Relevance and meaning: Interplay between objective and subjective

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Professori Kalervo Järvelinin 60-vuotisjuhlaseminaari 30.8.2013

information should be fully accessible for all, regardless of format, language or location

ASIS&T annual meeting award winners:
A career in information retrieval research

SIGIR Best Paper Award 2000

IR evaluation methods for retrieving highly relevant documents

Kalervo Järvelin & Jaana Kekäläinen
University of Tampere
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Tony Kent Strix Award

Winners

2012 Doug Cutting
David Hawking

2011 Alan Smeaton

2010 Michael Lynch

2009 Carol Ann Peters

2008 Kalervo Jarvelin

2007 Mats Lindquist

2006 Stella Dextre Clarke

2005 Jack Mills

Special Section

ASIS&T ANNUAL MEETING AWARD WINNERS

A Career in Information Retrieval Research

by Kalervo Järvelin

ASIS&T 2012

Editor's Note: Each year that the ASIS&T Research Award is given we invite the recipient to share his or her research goals and discoveries with *Bulletin* readers. This year's recipient is Kalervo Järvelin, professor and vice chair at the School of Information Sciences, University of Tampere, Finland. He can be reached at Kalervo.Jarvelin<at>uta.fi.

Extending IR toward CONTEXT

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(kalervo.jarvelin@uta.fi)
University of Tampere
Finland

Lab IR Tests

- IR research typically considers only *retrieval tasks* which most often are:
  - (a) purely topical
  - (b) content-only
  - (c) well-defined
  - (d) static, and
  - (e) exhaustive

This is like saying that no matter what your situation is, your needs always are purely topical, content-only, well-defined, static, and …
… True, isn't it?

Context? What?!

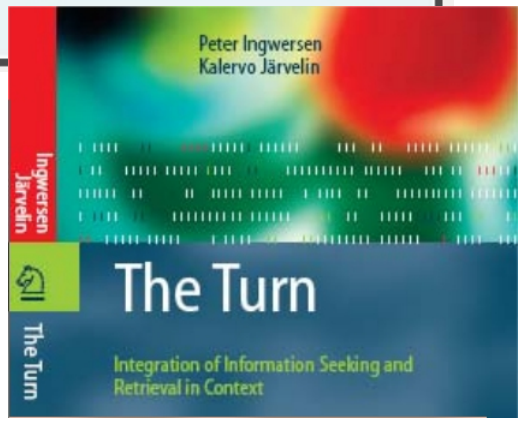
- Dervin (1997):
  - there is no term that is more often used, less often defined, and when defined defined so variously as context - it has become almost a ritualistic invocation
  - for some, context has the potential of being virtually anything that is not defined as the focus
  - for others, it is inextricable surround that denies all generalizations
  - there are endless lists of contextual factors
- This is why we hate it - it is foreign to CS!

How to model? - IR Context Dimensions

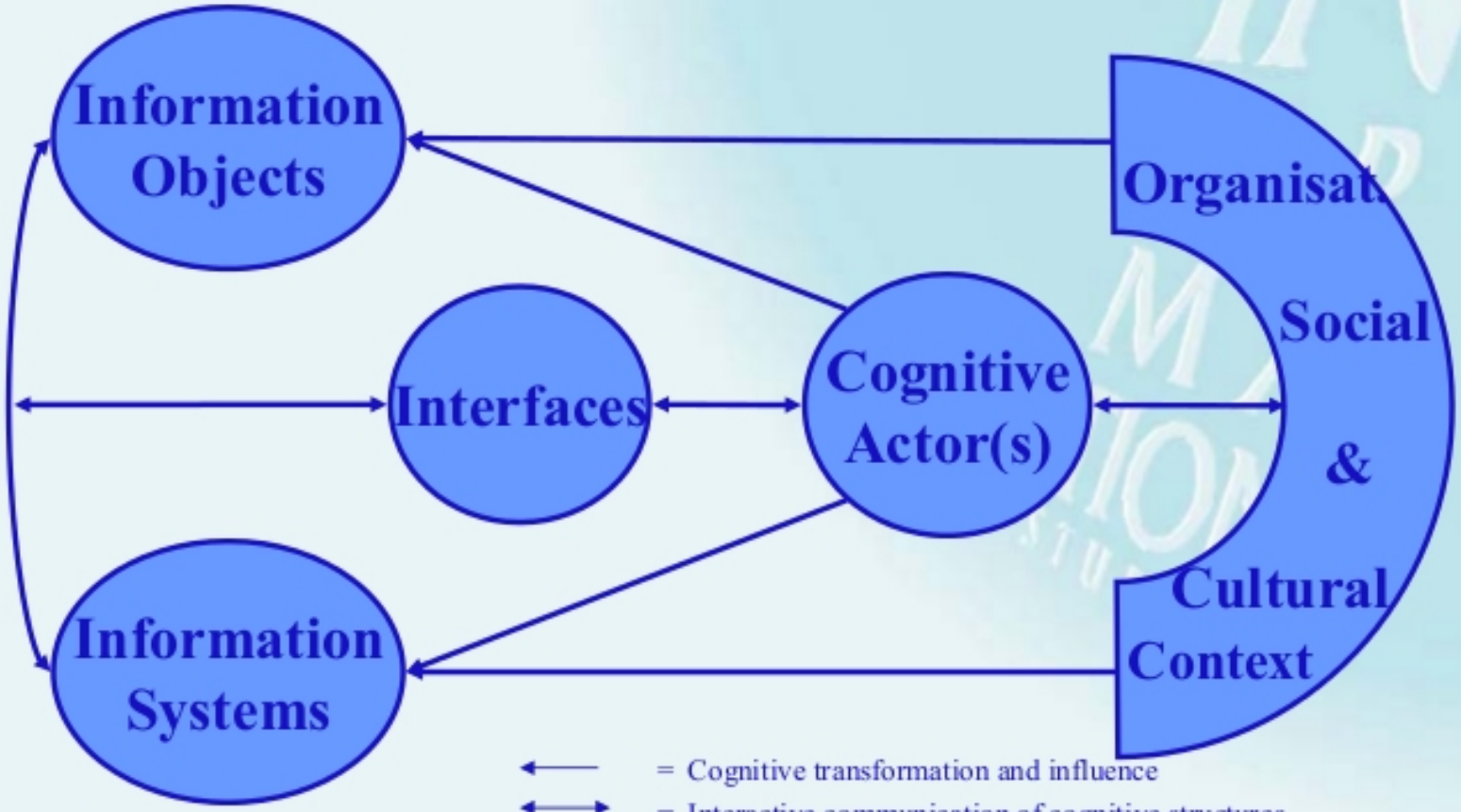
1. Work task dimension
2. Search task dimension
3. Actor dimension
4. Perceived work task dimension
5. Perceived search task
6. Document dimension
7. Algorithmic search engine dimension
8. Algorithmic interface dimension
9. Access and interaction dimension

