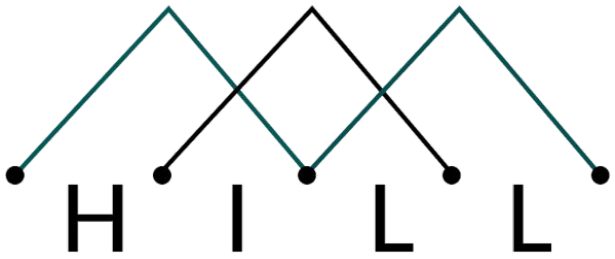
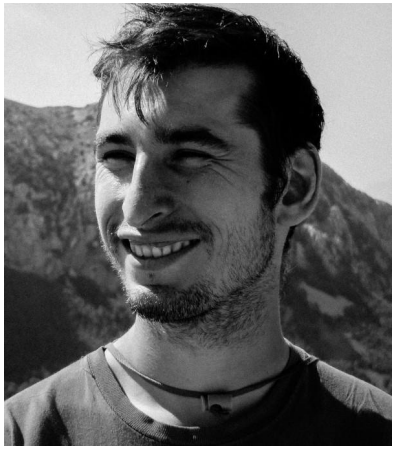


Human Interactivity & Language Lab

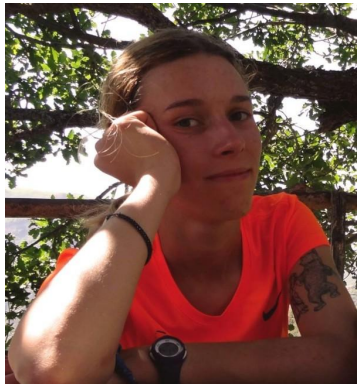
Joanna Rączaszek-Leonardi, Julian Zubek,
Konrad Zieliński, Natalia Klamann

5/11/2019

What is the role of research lab?








Foster collaboration between diverse individuals with common understanding of cognitive systems. Our lab gathers people interested in the importance of interactivity for human cognition

Manifesto

Cognition is system's adaptation to environment.

Communication regulates interaction creating functional (distributed) systems.

We study physical, situated, embodied and value-laden interactions of people with each other and with the world.

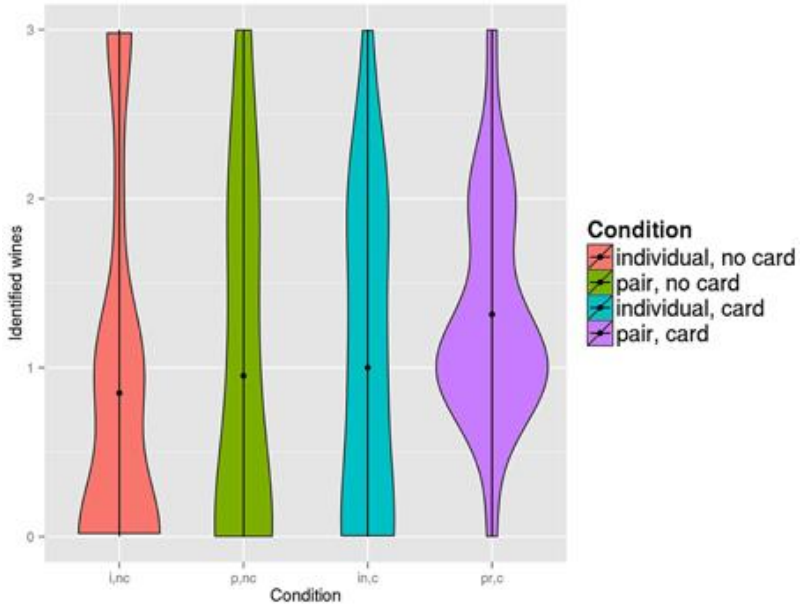
Current projects (* marks advancement)

- Collective wine drinking ***
- Ecological models of categorization *
- Early semantic development ***
- Parent-child coordination & social cognition **
- Uhura: enriching communication of larynx amputees *
- Symbol “un-grounding” models *

