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URPP Language and Space

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Interactive discoveries: A video and eye-tracking based study of knowledge construction in science centers

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1. The Project

Science and Technology Centers (STCs) differ from traditional museums in their views about how knowledge can be conveyed and what role visitors play in this process.
STCs do not simply show phenomena to visitors and then describe them in the language of the respective discipline. They offer their visitors platforms which enable the latter to approach the natural phenomena in question in an experimental way.

This process of actively discovering natural phenomena is an essential characteristic of STCs: In fact, they not only impart knowledge about the natural sciences but also foster the fundamental skill to acquire scientific knowledge by investigating certain phenomena.

Although this fact is responsible for the STCs' relevance for a public understanding of science, the process in which visitors of STCs actively work towards developing knowledge about natural phenomena has not received much research interest so far. Our project, which will start in 2016, fills this significant research gap.

The project is informed by multimodally enhanced Conversation Analysis.

2. Aims

General objective

- The aim of the project is to systematically reconstruct how visitors collaboratively construct knowledge about natural phenomena with the help of experiment stations.

Goal 1

- Reconstructing how the participants use elements of their spatial environment in order to collaboratively produce shared knowledge about natural phenomena: studying interactive methods of discovery.

Goal 2

- Reconstructing how participants make use of the multisensorial experiences the experiment stations facilitate, and how they share these experiences with their partners in the process of knowledge construction.

Goal 3

- Exploring the tension between what is seen or read by a visitor in the course of his/her ongoing construction of knowledge and the way these individual perceptions are 'fed into' the process of constructing a common ground shared with other visitors.

3. Corpus

- > 35h of video and (partially) eye-tracking recordings of visitor interactions.
- Groups of two or more 'real' visitors to the Technorama.
- 111 small groups recorded.
- 15-30 minutes/group.
- 2 video cameras (+ 2 eye-tracking devices).
- 24 days of field work.
- Photographic documentation of exhibits.
- Photographic documentation of exhibit texts.

4. Example

Extract «Zwerge»

FIO: Fiona, daughter
GRE: Greta, mother

```
FIO: die ZWERge sind imfall mega cool;
     (--)
GRE: WEli?
     (3.0)
GRE: da_sch aber nur DEko;=oder?
FIO: !NEI! im fall muesch lUEge (--) wenn du
     (4.0)
     lueg jEtz musch mal (-) !MA!mi.
     (--)
     musch RAte weli zwErge dass (--) INe gönd
     und weli USe chömmed.
     (2.0)
GRE: ah vo (DA)-
     (--)
FIO: JA:; ( ) (-)
GRE: aHA::;
     (.)
FIO: DA gat INne #und da gaat Usse.
                 #Fig. 1

FIO: und #[da mUsch] ( )-
GRE:     #[aso d   ]
         #Fig.2
```

Fig.1

Fig.2

```
GRE: und wo isch d LÖsig?
     (--)
     DA (WO [STAHT)-]
FIO:       #[NEI du ] musch nachane log wenn
           #Fig.3
```

Fig.3

```
FIO: d DA annestahsch;
     denn gsehsch NÜT.
     jetz muesch SCHÄtze,
     DÄ links wa_isch dÄ?
GRE: INne (-) #USse inne usse (-) inne usse
              #Fig.4
```

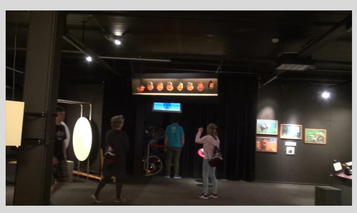

Fig.4

```
GRE: (--) inne usse. (.)
     s_isch GANZ äh vÖllig abwechs(ligswiis).
     (4.0)
FIO: (ja s) isch INe use ine use,
     [ine use USe] use.
GRE: [AH:: (   );]
     USse usse aber ich ha FASCHT rächt.
```

What is Mobile Eye-tracking?

Eye-tracking (ET) is an experimental method that consists of monitoring the eye movements a person makes.
Mobile ET devices are strapped to the head of a participant like sports glasses (**Fig. 5**).
One camera, the field camera, films what is in front of the participant, while two additional cameras, the eye-cameras, film the participants' eyes.
The ET software detects the participant's pupils on the eye-videos and calculates the participant's direction of gaze, which is then indicated on the field camera recording (cf. the red cross hairs in **Fig. 6**).

Fig. 5: ET glasses

Fig. 6: ET video

5. Relevance

The project connects two 'hot topics' of Conversation Analytical research: Research on the role of space in and for interaction and the interest in understanding and knowledge construction in interaction.

By working with eye-tracking data the project directs attention to one of the core tenets of Conversation Analysis, namely the construction of our reality in interaction: The eye-tracking data enable us to explore the perceptive foundations of co-constructed discoveries.

The focus on multisensory experiences will allow us to explore the potential points of contact between Conversation Analysis and Distributed Cognition.

Finally, our findings will foster the understanding of the central mechanisms (and the most appealing aspects) of Science and Technology Centers, opening up future possibilities for improving public understanding of science.

Participants

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