Each dimension containing multiple variables

Much more detail in the forthcoming book by Peter&Kal



A Cognitive Model of IS&R



Kelly (2009):

Each **individual** user has
a **different** cognitive composition
and behavioral disposition.

Users **vary** according to all sorts of factors including
how much they know about particular topics,
how motivated they are to search,
how much they know about searching,
how much they know about the particular work or
search task they need to complete, [...]

People are treated

in a black box way

A side step

Learning to know Kalervo

Through WEBSOM research

Teuvo Kohonen:
Self-Organizing Map 1981

Timo Honkela:
What about maps of documents? 1991

Honkela, Kaski, Lagus, Kohonen 1996
WEBSOM

Saarikoski, J., Laurikkala, J., Järvelin, K., & Juhola, M. (2009). A study of the use of self-organising maps in information retrieval. Journal of Documentation, 65(2), 304-322.

Exploring meaning in man and machine

Information retrieval

Content analysis

Artificial and computational intelligence

Natural language processing

Cognitive science

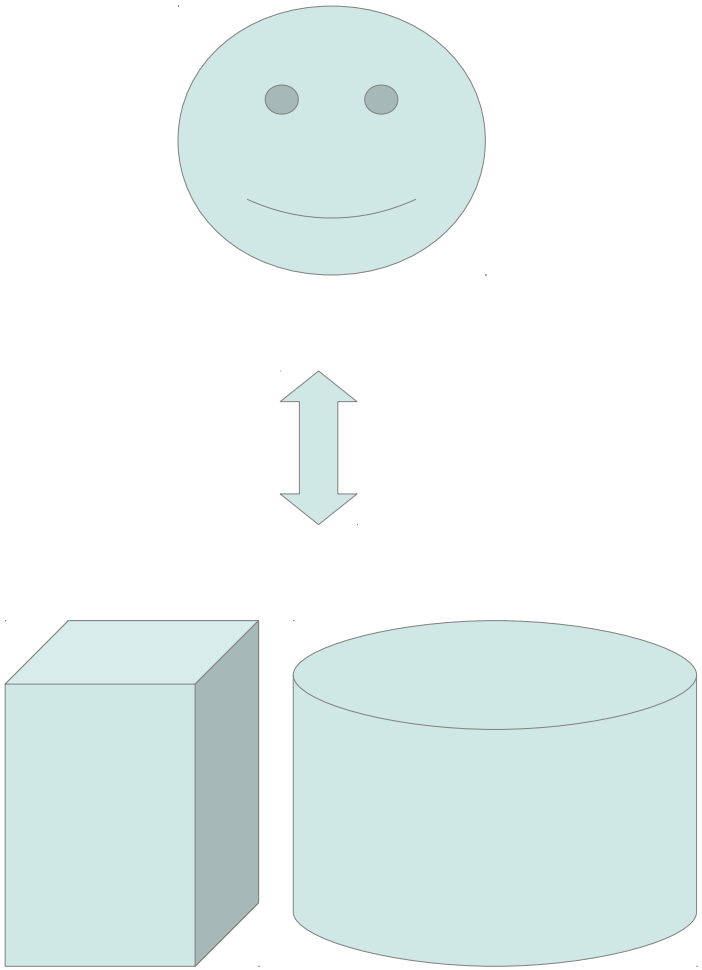
Linguistics

Cognitive linguistics

Philosophy

Social sciences

Information processing in humans and machines

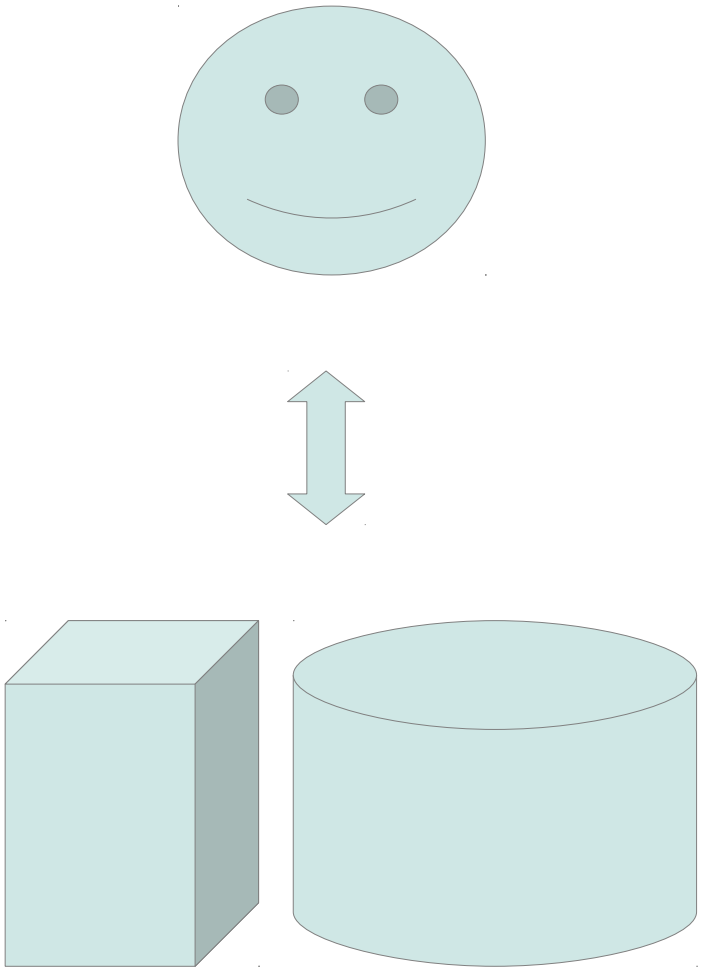


Relevance judgment
Information interpretation