Projects and datasets

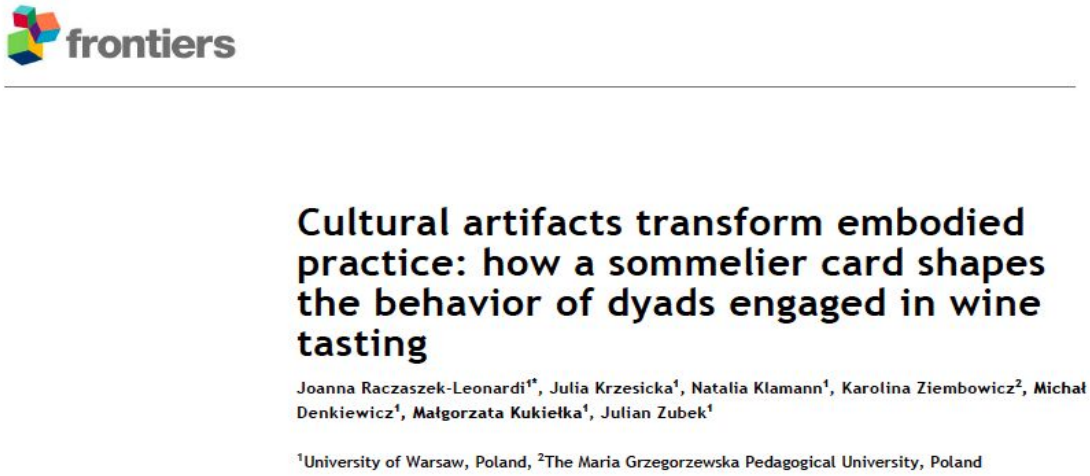
Collective wine drinking

- Results of wine recognition in four conditions.
  - individual vs dyad, with or without sommelier card
- Collection of video recordings of dyads drinking wine.
- Dialogues transcriptions.
- Coded utterances categories.
- Coded behavioral categories.
- Quantified movement activity.

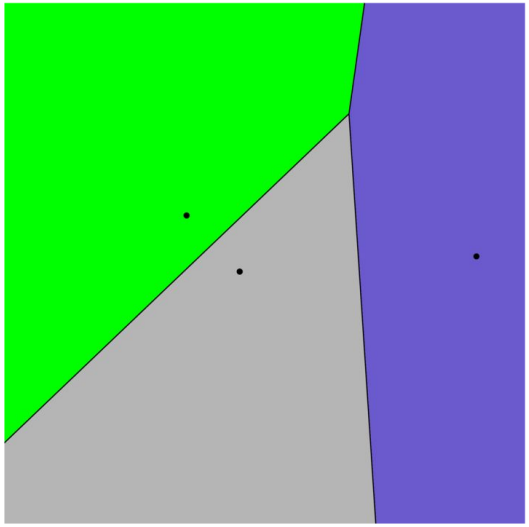


Collective wine drinking

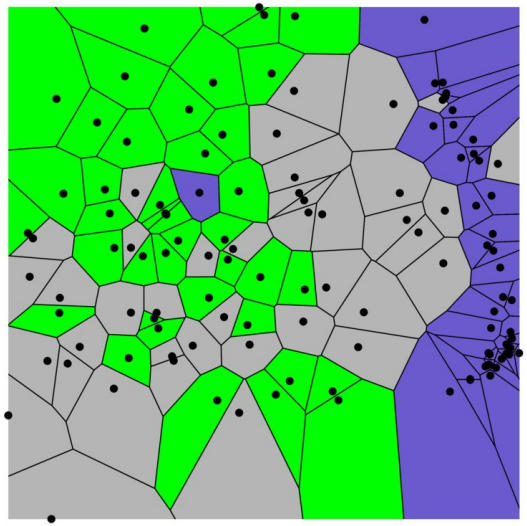
- Phase II began as a student project of Julia Krzesicka and Natalia Klamann.
  - Fresh research questions ("agency of things") and theoretical perspective (anthropological) met existing data.
  - Results presented at 2nd Symposium on Embodied Interaction: "Gesture, Touch and Embodied Meaning-Making", June 26-27 2018, Odense, Denmark.
  - Manuscript submitted for publication (during second round of reviews).



