



GangKlang

sonic interaction design for
flow while walking

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GEFÖRDERT VOM



Bundesministerium
für Bildung
und Forschung



Universität Bremen



HOCHSCHULE BREMEN
UNIVERSITY OF APPLIED SCIENCES



► **Who???**

- Gangs of Bremen
- Flow-Machines Project

► **PhD research : GangKlang**

- IxD Research
- Flow | Experience Design
- Walking| Activity Theory
- SID | Begreifbare Interaktion

Outline



research topics	Phd: sonic interaction design, flow Research group: mobile interaction & experiences
work	Phd student: University of Bremen (Oct. 2012) Research Assistant: Gangs of Bremen, University of Applied Sciences Bremen Flow-Machines: Body-Movement and Sound (2012-2015)
study	Bachelor & Master of Science in Digital Media University of Applied Sciences Bremen

About

Nassrin Hajinejad

29 years old, born in Iran, living in Germany



- ▶ Mobile interactions & experiences
- ▶ Everyday life activities
- ▶ Transformation of activities by mobile devices
- ▶ Physical & Virtual interplay
- ▶ Mobile Games & Play
- ▶ Activity Theory

Gangs of Bremen

Research Group led by Prof. Barbara Grüter.
www.gangs-of-bremen.de

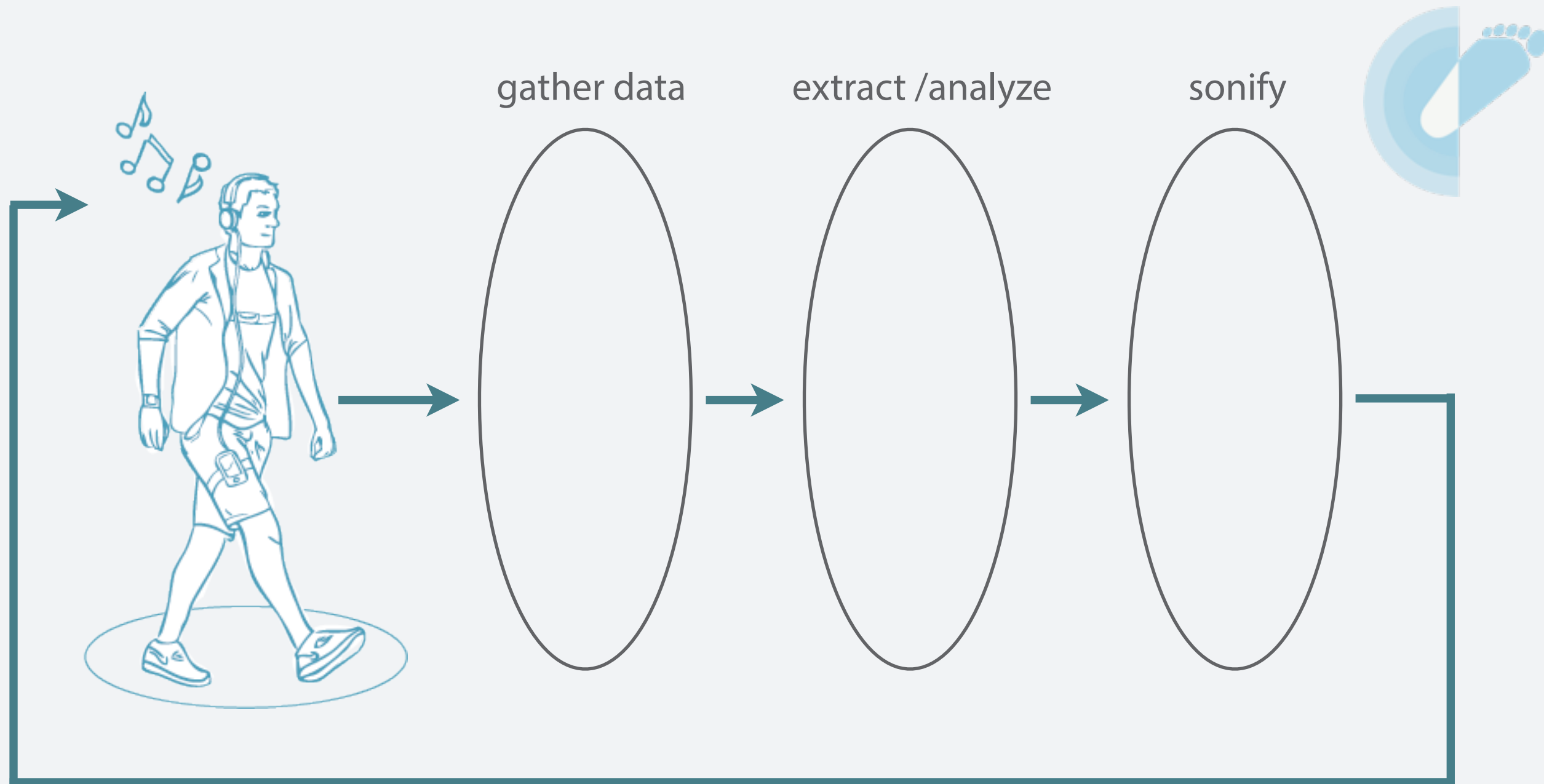


- ▶ Supporting the walking activity
- ▶ Facilitating the experience of flow
- ▶ different contexts:
 - everyday life | rehab | mobile games