Contextualization
Learning

Storage and retrieval tools

Digital content

Information processing in humans and machines



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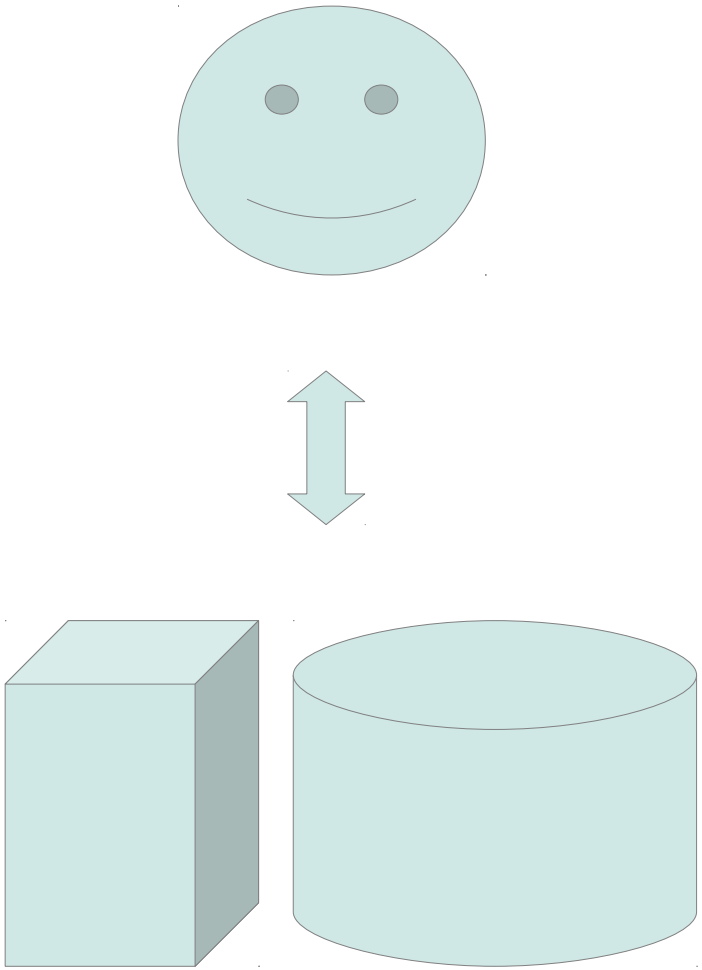


Relevance judgment

Information interpretation

Contextualization

Learning

Machine learning
Pattern recognition
Cognitive systems with perception-action loops
> Semiotically competent autonomous systems

Steps towards human-like content analysis

Example of Multimedia Content Analysis

Acknowledgement: Jorma Laaksonen and Mikko Kurimo
with their research teams at Aalto University

Example of Multimedia Content Analysis

Speech-to-text

Video content (context) classification

Speaker recognition

Optical character recognition

Acknowledgement: Jorma Laaksonen and Mikko Kurimo with their research teams at Aalto University

Being-in-the-world: Perception and Movement

Why brains?

- What are the central differences between plants and animals?

  “The original need for a nervous system was to coordinate **movement**, so an organism could go find food, instead of waiting for the food to come to it.” http://www.fi.edu/learn/brain/

- An extreme example: A sea squirt transforms from an “animal” to a “plant”. It absorbs its own cerebral ganglion that it used to swim about and find its attachment place.