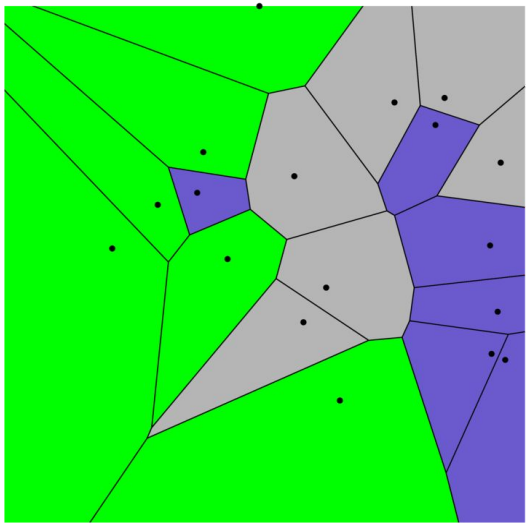
Ecological models of categorization



Prototype model



Exemplar model

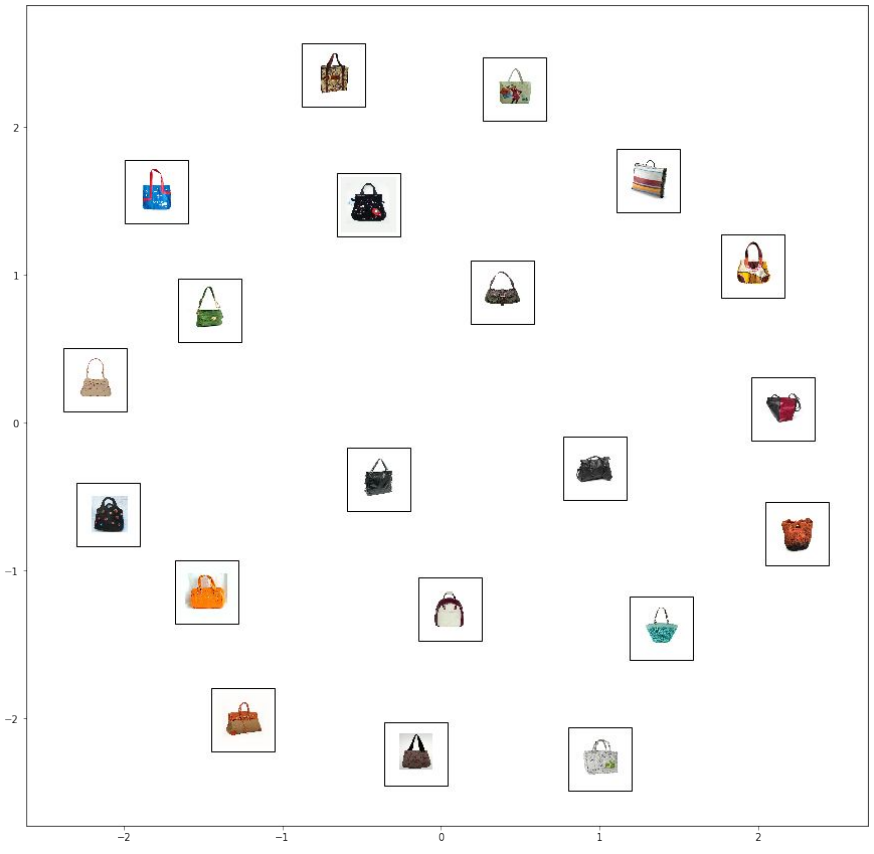


Adaptive model

Which objects from category are taken as reference?

- Typical?
- Surprising?
- Evenly spaced?