- ▶ BMBF funded
- ▶ 10 /2013 - 10/2015

BMBF Research Project

Facilitating flow experiences while walking.
www.flow-maschinen.de



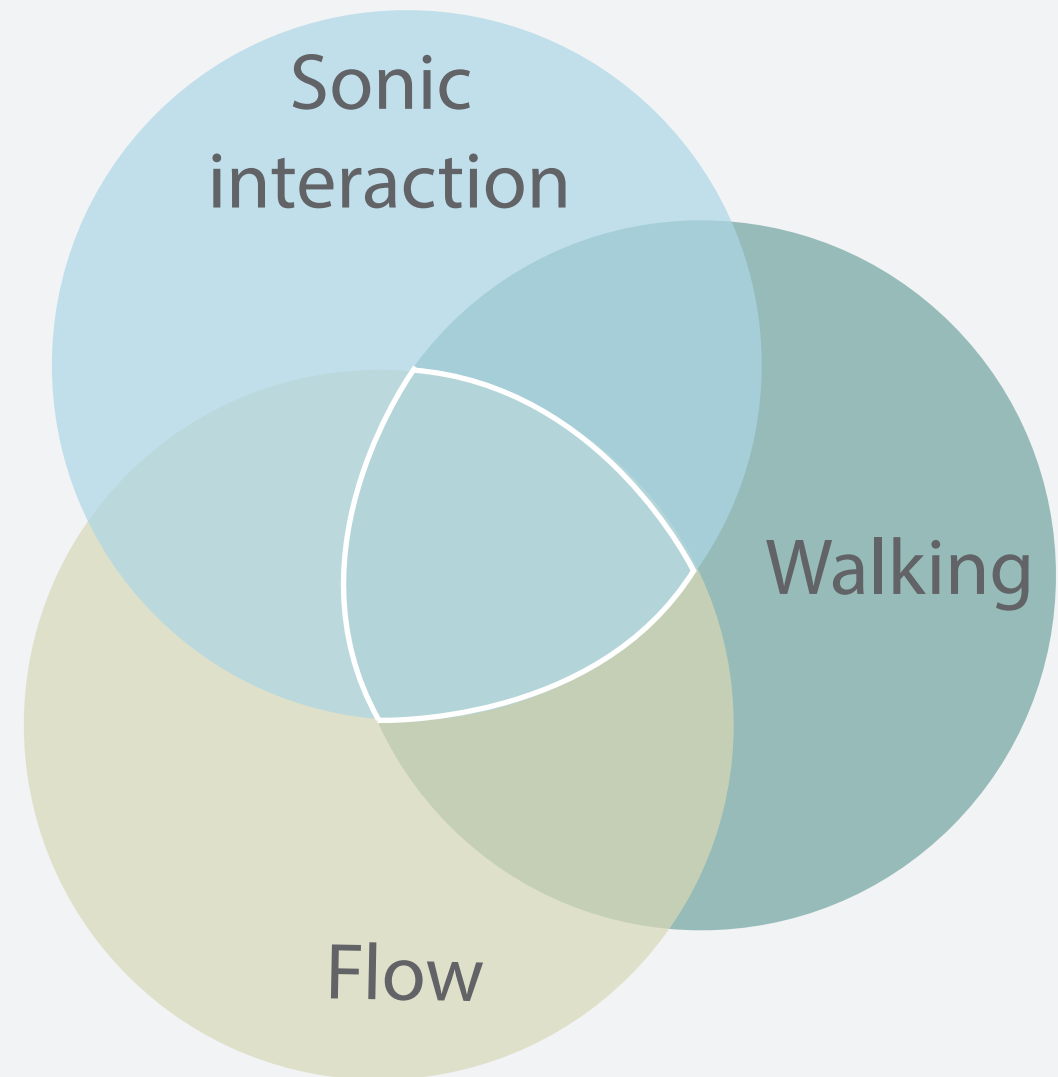
Flow-Machines

Biofeedback systems for walking

Supporting the personal manner of walking.



How to design sonic interactions for walking
to facilitate the experience of flow?



GangKlang
PhD research

Sonic interaction design for flow while walking
www.flow-maschinen.de

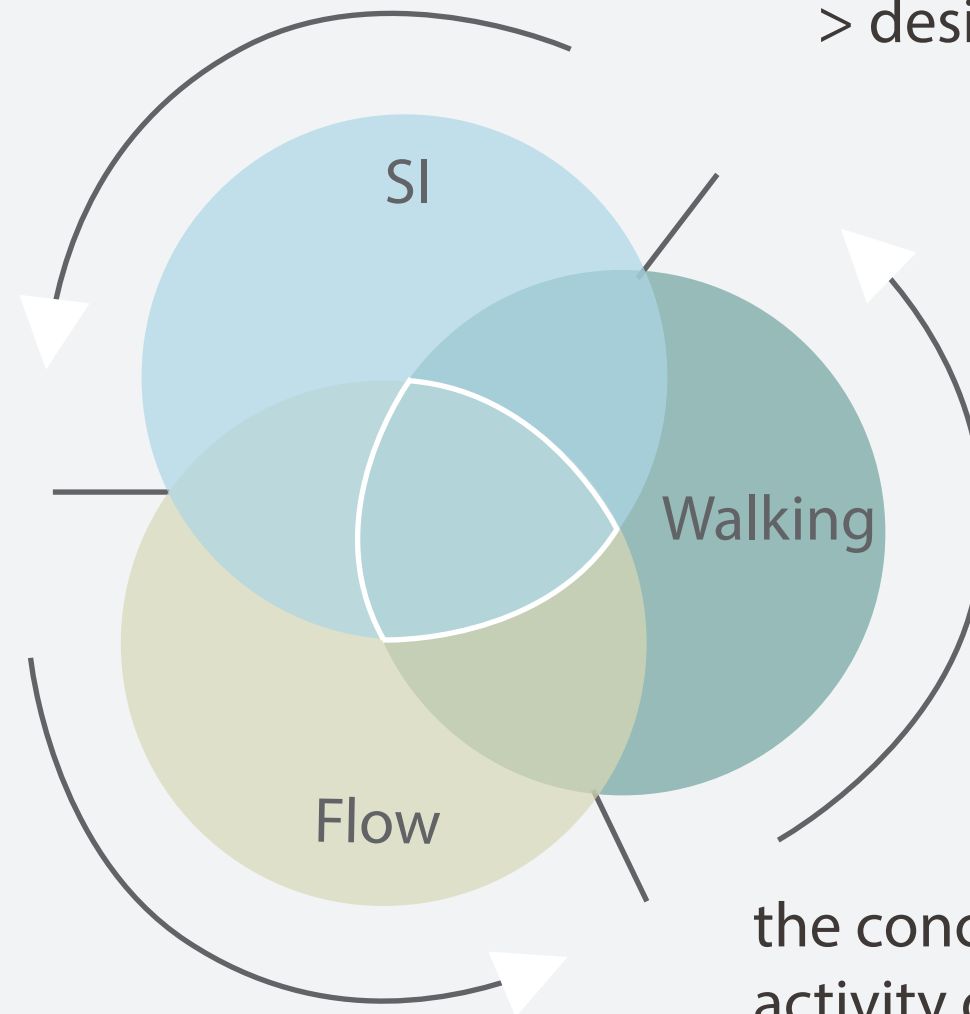
sonic interaction to enrich
the walking experience

- > technological challenges
- > design solutions



sonification of walking
data

- > reciprocal effect
- > experience of flow



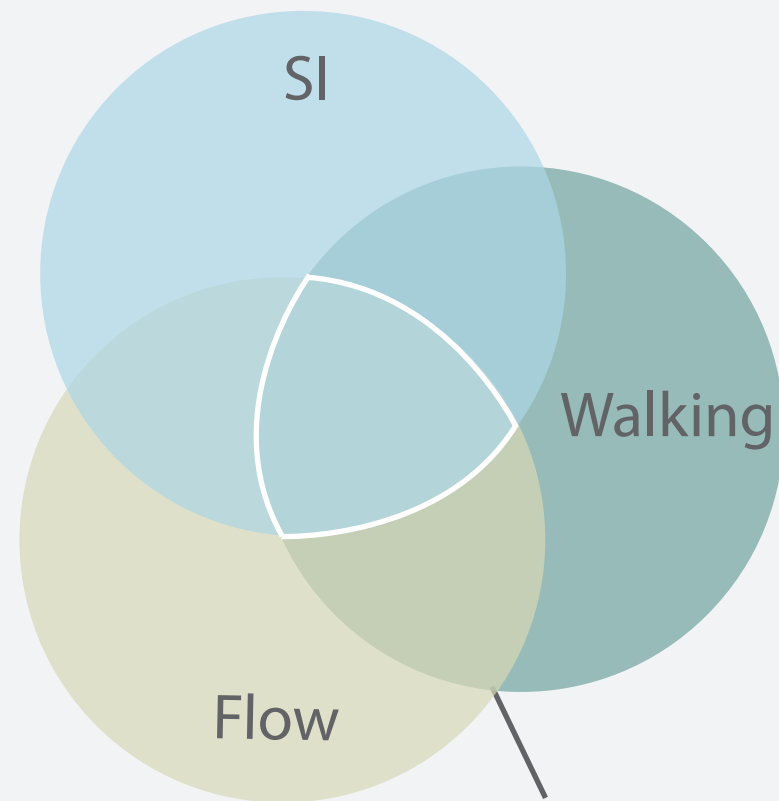
the concept of flow in the
activity of walking