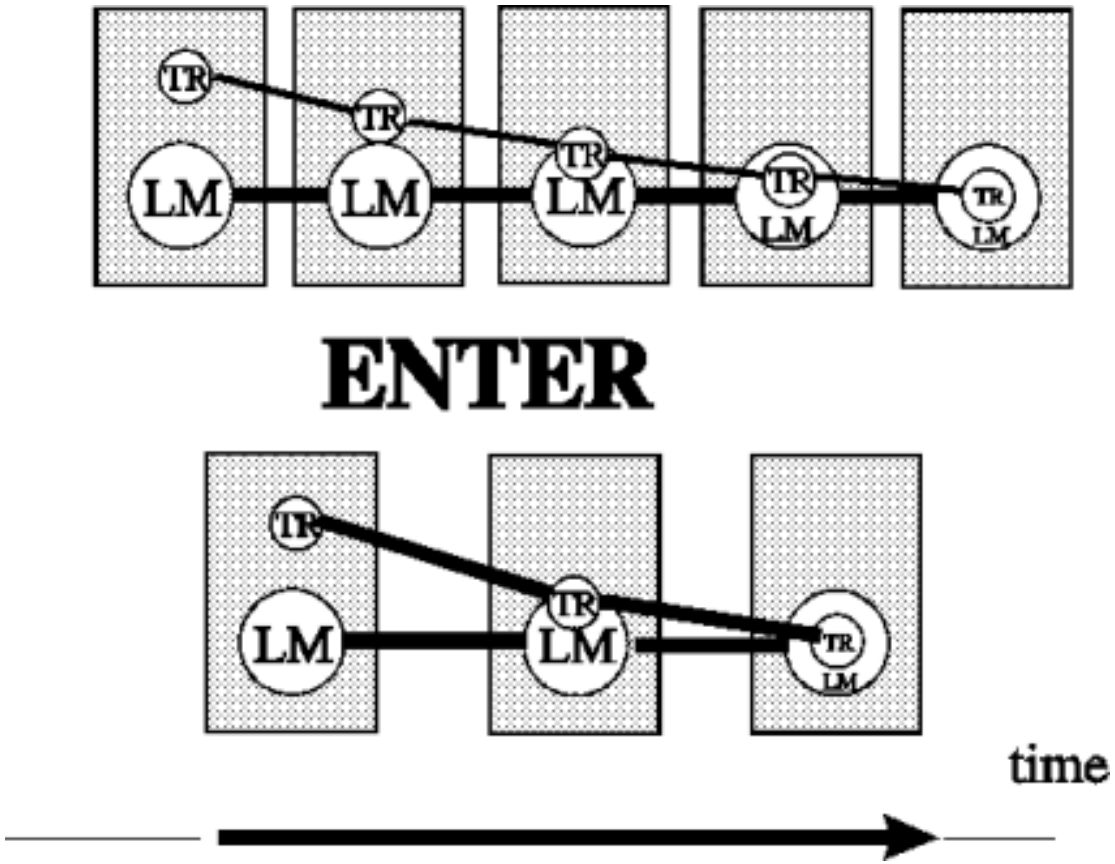
http://goodheartextremescience.wordpress.com/2010/01/27/meet-the-creature-that-eats-its-own-brain/

Point of view from cognitive linguistics

Aalto University

- The meaning of linguistic symbols in the mind of the language users derives from the users' sensory perceptions, their actions with the world and with each other.
- For example: the meaning of the word 'walk' involves
  - what walking looks like
  - what it feels like to walk and after having walked
  - how the world looks when walking
    (e.g. objects approach at a certain speed, etc.).
  - ...

Abstract vs concrete grounding



Ronald Langacker

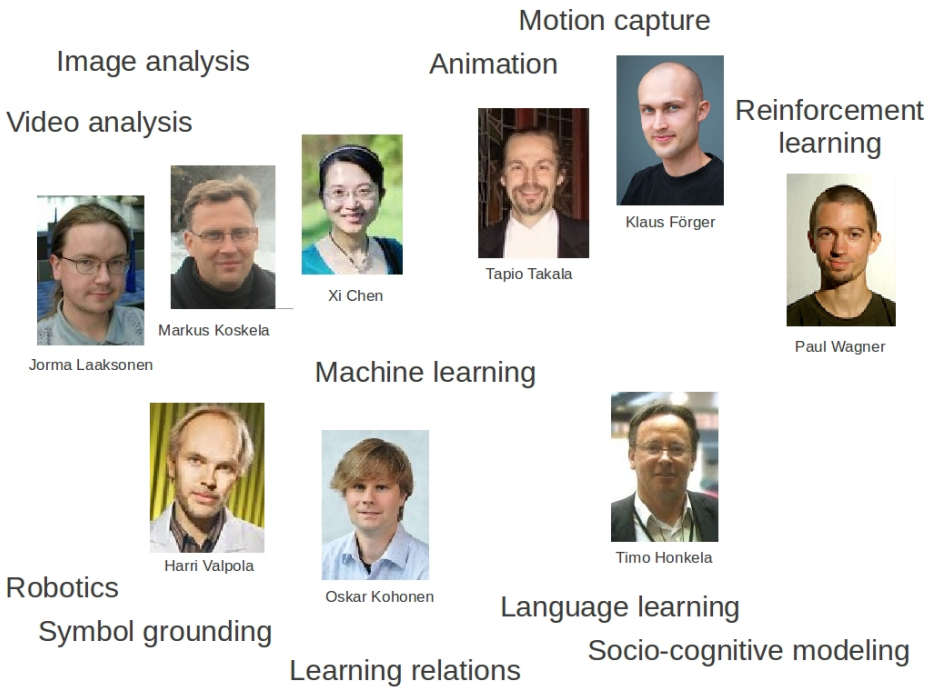
Multimodally Grounded Language Technology

