



Feedback as a Means to Support Recipient Design

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Why Study HRI?

- **methodological reasons**
 - comparable scenarios
 - isolation of context features
 - displays of participants' sense making processes
- **theoretical reasons**
 - observe processes in action
- **practical reasons**
 - contribute to more pleasant human-computer interfaces



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- **theoretical reasons**

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Schober & Clark (1989)

- **Subjects:** 102 undergraduates in psychology
- **Task:**
 - Speaker S instructs Addressee A to select Tangram figures in right order (reference task), six trials
 - Overhearers present
- **Restrictions:**
 - While the addressee A could give feedback, the overhearer O could not, yet O heard everything S and A were saying.
- **Results:**
 - As are more accurate than Os.
- similar results by Kraut et al. (1982) and Krauss & Weinheimer (1966)



The Puzzle

- **Whether addressees can give feedback has significant consequences for**
 - efficiency, speed, and accuracy of task completion
 - level of detail presented
 - recipients' depth of understanding
- **How can the possibility to give feedback make such a difference?**



How Does Feedback Work?

- three different answers
 - Schegloff (1982)
 - Clark & Schaefer (1989)
 - Gardner (2001)

- case study of human-robot interaction





Schegloff (1982)

- **“continuers” work due to the places where they occur**

A: first we turn around and leave the room

B: uh-huh

A: left into the corridor

B: mhm

A: from there about ten meters then there's a door on the left

B: uh-huh

A: we turn left and go straight for another 20 meters

B: okay

- **feedback signals occur at TRPs**
- **by passing the opportunity to either take the turn or to initiate repair, the listener ratifies the speaker's speaking role**



Clark & Schaefer (1989)

Grounding:

- people “try to ground what is said – to reach the mutual belief that what the speaker meant has been understood by everyone well enough for current purposes” (1989: 290)
- building up common ground as a shared basis
- speakers “take positive steps to establish understanding” (1989: 265)

Contribution = presentation + acceptance

- “not formulated by a speaker according to a prior plan, but emerge as the contributor and the partner act collectively” (1989: 292)



Providing Feedback

- **continued attention**
 - for instance, by non-verbal signals
- **initiation of relevant next contribution**
 - A: Sit down.
 - B: thanks.
- **acknowledgement**
 - A: Bill is late.
 - B: uh-huh.
- **demonstration**
 - A: Sit down
 - B (sits down)
- **display**
 - A: call 9 – 1 – 1.
 - B: 9 – 1 – 1, okay.



Gardner (2001)

Feedback signals do their work because of their intonation contours

- ***mm* with fall-rising intonation is oriented to turns that are:**
 - regularly articulated unclearly
 - regularly conceptually difficult to understand
 - frequently in a sequentially incomplete position (e.g. in the middle of a story)
- ***mm* with falling intonation is oriented to turns that:**
 - exhibit no problems in articulation
 - are conceptually simple or straightforward
 - are not emotionally or judgementally strongly expressive
 - are pragmatically, grammatically and intonationally complete



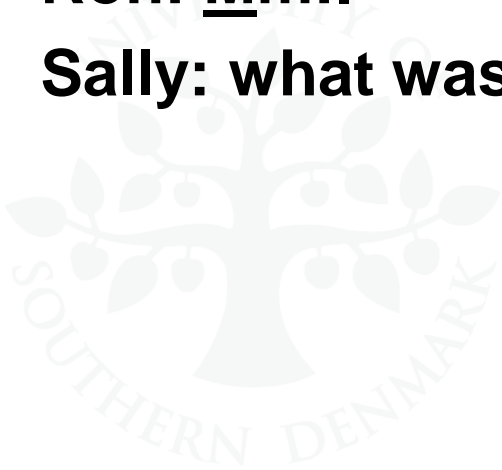
Ron: We had an appalling meeting tonight,

(1.7)

Sally: So did we:.

Ron: Mm:.

Sally: what was yours about-.





