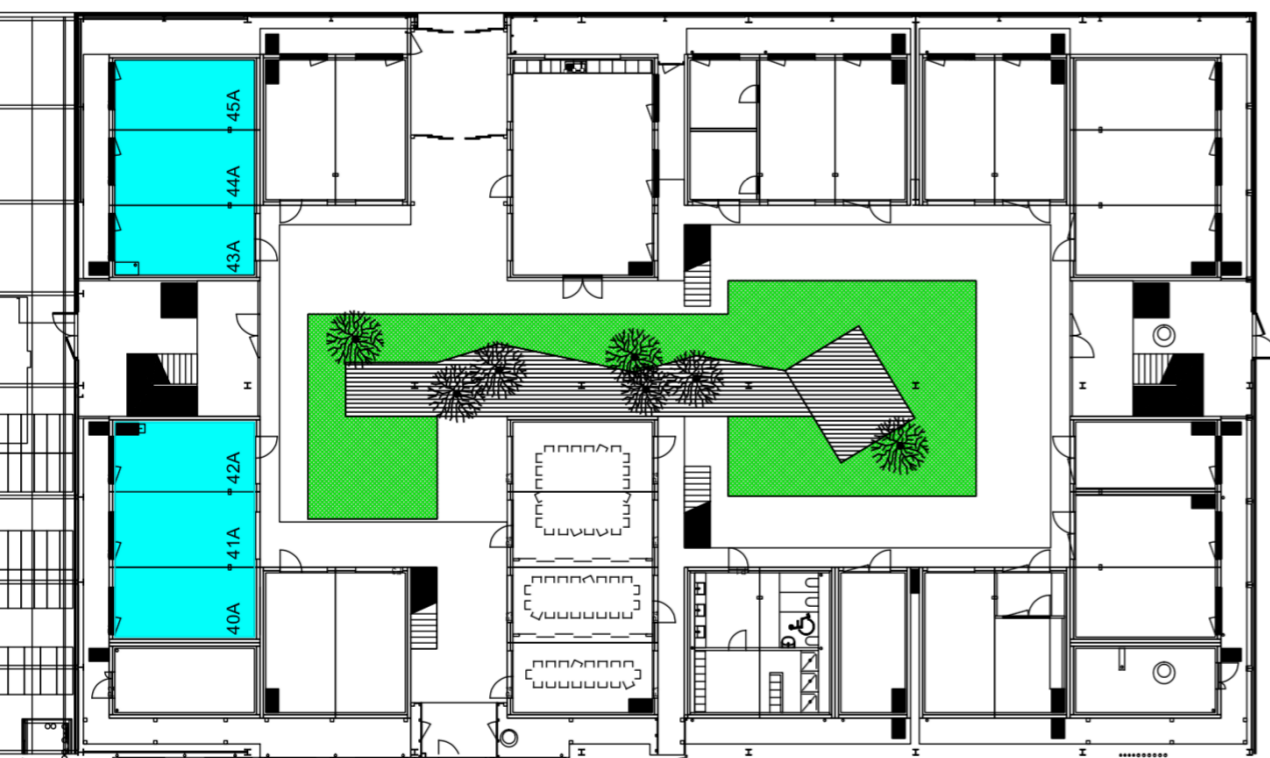
Space-Use Behavior and Designing Sustainable Offices

Motion Capture
- Cameras
- Marker badges

Bluetooth Bracelets

Verma, H., Alavi, H., and Lalanne, D., 2017. *Studying Space Use: Bringing HCI Tools to Architectural Projects.* ACM CHI

Alavi, H., Verma, H., Mlynar, J., and Lalanne, D., 2018. *The Hide and Seek of Workspace: Towards Human-Centric Sustainable Architecture.* ACM CHI