A project funded by Academy of Finland 2011-2014

A collaboration between departments of

* Information and Computer Science, and

* Media Technology



Labeling movements

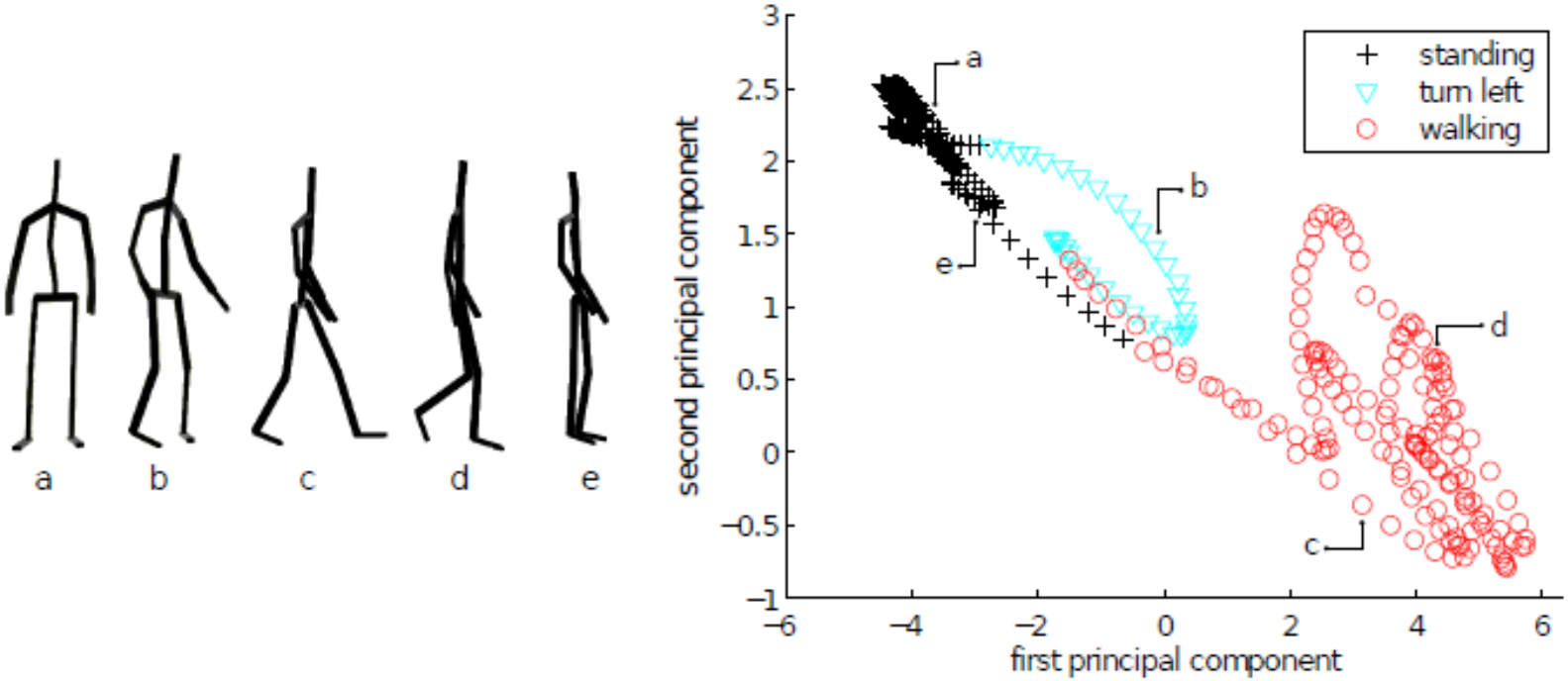


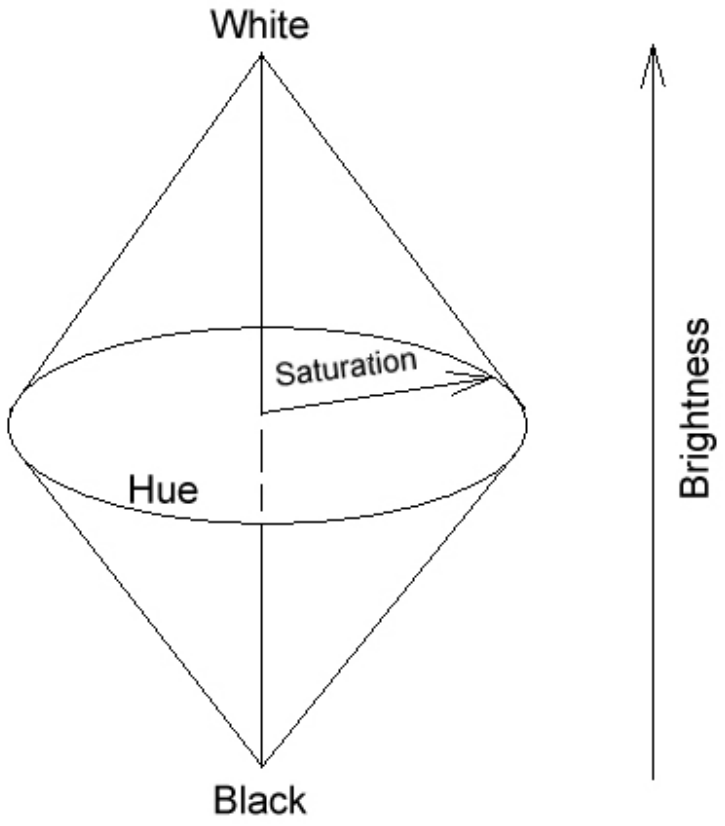
Fig. 11 Motion of a character standing (a), turning (b), walking (c, d) and again standing (e) as stick figures (left) and the trajectory formed by the frames on plotted on the first and second principal component (right).

Honkela & Förger (2013), in print

Contextuality and Subjectivity of Understanding

Meaning is contextual

red wine
red skin
red shirt



- Gärdenfors: Conceptual Spaces
- Hardin: Color for Philosophers

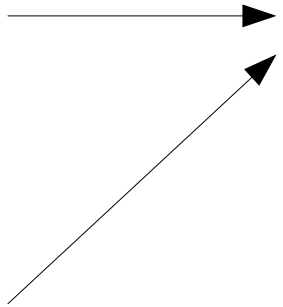
Meaning is contextual

WHITE

SNOW - WHITE?