- > new insights to flow
- > interaction ideation

IxD Research

PhD research

Zimmerman, J., Forlizzi, J., and Evenson, S. *Research through design as a method for interaction design research in HCI*. Proc. SIGCHI Conf. on Human factors in computing systems, (2007), 493–502.



reveal: the concept of flow in
the activity of walking

- > new insights to flow
- > interaction ideation

Flow & Walking

Step I



*„... a subjective state that people report
when they are completely involved in something
to the point of forgetting time, fatigue, and
everything else but the activity it- self.“*

preconditions:

optimal challenges / opportunities
proximal goals
immediate feedback

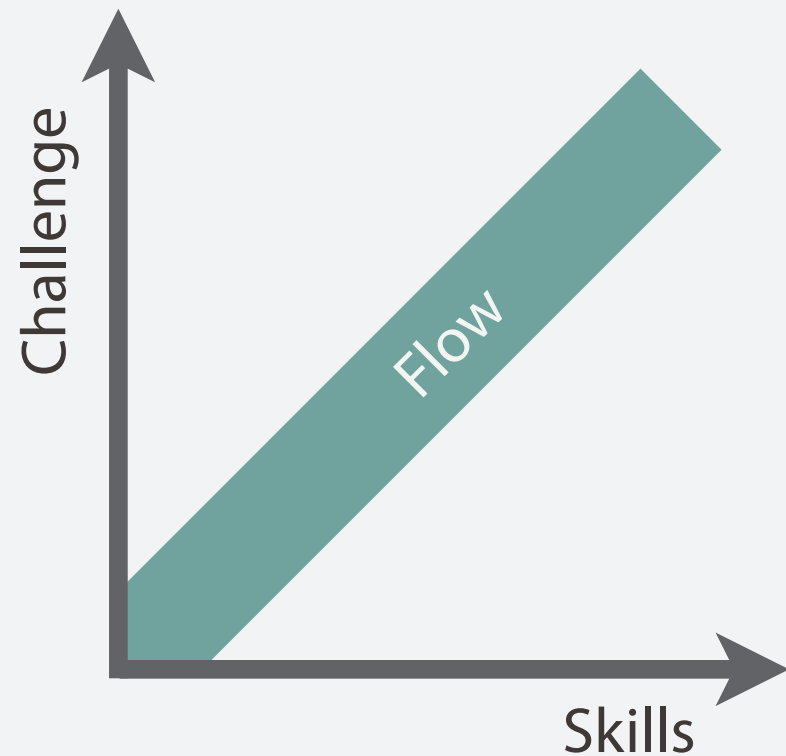


flow characteristics:

intense and focused concentration
merging of action and awareness
sense of control
distorted temporal experience
activity feels intrinsically rewarding

Flow:
a state

Csikszentmihalyi, M., Abuhamdeh, S., and Nakamura, J. *Flow*. In Handbook of competence and motivation. Guilford Publications, NY, US, 2005, 598–608.



- ▶ Designing for flow
 - Balancing challenge & skills
- ▶ Experience Sampling Method
 - Questionnaires, Self-Report
- ▶ Physiological Measurement
 - Salivary cortisol, Heart rate variability

Flow: objectified

Engeser, S., ed. *Advances in Flow Research*. Springer, 2012.



*"... when defining challenge more broadly as **"opportunities for action"** as Csikszentmihalyi (1975;p.49) did in the beginning of his research, one comes closer to an explanation of why flow can be experienced in situations without an obviously challenging character as well." (a)*



„ ... the original meaning of an affordance is that of an empty space between two fitting jigsaw pieces." (b)

Flow & Affordances

(a) Schiepe-Tiska, A. and Engeser, S. Flow in non-achievement situations. In *Advances in Flow Research*. Springer, New York, NY, 2012, 87–108.
(b) Linderoth, J. *Beyond the digital divide: An ecological approach to gameplay*. (2011).



smoothness of motion: characteristic describing the degree of continuity in the progress of a movement

- ▶ subjectively experienced
- ▶ quantified by the jerk cost

Flow & body movement

Meinel, K., Schnabel, G., Schnabel, G.G., and Krug, J. Bewegungslehre Sportmotorik: Abriss einer Theorie der sportlichen Motorik unter pädagogischem Aspekt. Meyer & Meyer Sport, Aachen, 2007.



What is walking for you?

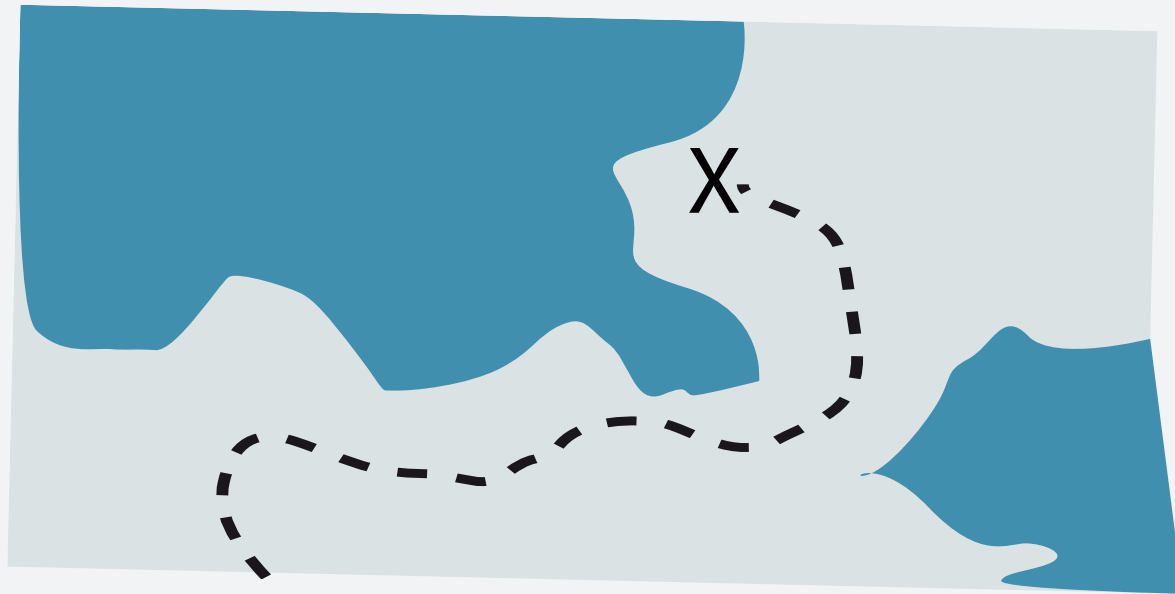


Gait:

objectified body movement

A cyclic activity in which one step follows the next one in a reciprocating movement.