Pervasive Sensing of Inhabitants' Presence and Proximity

Indoor Mobility
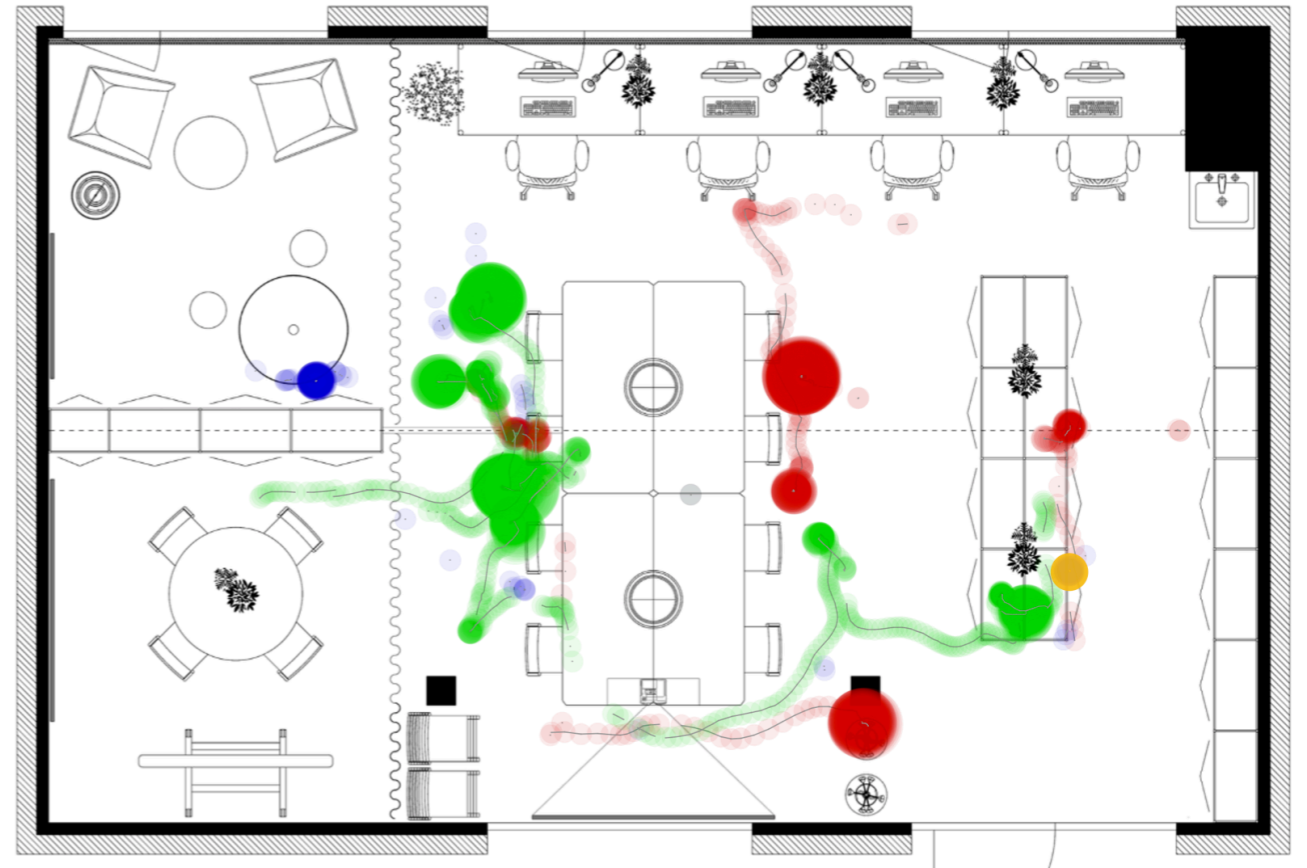Time spent in different spaces

Social Navigation
Meetings and coffee breaks

Tendency for Anchorage
Preference for a specific workplace

Communication Needs
Interruptions

Subtle Contextual Cues in
Space-Use Behavior

Indoor Mobility
Time spent in different spaces

Social Navigation
Meetings and coffee breaks

Tendency for Anchorage
Preference for a specific workplace

Communication Needs
Interruptions

Inhabitant Profiles &
Usability Assessment of Built Spaces

Subtle Contextual Cues in
Space-Use Behavior

Architectural conception of "School is Leisure" implemented at Brunswick Park Primary School (CCA, Montreal, 2018)

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