Meaning is contextual

- “Small”, “big”
- “White house”
- “Get”
- “Every” - “Every Swede is tall/blond”
- etc. etc.



Fuzziness

Another comment:

Strict compositionality
cannot be assumed

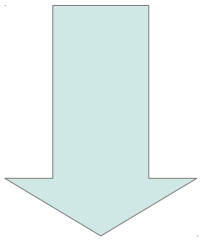
Learning meaning from context

- Self-Organizing Semantic Maps
- Latent Semantic Analysis
- Latent Dirichlet Allocation
- WordICA
- etc. etc.

Meaning is subjective

Meaning is subjective

- Good
- Fair
- Useful
- Scientific
- Democratic
- Sustainable
- etc.



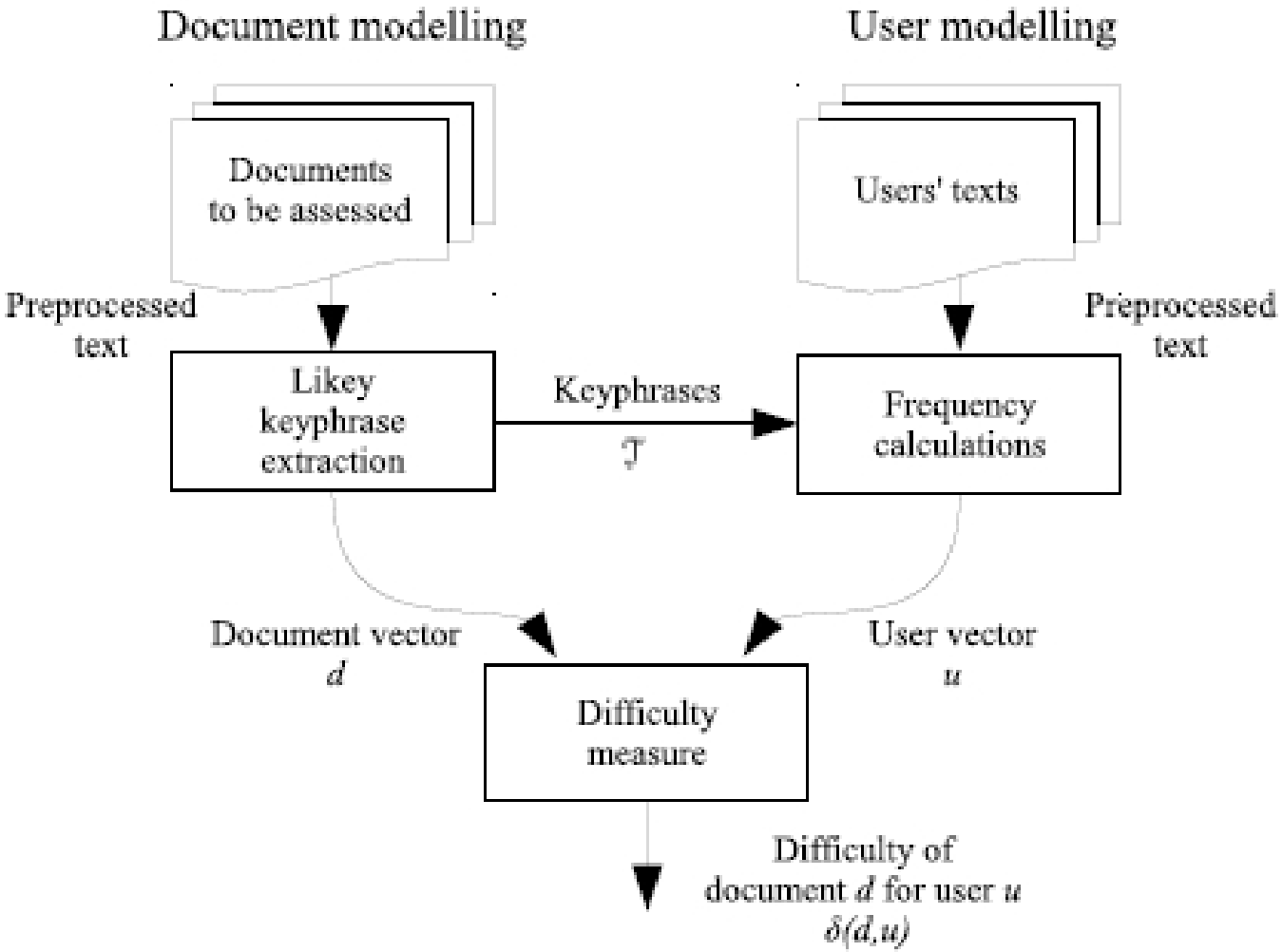
A proper theory of meaning has to take this into account

Measuring Subjectivity of Understanding

User-specific difficulty assessment

Basic architecture of the method

User-specific difficulty assessment



Paukkeri, Ollikainen & Honkela, Information Processing & Management, 2013.

