# Gestures on a tangible tabletop during collaborative problem solving tasks

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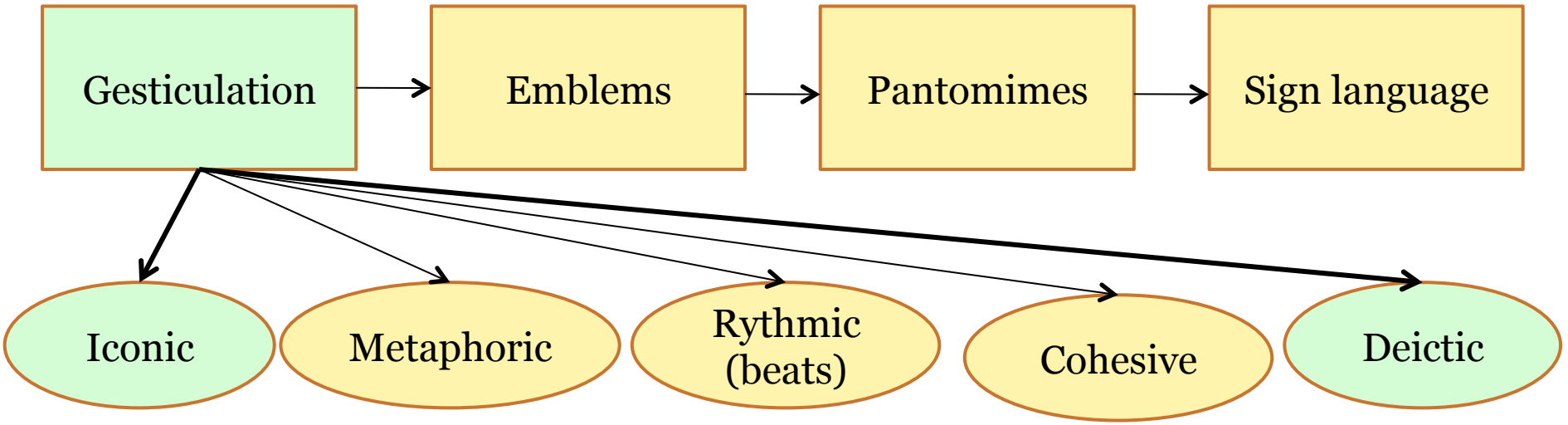
# Outline

- Taxonomy of Gestures
- Gestures, TUIs, and Cognition
- Pilot study in LIST
- Current research
- Research goals

# Taxonomy of gestures (Semiotics)




[Kendon, 1982; McNeill, 2000/2005]

# Gestures, TUIs, Cognition

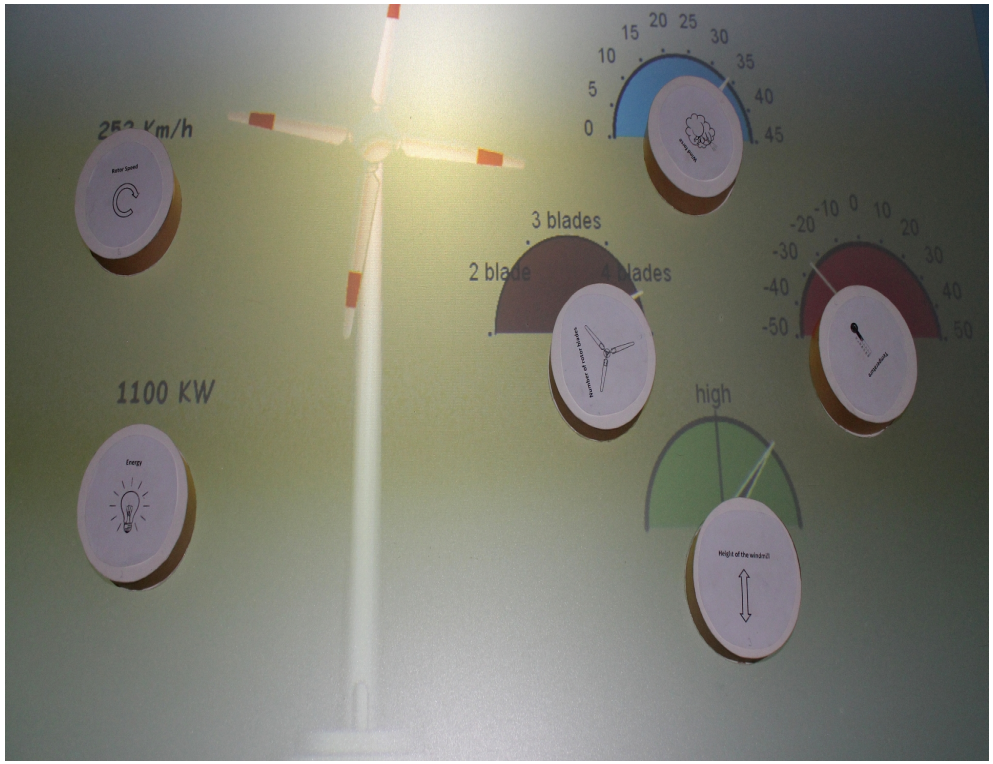
- ***Pointing*** is a part of events provided by other meaning-making resources, such as speech, spatial properties, body posture, and **collaborative** action.