Ecological models of categorization

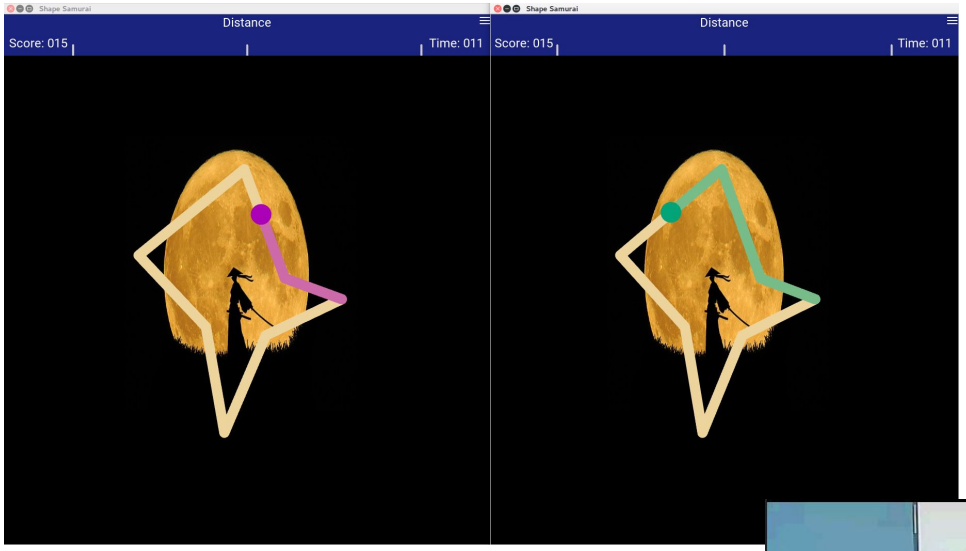


Data:
Perceptual similarity spaces of realistic objects (clothes, accessories, etc.).

Questions:

- Contextual complexity of categories?
- Experience shaping categories?
- Task-dependent categories?
- Individual preferences?

Parent-child coordination & social cognition



Shape Samurai: coordination game played on tablets

- Players trace particular shapes.
- They have to trace their shapes simultaneously.
- Shapes may be identical or different.

Labyrinth: coordinative puzzle made from ecological materials

- Natural play of child and parent.
- Rich interaction context.
- How movement coordination and social coordination are related?

The Uhura Project

The aim of the project is to study interactions of larynx amputees in order to find a way to enrich the rehabilitation process and to better understand their communication.

We also investigate how wearable technologies and artificial intelligence could be used in a way that not replace, but support and augment natural human intelligence.

Uhura Research: field studies

We are about to finish our ethnographic research. Case study of 9 laryngectomees consists of observation, individual in-depth interviews and shadowing sessions.

The results of this research changed our perspective from studying the voice loss only to studying the whole interaction and reminded us of the importance of the body as well.

Uhura Research: interaction tests

We work on a process that will provide patients with the more aware and data-driven way of choosing their method(s) of communication to enrich the speech rehabilitation with it s multimodal, personalized and context-dependent aspects.

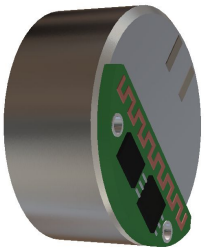
1) choose of situations which quality are the most important predictors of one's overall quality of life,
2) observation and recording in natural environment,
3) measurement: laryngectomee and interlocutor(s) satisfaction,
4) participatory design recommendations.

We are **looking for 1-2 students** interested in experimental psychology and/or user experience research.

Uhura Technologies: wearable audio interface

We're going to start a project of our own system, convenient for laryngectomees, consisting of a microphone, a speaker, an amplifier and (optionally) a tiny earbud for listeners.

We are **looking for 1-2 students** with technical or engineering background and/or interested in user experience design of physical interfaces.