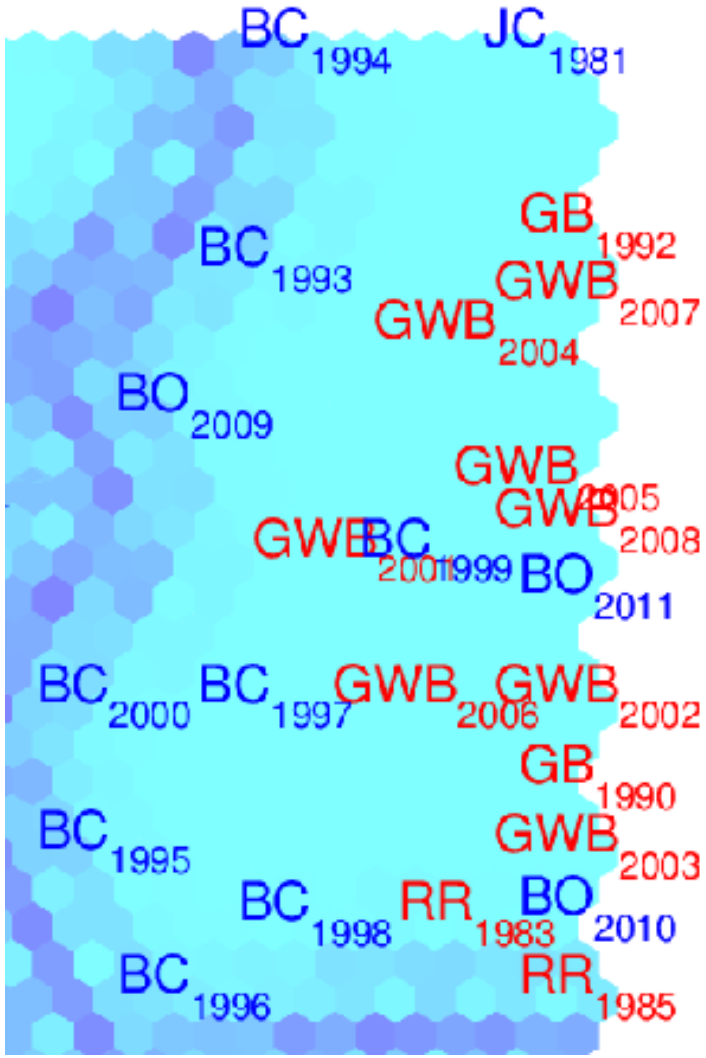
GICA:

Grounded
Intersubjective
Concept
Analysis

Case: State of the Union Addresses

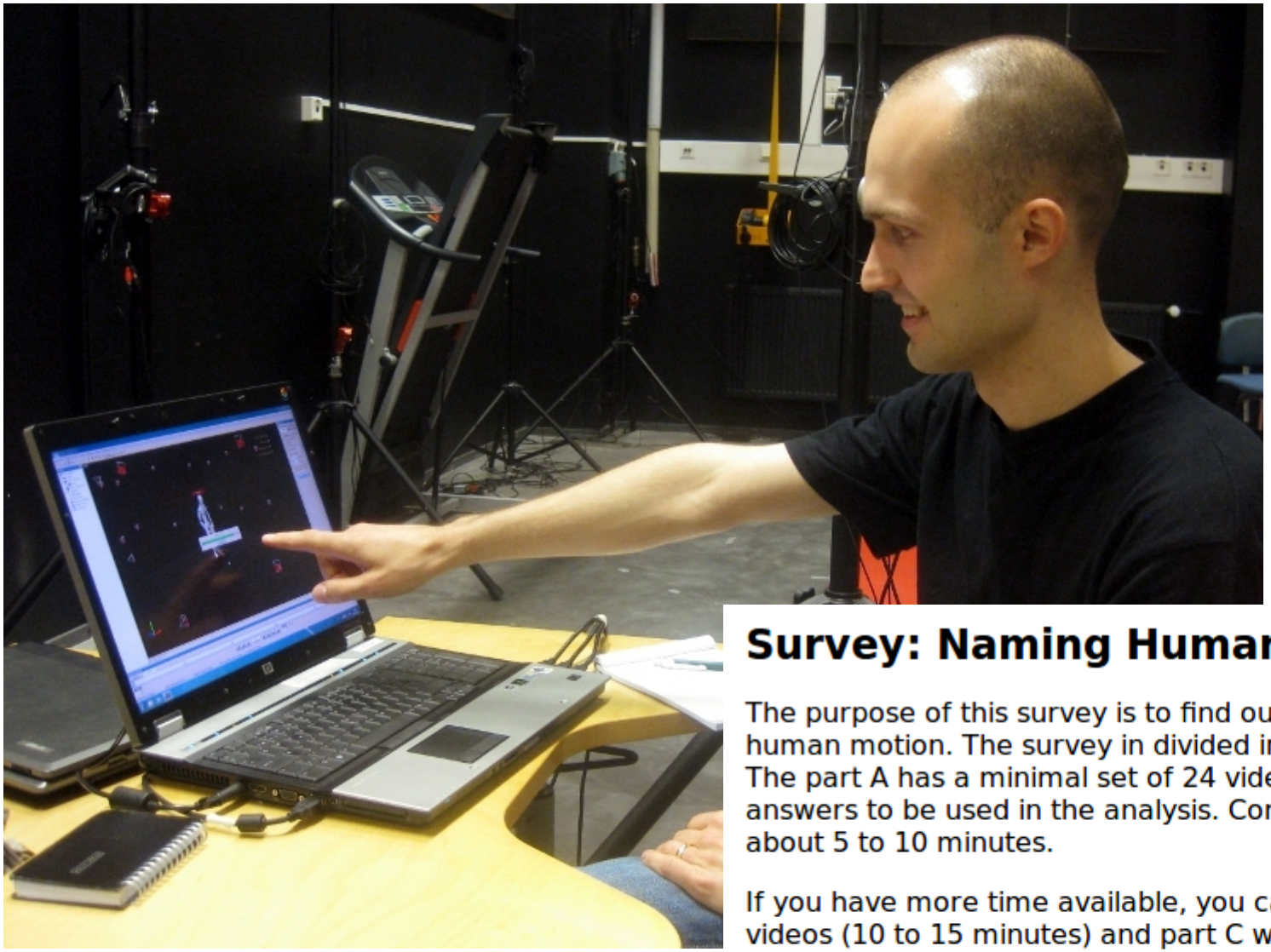
- Text mining is used in populating a Subject-Object-Context tensor
- This took place by calculating the frequencies on how often a subject uses an object word in the context of a context word
  - Context window of 30 words