Regular, target-oriented, continuous



Spatial vs. Body movement

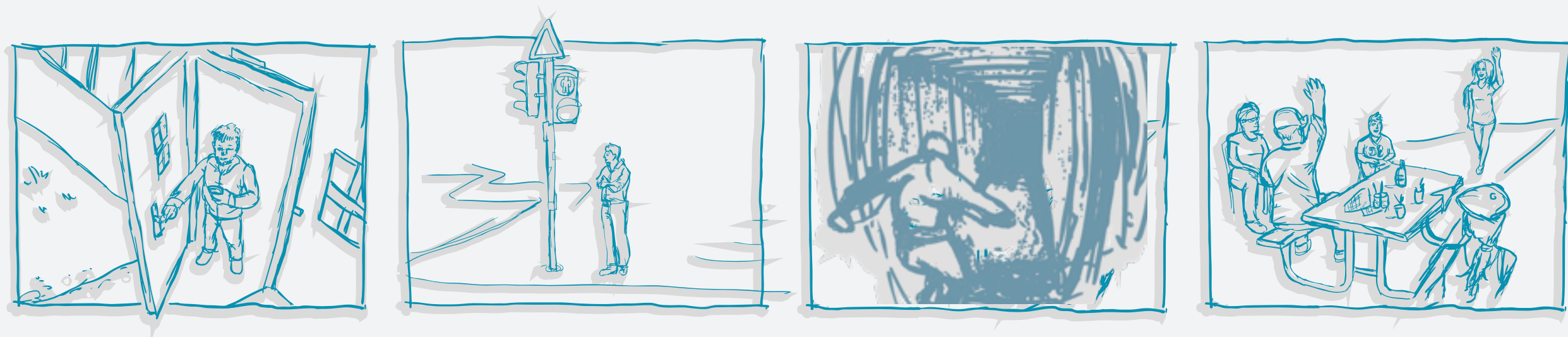
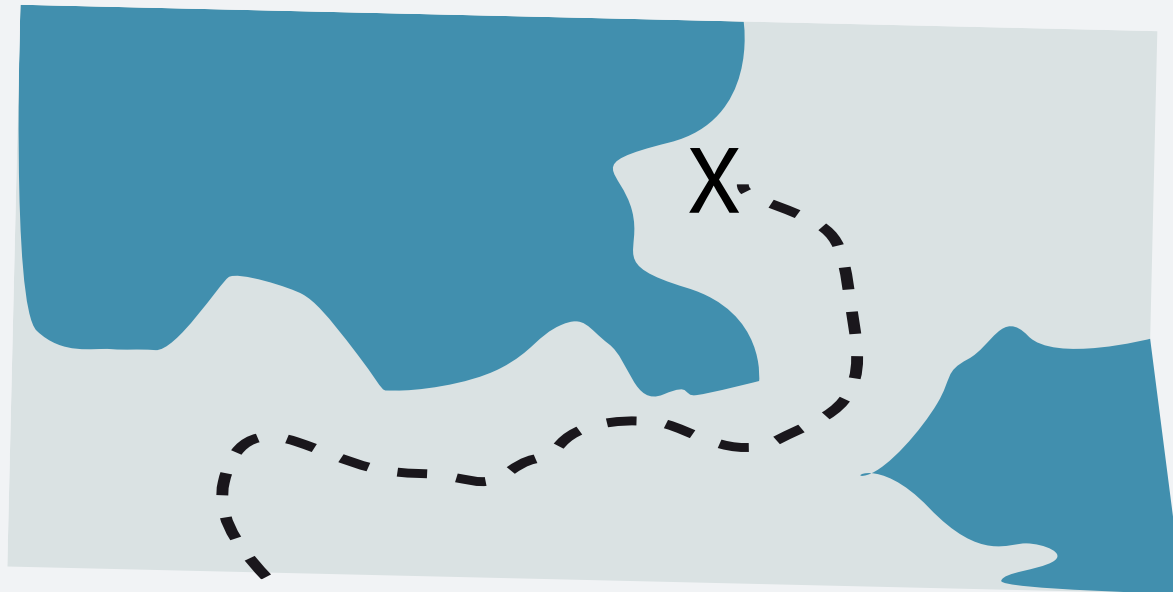




"Activity theory is an approach in psychology and other social sciences that aims to understand individual human beings, [...] in their natural everyday life circumstances, through an analysis of the genesis, structure and processes of their activities."

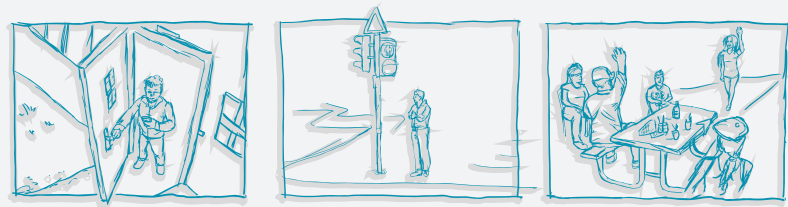
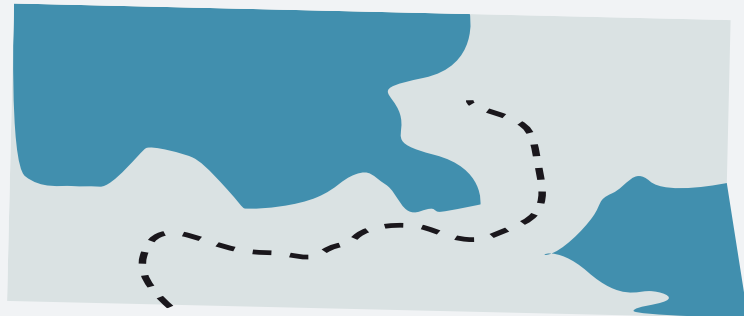
Activity Theory

Kaptelinin, V. and Nardi, B.A. *Acting with Technology: Activity Theory and Interaction Design*. MIT Pr, 2009.



Walking: an activity



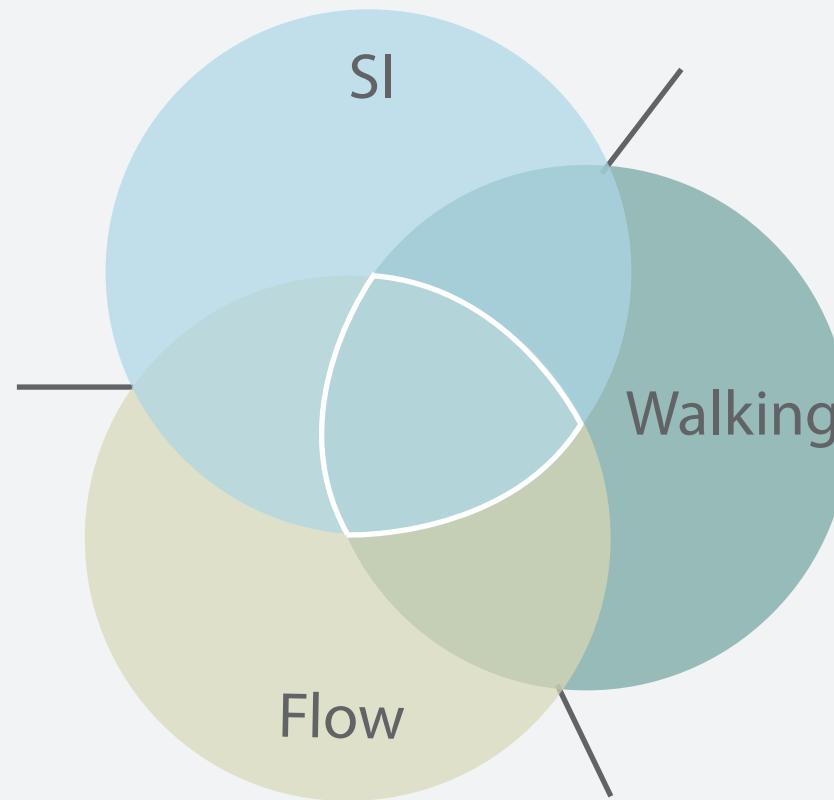


Flow while walking

- ▶ Smooth transitions between units of interactions on different levels of the walking activity
- ▶ A quality of a continuous process
- ▶ Opportunities for action