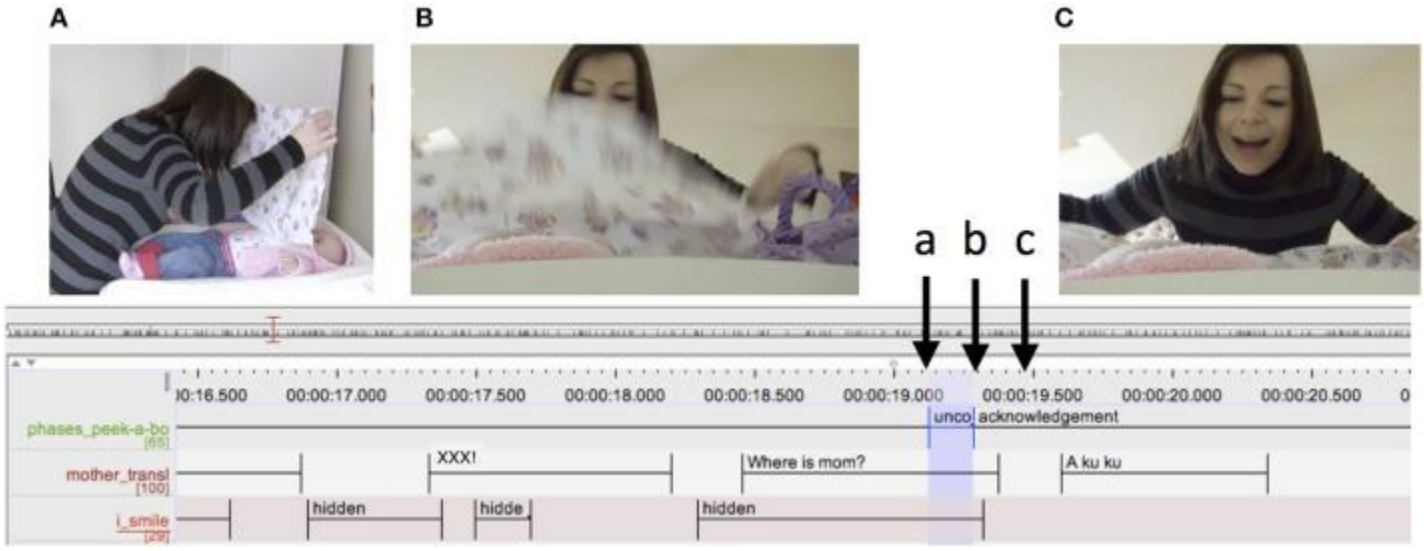


Early semantic development

- NCN-DFG Beethoven 1 (with Katharina Rolfing and Iris Nomikou, Paderborn, Portsmouth).
- Two video corpuses (parent-infant interactions: diaper changing, peekaboo).
- Qualitative & quantitative analyses (behavioral coding, movement analyses, dynamical time series).
- Goal: language emergence in interaction, as coordination tool.

Early semantic development (continuation)

- Early dialogicity development.
- Is mother talking to infant “in dialogue” or “in monologue”?
- Transcription of mother’s speech & infant’s vocalizations (current research labs K1 & K2) --?> CLARIN_pl



Symbol “un-grounding” models

- Symbol grounding problem: how abstract symbols get their meaning? (Harnad, 1990)
- Symbol un-grounding problem: how physical signals being a part of real-time interactions can ever become abstract?

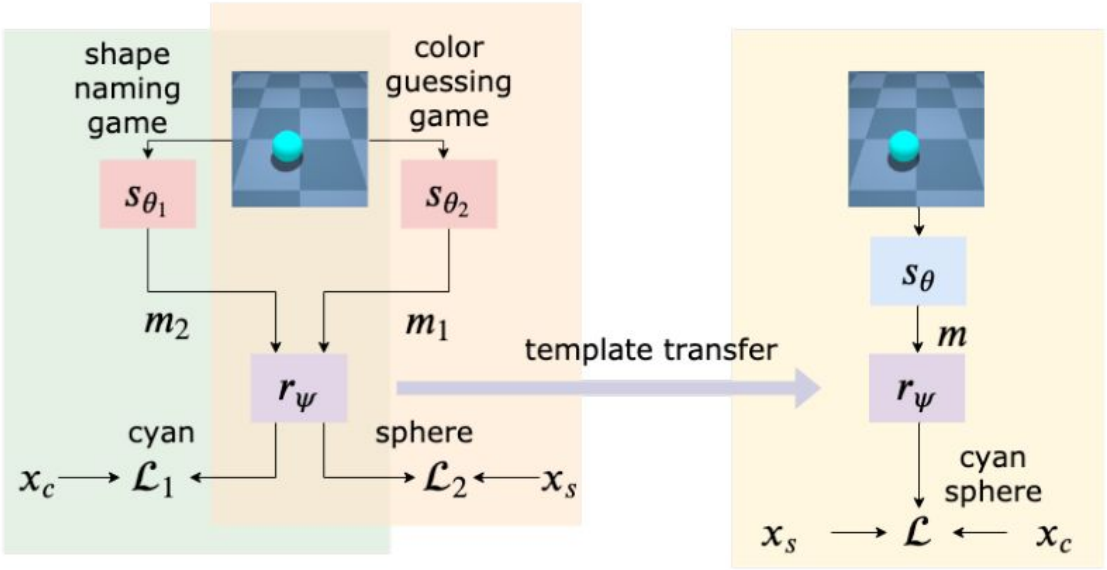
Classic C.S. Peirce’s semiotic framework:

- Icons – meaning based on similarity
- Indices – meaning based on co-occurrence
- Symbols – meaning based on…?

Modern language development theory by T. Deacon.

Symbol “un-grounding” models

- We are building computational models illustrating symbol emergence.
- Mostly interested in social dynamics of coordinated joint-action (using agent-based models).