Analysis of the word 'health'



JC	Jimmy Carter
RR	Ronald Reagan
GB	George Bush
BC	Bill Clinton
GWB	George W. Bush
BO	Barack Obama

Movement and Subjectivity



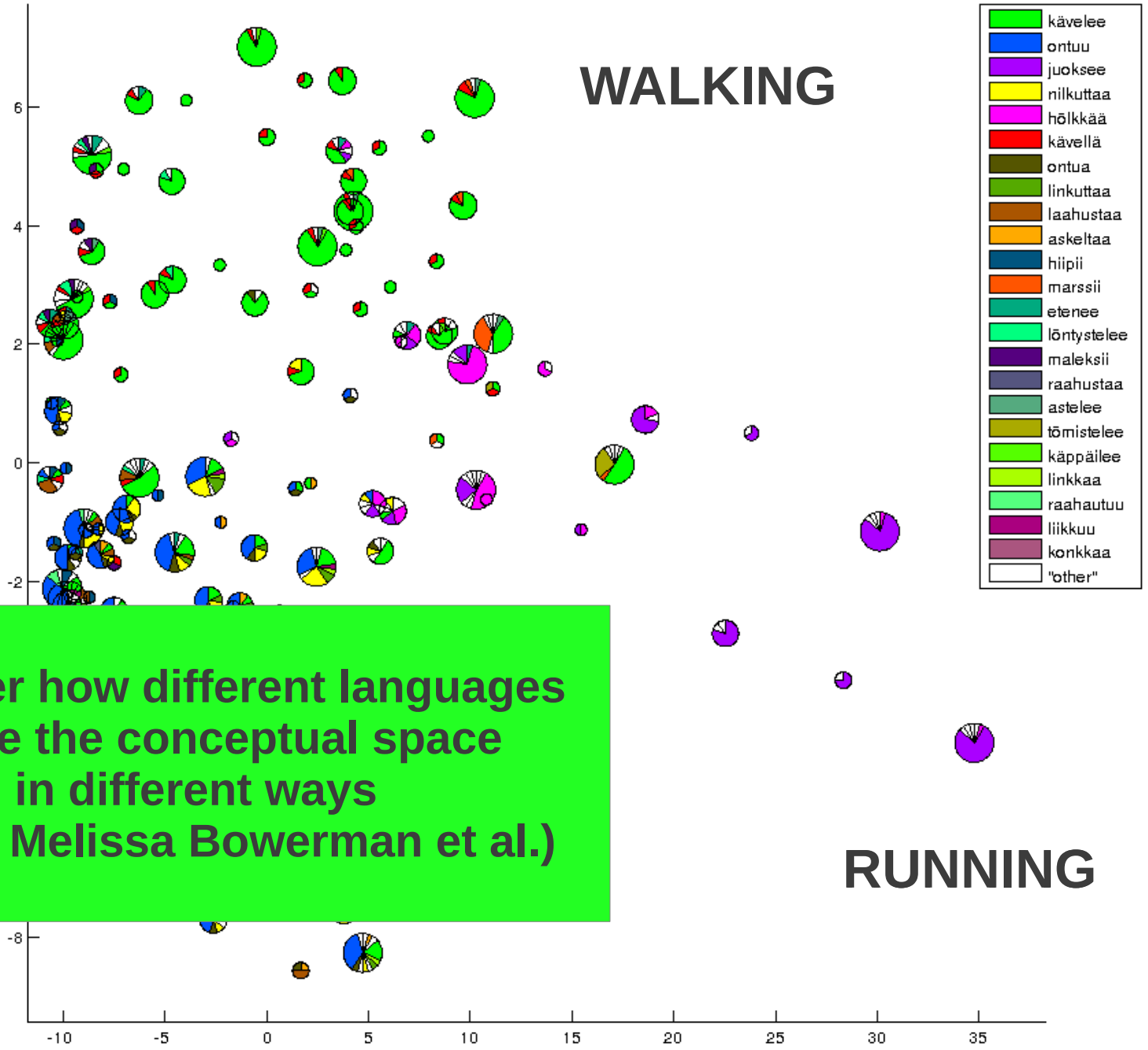
Survey: Naming Human Movement

The purpose of this survey is to find out how people describe human motion. The survey in divided in to three parts A, B and C. The part A has a minimal set of 24 videos that enables your answers to be used in the analysis. Completing the part A will take about 5 to 10 minutes.

If you have more time available, you can continue to part B with 40 videos (10 to 15 minutes) and part C with 60 videos (15 to 20 minutes). Answering only to the part A is already valuable to the research, but we hope that you would also consider answering the parts B and C.

First you are asked to fill in a background questionnaire. Then the task is to watch a moving character in a set of videos and to write a verb and optionally some adjectives that describes the seen motion.

goo.gl / UZnvH



Consider how different languages divide the conceptual space in different ways (cf. e.g. Melissa Bowerman et al.)

Klaus Förger & Timo Honkela, unpublished results

Machines more like humans – why?

- Developing better and better tools
  to share and benefit from human knowledge and understanding
- Alleviating the need for people and organizations to act like machines
- Increasing understanding of individuals and communities through modeling and simulating complex systems
  - Dealing with the inherent complexity of the research topics in humanities

information should be fully accessible for all, regardless of format, language or location

Thank you!

Merci!

Kiitos!

Tack!

¡Gracias!

ありがとう

Danke schön!

Onneksi olkoon ja lämmin kiitos kaikesta Kalervo!