  [Goodwin, 1994]
- Systems that **constrain gestural abilities** are likely to **hinder the user's thinking and communication**.

  [Klemmer et al., 2006]
- By providing users with multiple access points to the system and **maintaining their physical mobility**, TUIs enable users to take advantage of **thinking** and **communicating** through unconstrained **gestures.**

  [Shaer & Hornecker, 2000]

# Pilot Study with Tabletop Display

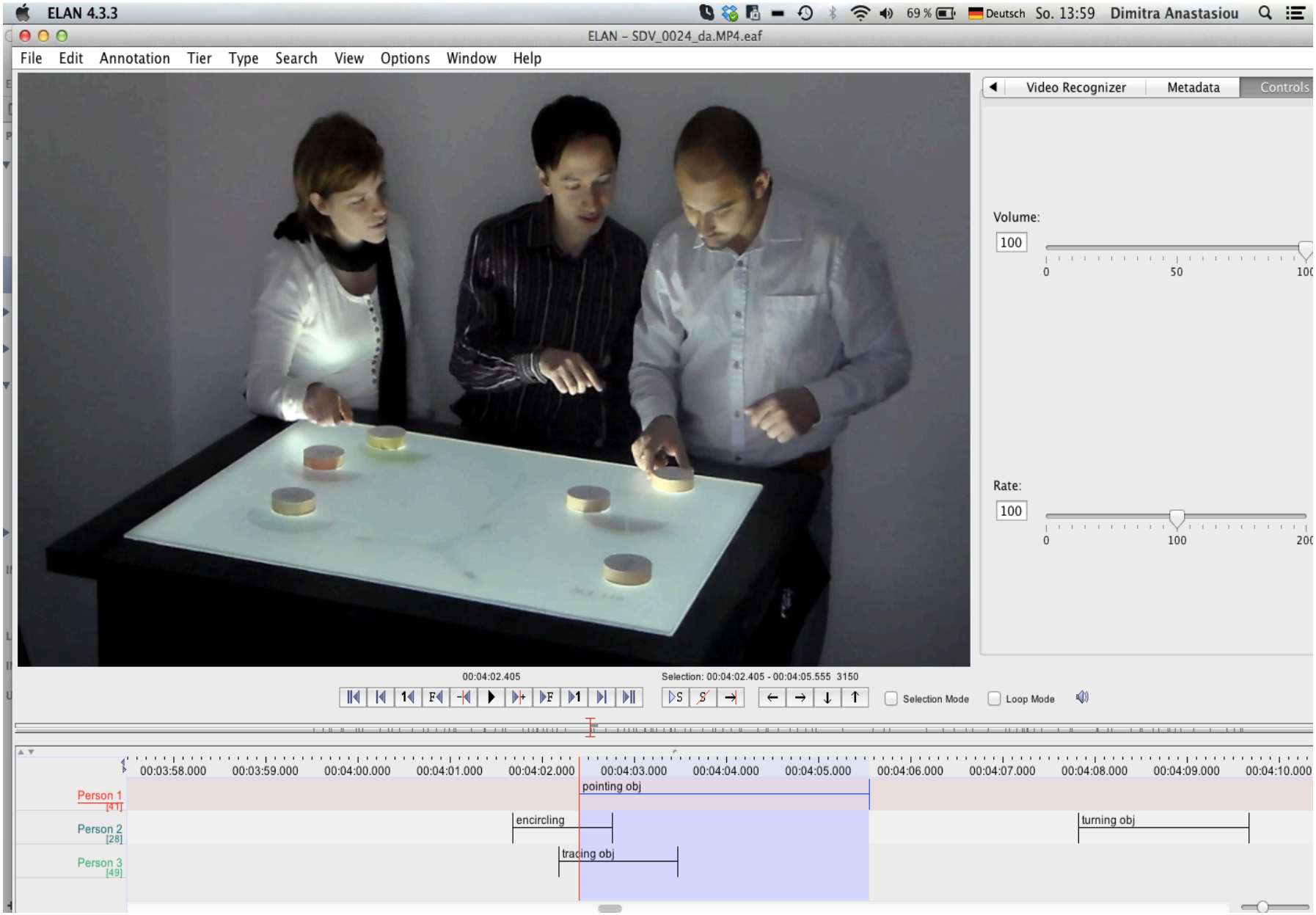



**Task** of the participants: explore the relation of external parameters on the production of electricity of a windmill presented on a tangible tabletop.

# Gesture taxonomy from the study

- *Deictic/pointing* gestures
  - point something/somewhere;
- *Iconic* gestures
  - resemble concrete objects or actions;
- *Emblems*
  - can be used instead of speech/are known by almost everybody in a social group
  - shoulder shrugging, headshake, head nod
- *Adaptors*
  - are not used intentionally during an interaction;
  - are linked with negative feelings (head scratching)
- *TUI-related/manipulative* gestures
  - occur specifically in interaction with TUIs.