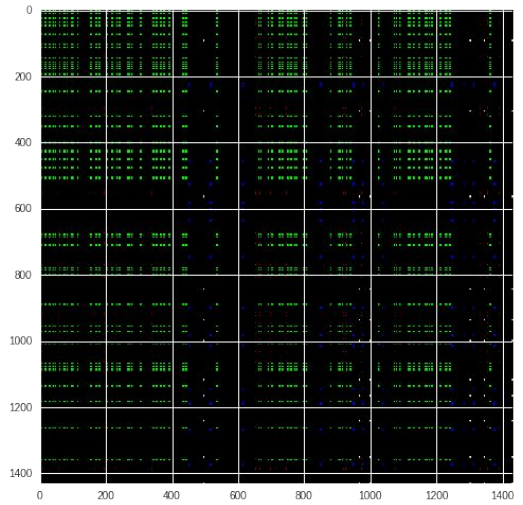


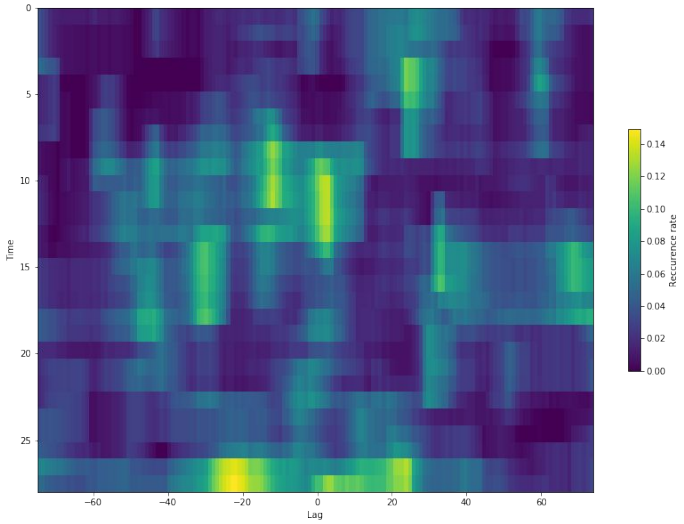
Developmentally motivated emergence of compositional communication via template transfer. Tomasz Korbak, Julian Zubek, Łukasz Kuciński, Piotr Miłoś, Joanna Rączaszek-Leonardi.