apply: sonic interaction to
enrich the walking
experience



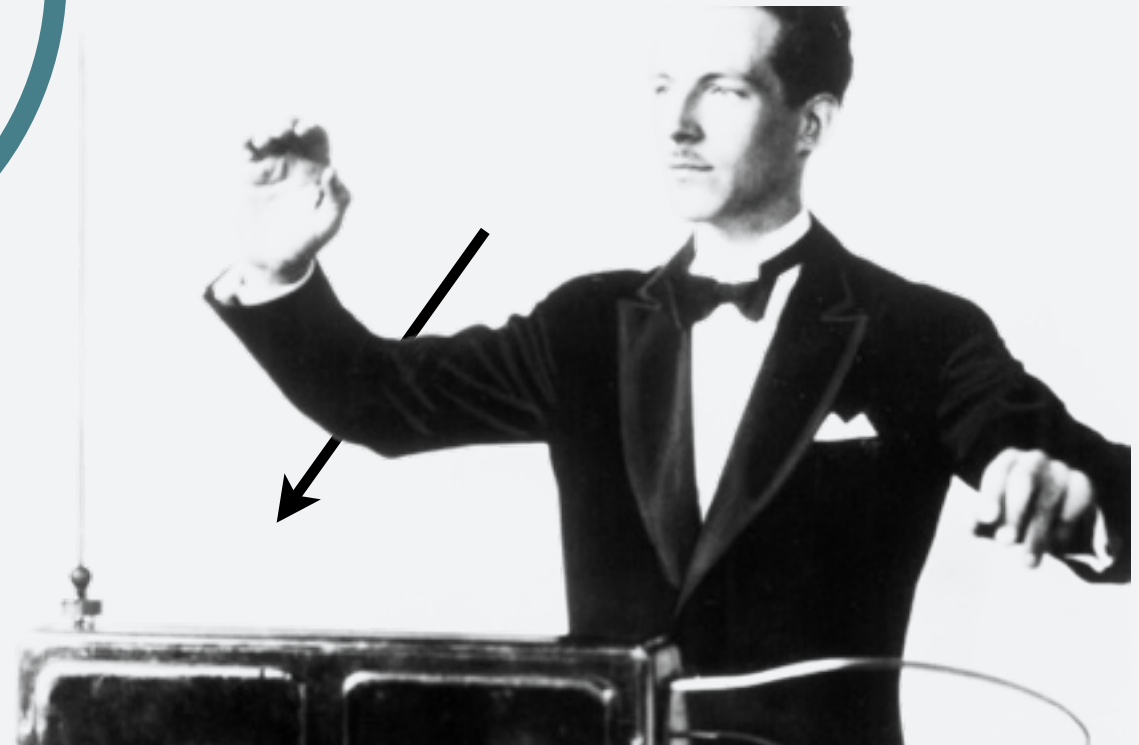
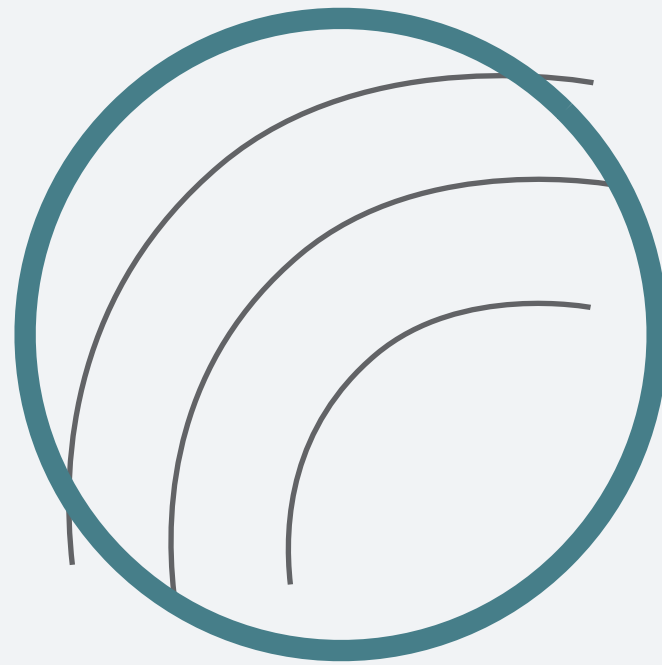
> flow: smooth transitions
> possibilities for action

SI & Walking



Sonic Interaction Design

Interacting with sound, the Theremin becomes a means, an instrument.



Sonic Interaction Design

Interacting with the Theremin, the sound becomes a means, an instrument.



SID

Product Design

Creating Identity

Audi sound design

<https://www.youtube.com/watch?v=sY7KhvdtB9I&list=PL7470479D05639FFE>



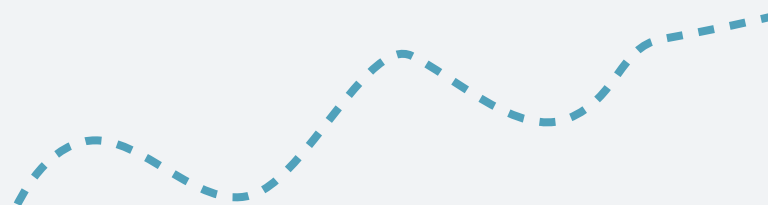
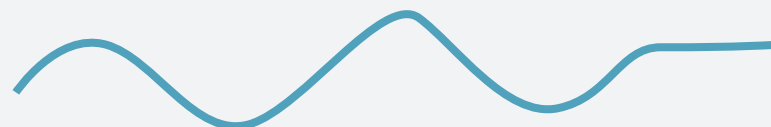
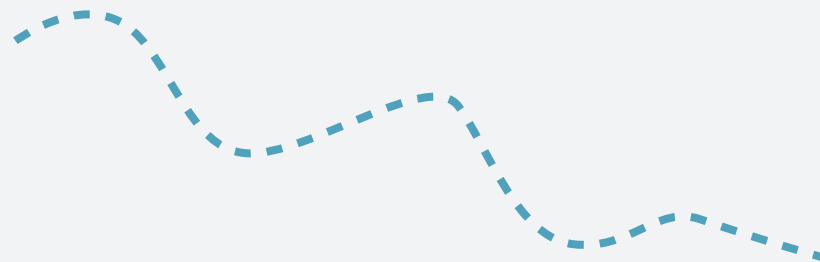
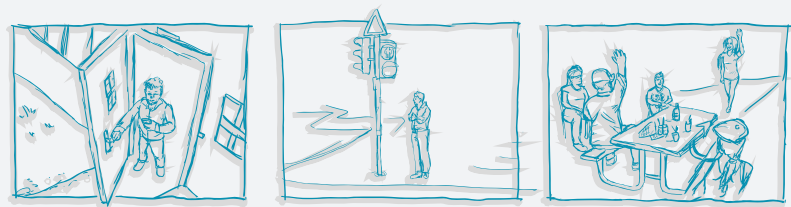
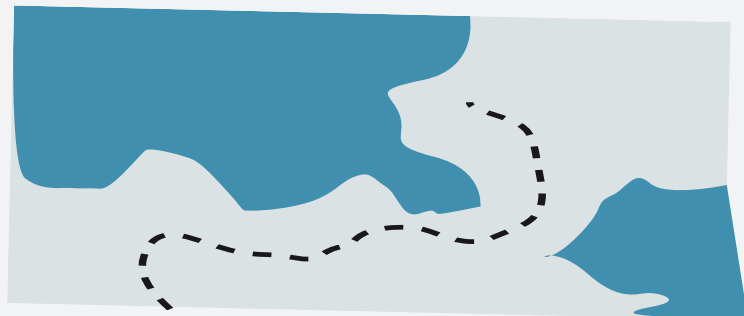
SID
Earcons