# Sample video


ELAN 4.3.3
ELAN – SDV_0024_da.MP4.eaf
File Edit Annotation Tier Type Search View Options Window Help
Video Recognizer
Metadata
Controls
Volume:
100
0
50
Rate:
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0
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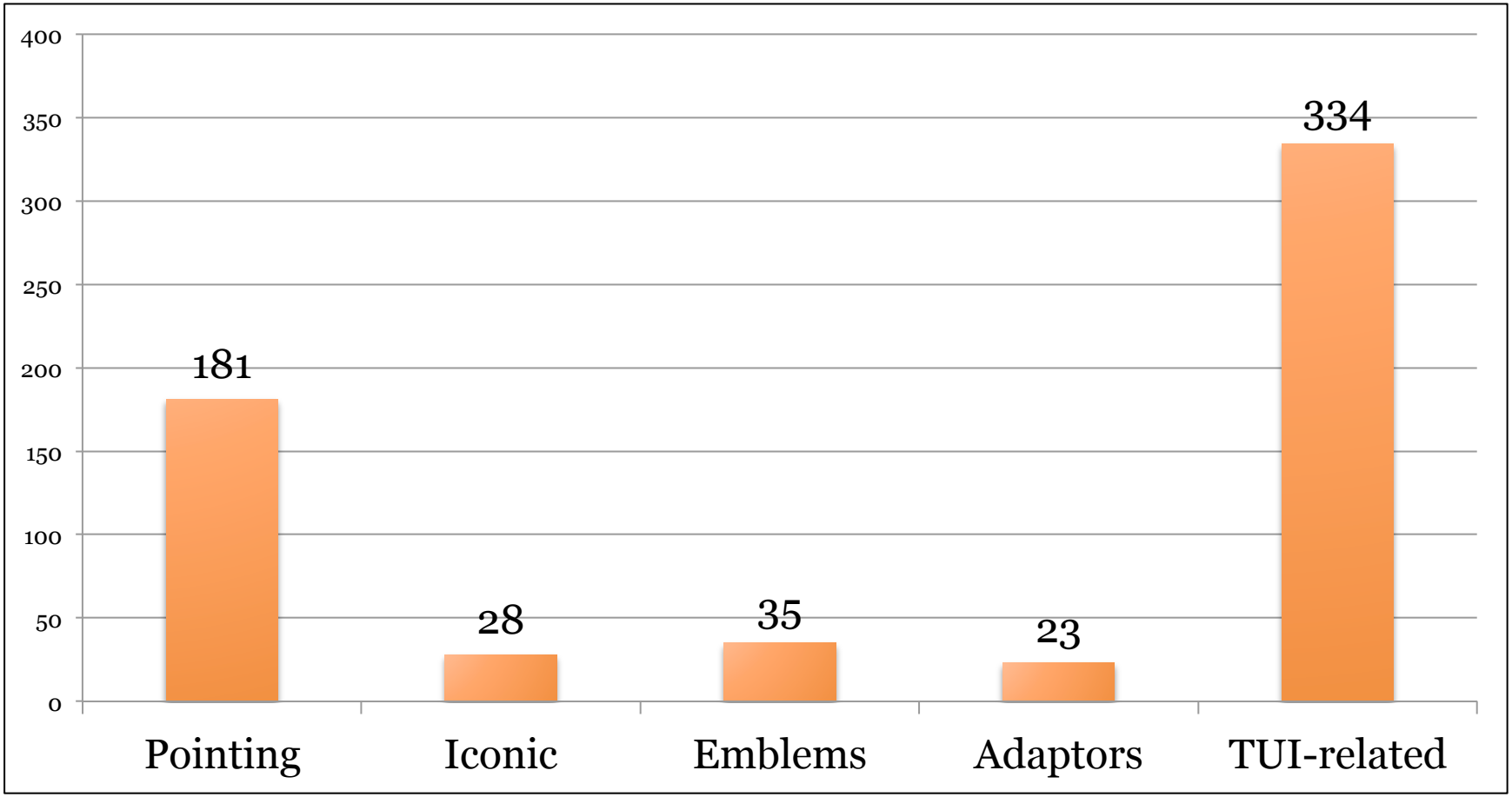
00:04:02.405
Selection: 00:04:02.405 - 00:04:05.555 3150
Selection Mode
Loop Mode
00:03:58.000
00:03:59.000
00:04:00.000
00:04:01.000
00:04:02.000
00:04:03.000
00:04:04.000
00:04:05.000
00:04:06.000
00:04:07.000
00:04:08.000
00:04:09.000
00:04:10.000
Person 1
[41]
Person 2
[28]
Person 3
[49]
pointing obj
encircling
tracing obj
turning obj

# Distribution of gestures



# Findings

- Gesturing accelerates *collaborative* work;
- Reaction of participant(s) after gestural performance by another participant:
  - 85% nothing → helping the gesturer to think and share their understanding
  - 58% other person reacts → pattern for *coordinating* work in *collaborative* settings
  - 38% same person reacts → pattern for *coordinating* work in *collaborative* settings
- 78,5% spoke during gesturing;
- *Problem solving* task on the TUI encourages the use of rapid *epistemic actions*.

# Current research

- Marie Curie H2020-MSCA-IF-2014 Project **GETUI: GE**stures in **T**angible **U**ser **I**nterfaces
- **Goal**: explore the gestural performance of users while interacting on a TUI in a collaborative problem solving task.
- **Methodology**: user studies similar to the international large-scale educational Programme for International Student Assessment (PISA) programme.

# Research goals

- Video annotations with speech-gesture alignment of the user studies;
- A taxonomy of gestures used in interaction with TUIs for collaborative problem solving;
- Locale-specific differences in the above gesture taxonomy;
- Statistics and scores about task performance;
- Design guidelines for TUIs and applicability of the TUI for further PISA studies.

# References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# Thank you for your attention!

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