Tools, techniques, opportunities

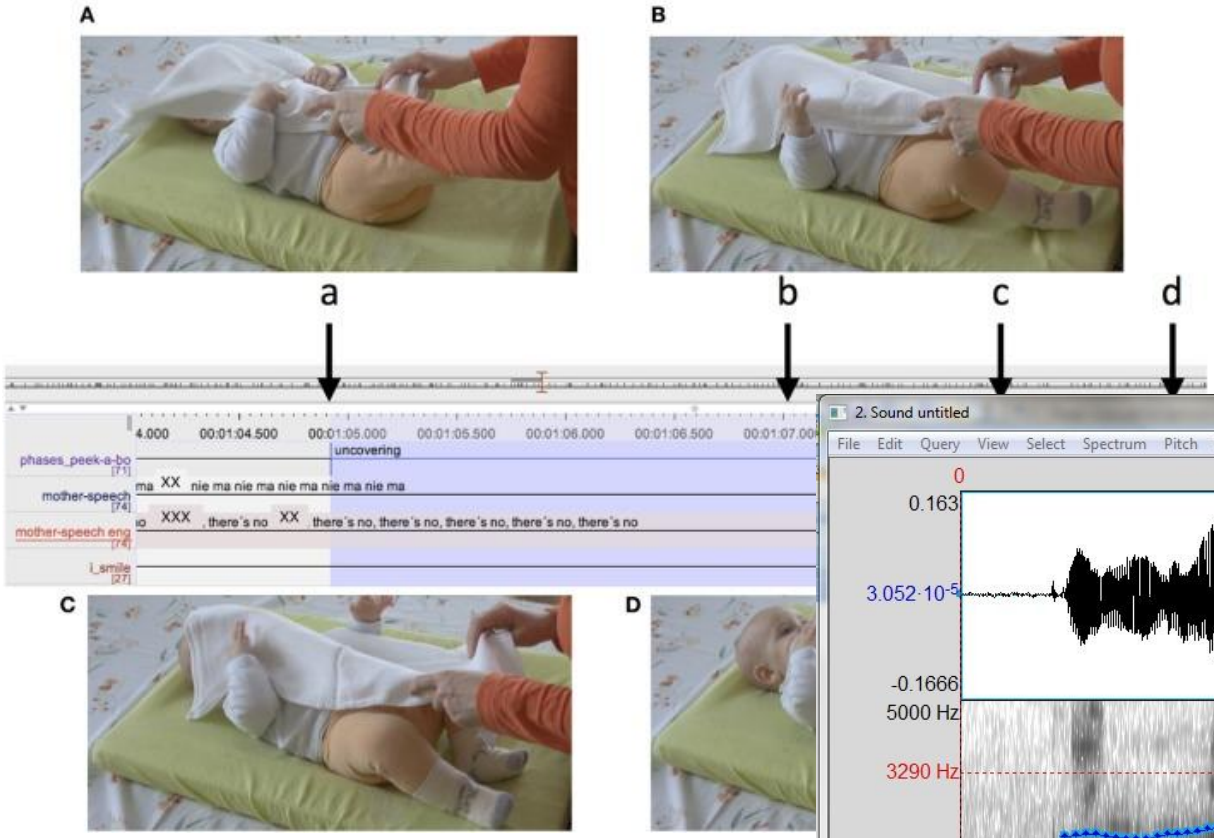
Diverse datasets and tools

- Intensive measurement of real-time interactive systems.
- Data: video recordings, interaction transcripts, material artifacts (notes), task performance, reaction times etc.
- Tools: software for behavioral coding (ELAN, Praat), movement analysis (frame-difference methods, motion tracking).
- Analytical techniques: qualitative, quantitative statistics (single and multilevel linear models), non-linear predictive modelling (machine learning), dynamical time series analysis (RQA, cRQA).