Providing Feedback

Windows XP interface design
<http://www.youtube.com/watch?v=XAZv5NHxZic>



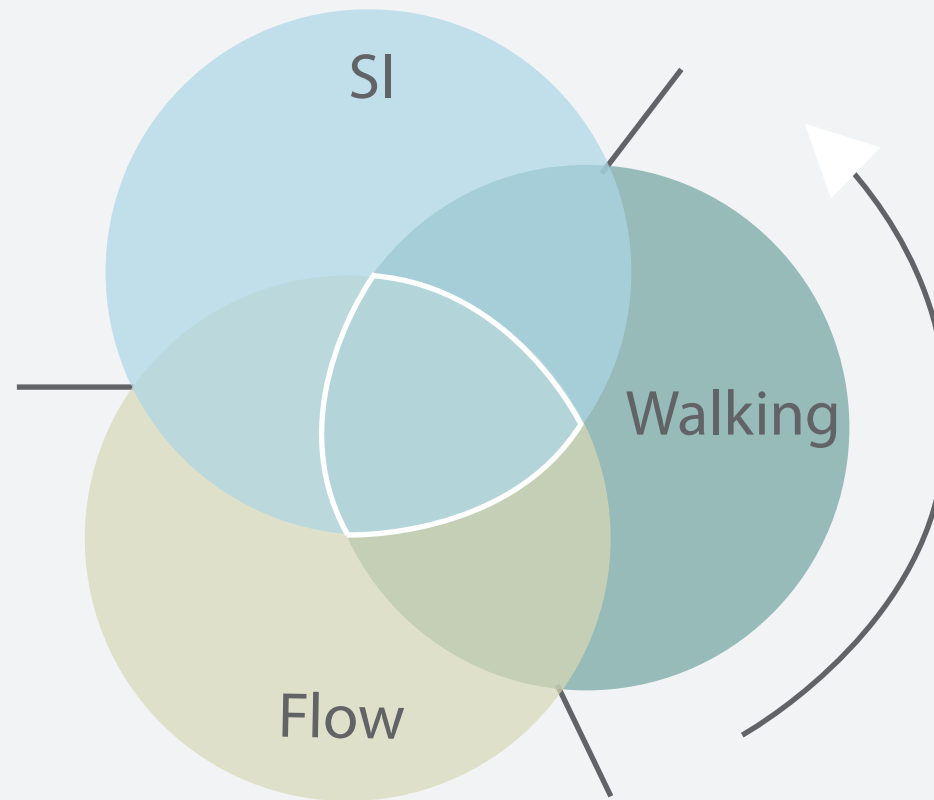
Sonic Interaction Design



SID for Walking



apply: sonic interaction to
enrich the walking
experience



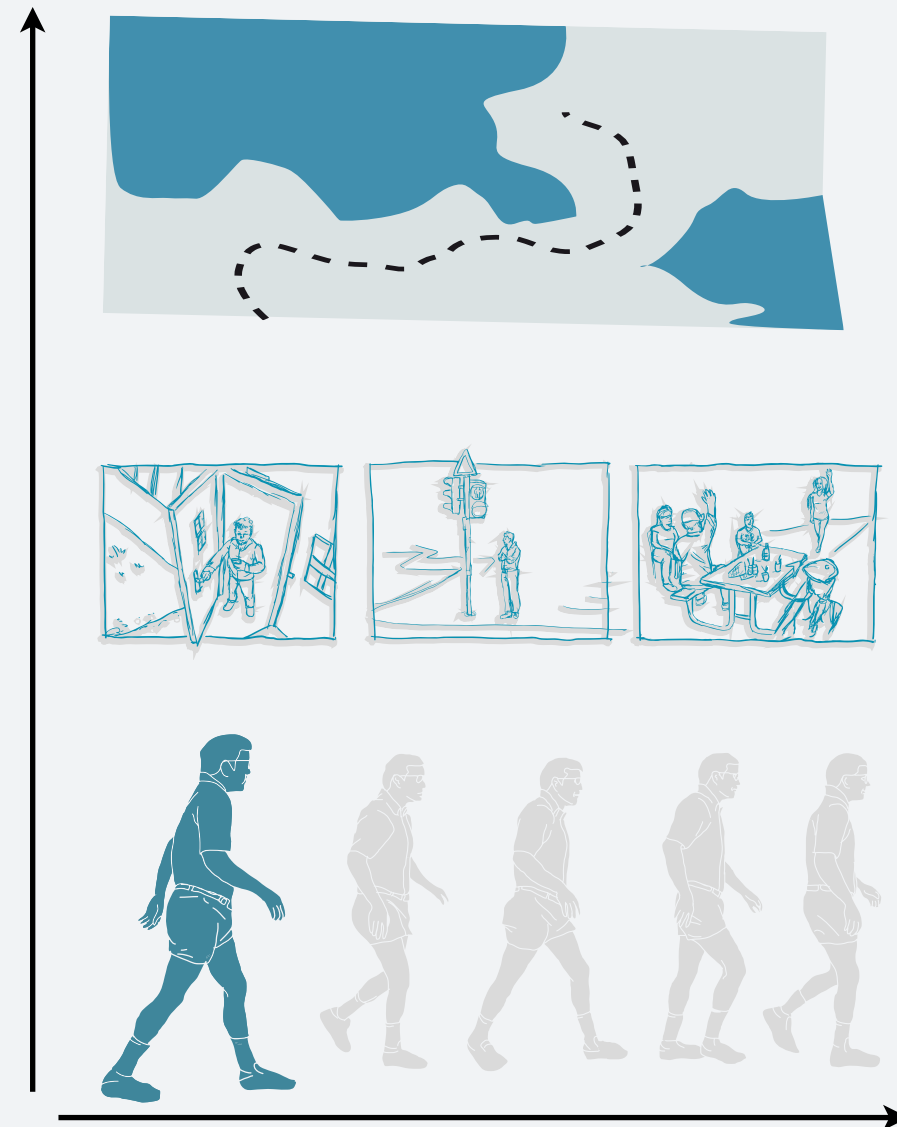
- > flow: smooth transitions
- > possibilities for action

IxD Research

Applying theoretical models and concepts in

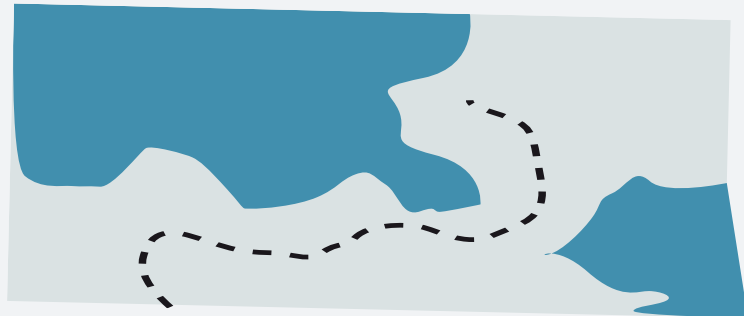


- ▶ opportunities that facilitate meaningful stories
- ▶ apply sound to unify

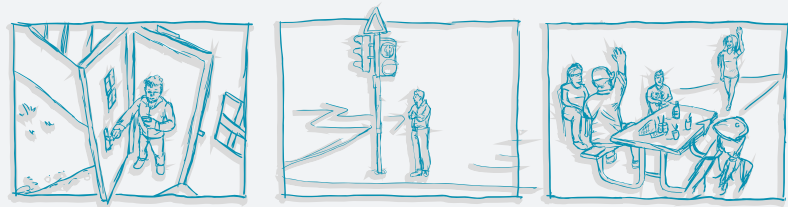


Narratives of Walking

Desmet, P. and Hassenzahl, M. *Towards Happiness: Possibility-Driven Design*. In *Human-Computer Interaction: The Agency Perspective*. Springer Berlin Heidelberg, Berlin, Heidelberg, 2012, 3–27.