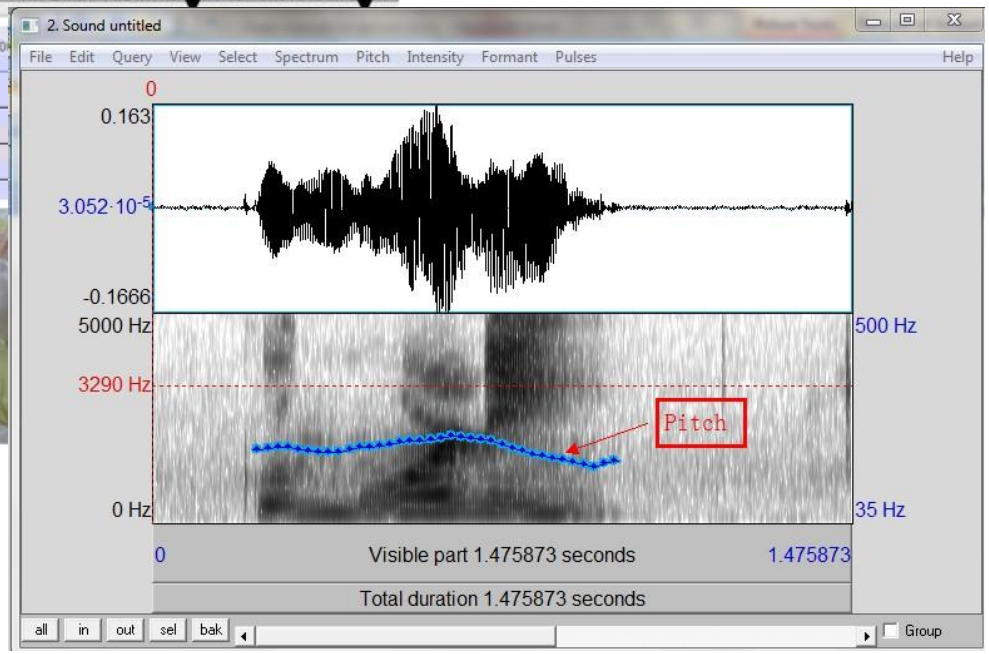




Video and audio coding

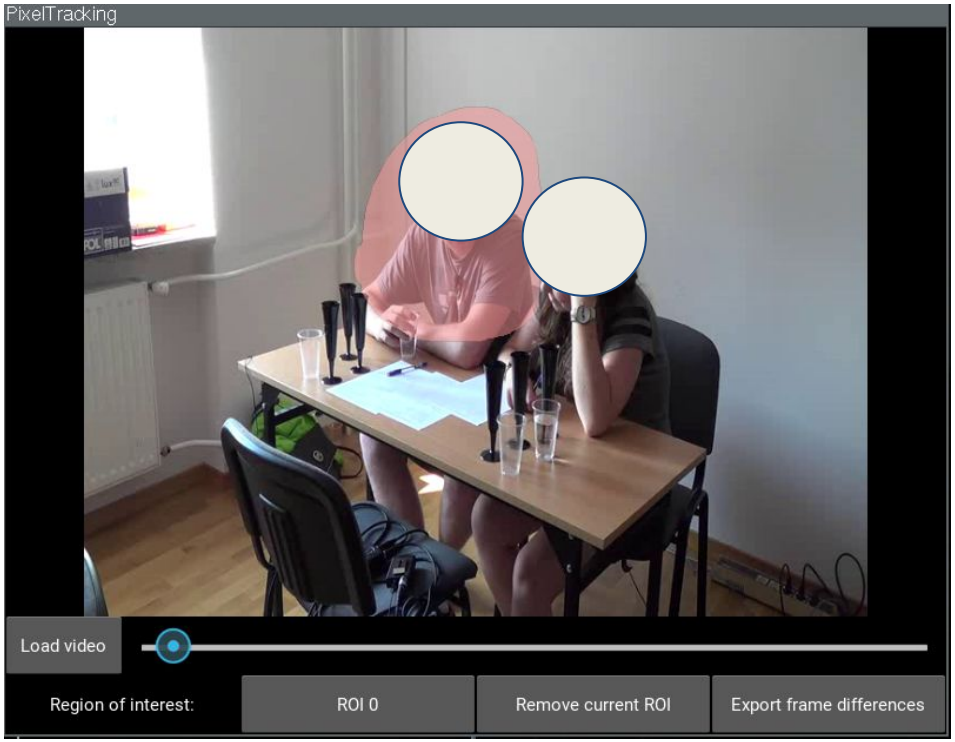


ELAN software.



Praat software.

Frame-difference movement quantification



Time series suitable for cRQA analysis.

Custom PixelTracking software:
https://github.com/zubekj/pixel_tracking

Agent-based models

- Reimplementing and studying existing models from symbol emergence perspective.
- Designing new models from scratch.

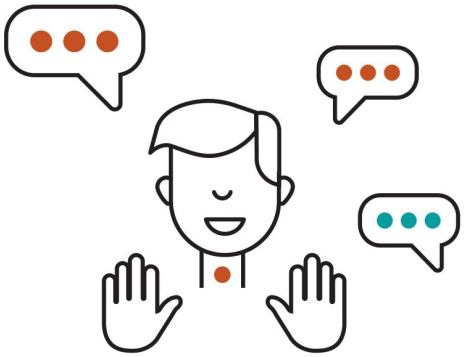
Techniques:

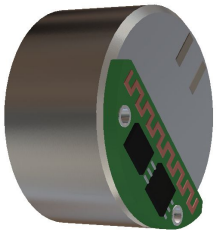
- Deep reinforcement learning.
- Genetic programming.

Possibility to embed models in e-puck 2 robots.

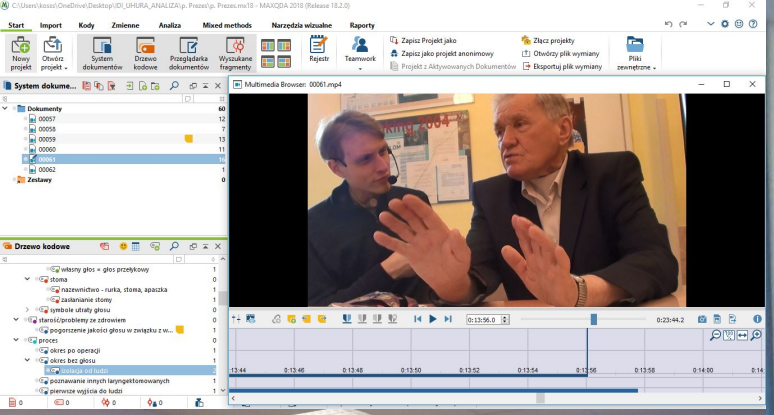
Uhura: user experience design

The opportunity to design 3D models and build functional prototypes according to participatory design methodology





Uhura: unique collaborative process crossing border of disciplines: i.a. anthropology, cognitive science, user experience

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