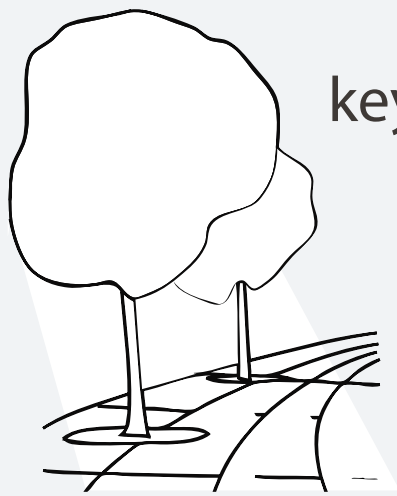


- ▶ keynote sounds
- ▶ sound signals
- ▶ soundmarks

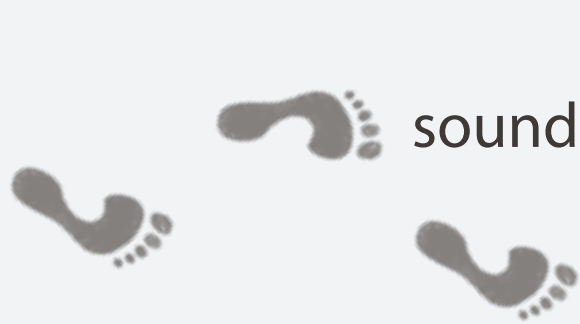
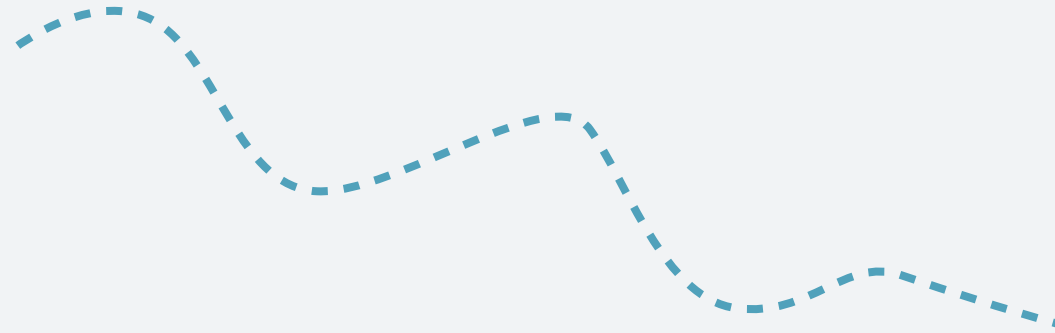


Soundscapes of Walking

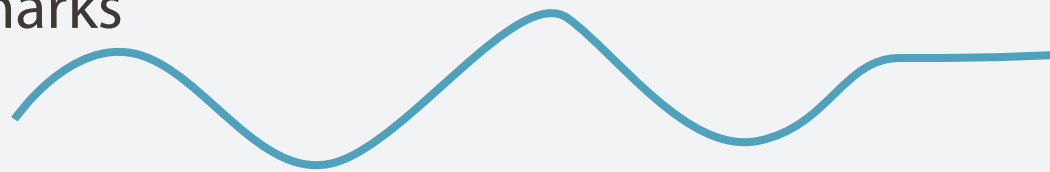
Soundscape composition & acoustic ecology: R.
Murray Schafer, Barry Truax



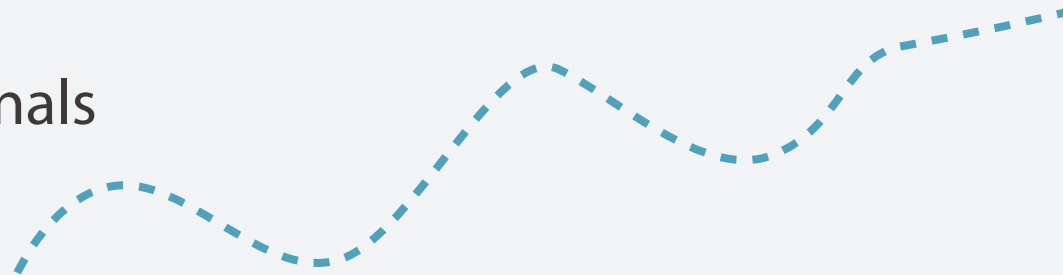
keynote sounds



soundmarks



sound signals



Soundscapes of Walking

Soundscape composition & acoustic ecology: R.
Murray Schafer, Barry Truax



First idea

prototype detects toe-off event of one leg, toe-off event of second leg is simulated.

sonification:

toe-off 1 -> kick

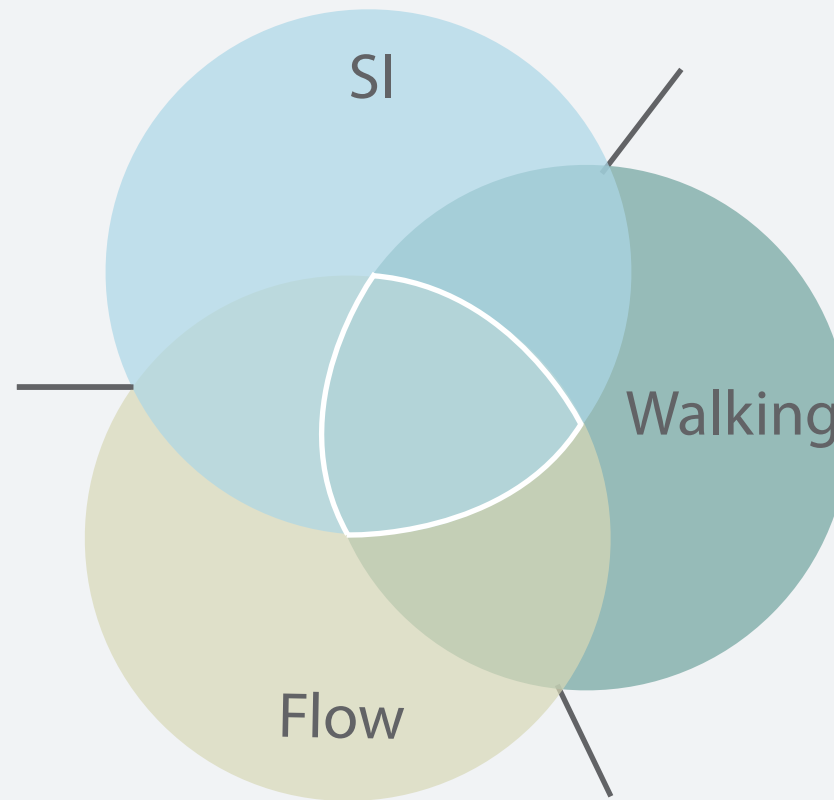
toe-off 2 -> snare

heel-strike -> hi-hat



- > seamfull design
- > simulate

sonification of walking
data



- > flow: smooth transitions
- > possibilities for action

IxD Research

Applying theoretical models and concepts in



sound texture changes walking style

Bresin et al. 2010



Sound guided actions

Hard texture -> aggressive walking style

Soft Texture -> tender walking style

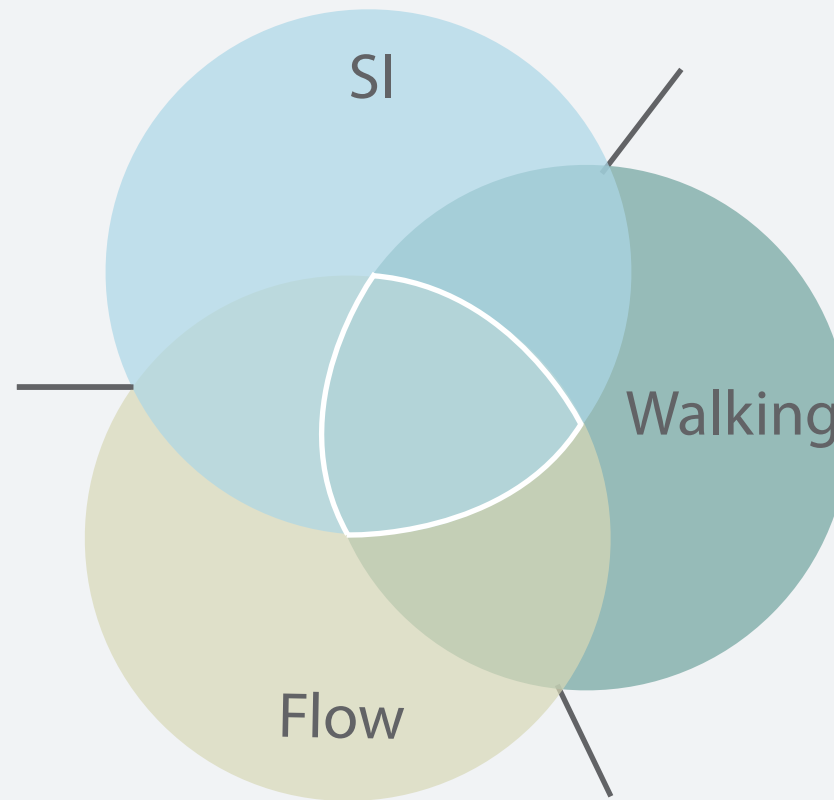
High spectral centroid -> more active style

Low spectral centroid -> less active style



> seamfull design
> simulate

sonification of walking
data



> flow: smooth transitions
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IxD Research

Applying theoretical models and concepts in



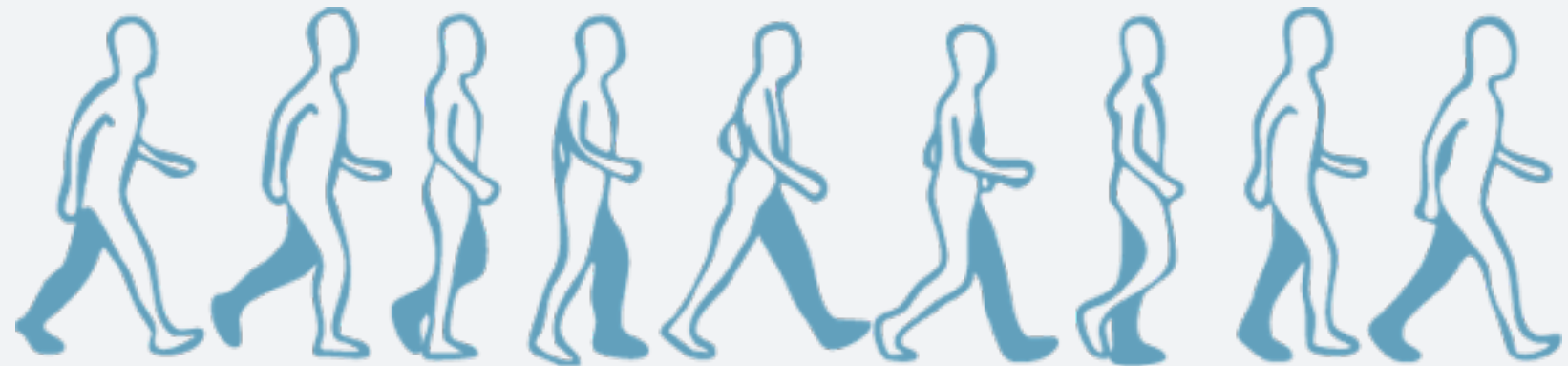
events



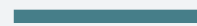
heel-strike



toe-off



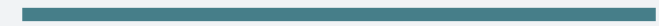
phases



stance



swing



stance

Sonified gait

objectified movement



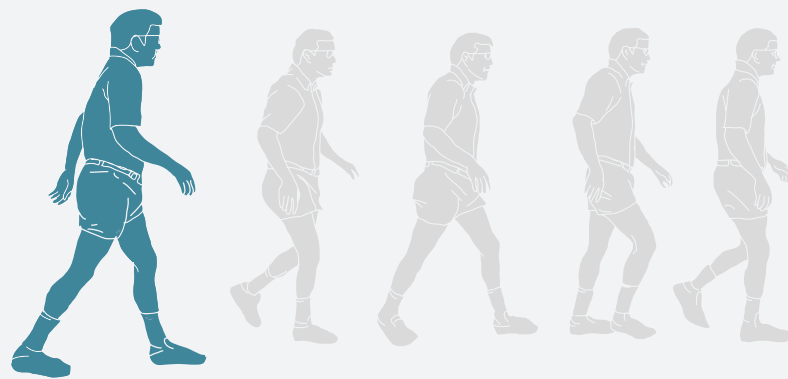
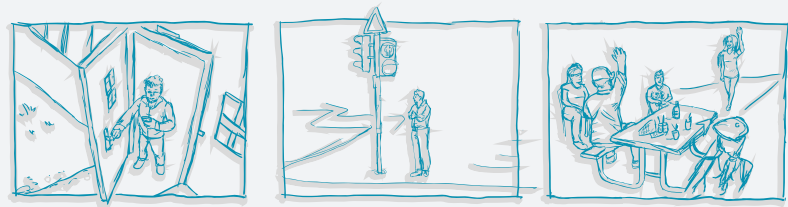
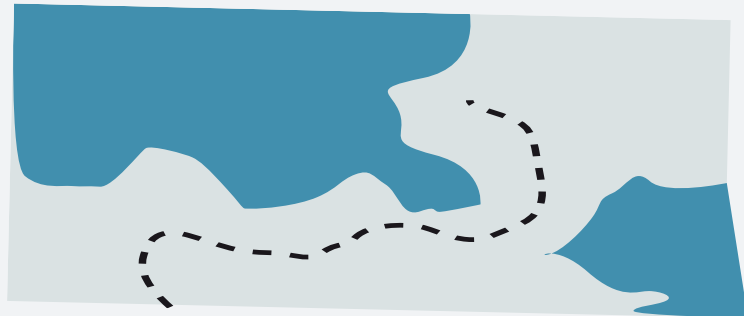
Blind spots

approach of small iterative loops

design activities not as
distinct items but rather a
network

tangible interactions: a
transforming mediation type

???



- ▶ Providing a means to facilitate meaningful stories
- ▶ Apply sound to unify
- ▶ Soundscapes

Soundscapes of Walking

Desmet, P. and Hassenzahl, M. *Towards Happiness: Possibility-Driven Design*. In Human-Computer Interaction: The Agency Perspective. Springer Berlin Heidelberg, Berlin, Heidelberg, 2012, 3–27.