Synthesis

■ feedback does its work

- by passing the opportunity to turn-taking and repair
- by showing how the previous utterance is oriented to (as complete, unproblematic, conceptually simple etc. or not)

■ the work feedback does is

- accepting a previous presentation in order to ground a contribution 'well enough for current purposes'
- showing how the previous utterance is attended to interactionally



Designing Feedback for HRI

Corpus

- **11 native speakers of English (exchange students from various English-speaking countries)**
- **Task: familiarize a robotic wheelchair with a flat for handicapped people (hometour scenario)**
- **Wizard-of-Oz scenario**
 - utterances pre-specified for each location
 - location names and constructions elicited in pre-study
 - simulated 'learning' through alignment with formulation alternatives

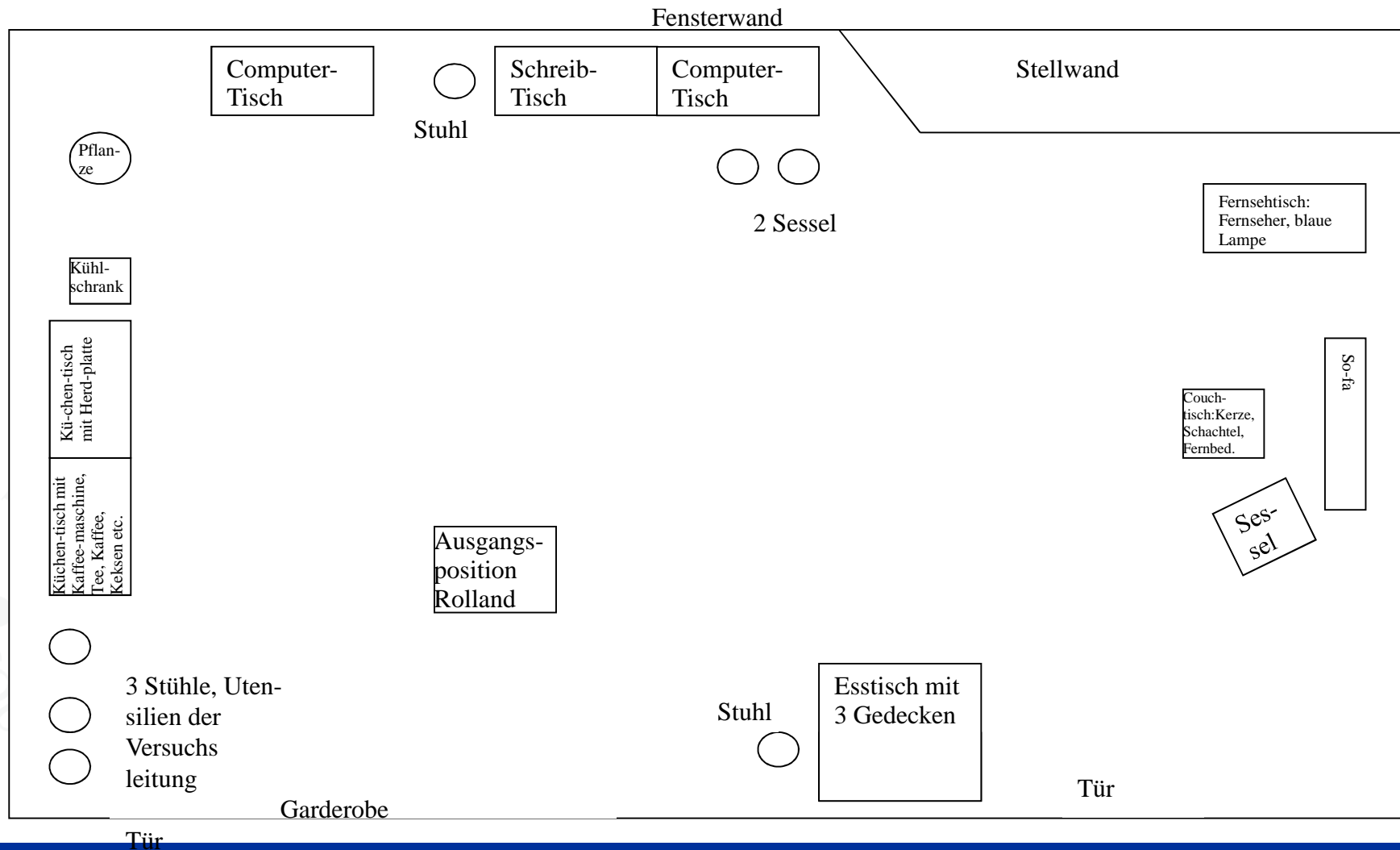


Rolland



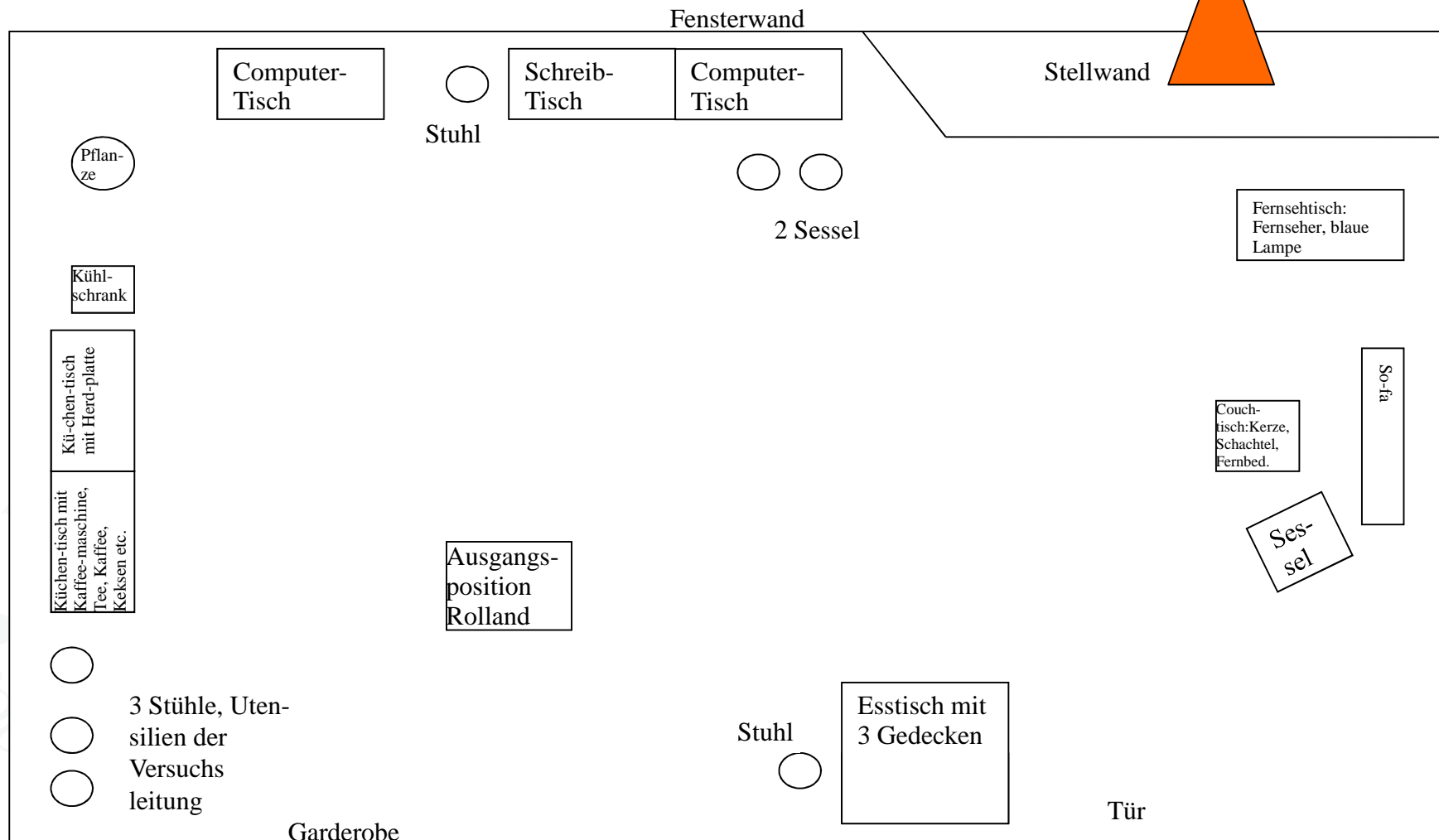
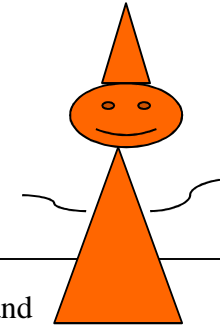


Home-Tour Scenario





Home-Tour Scenario



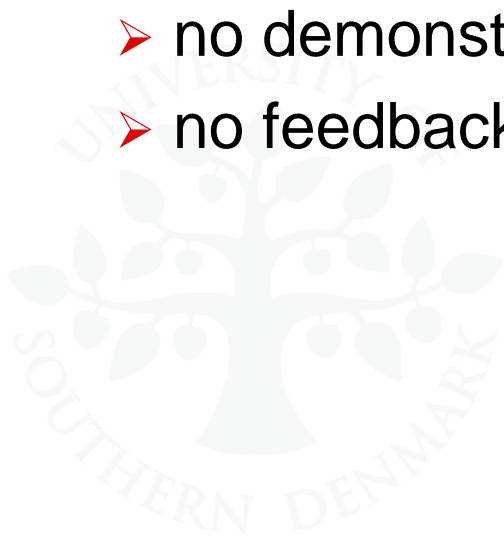
Tür



Designing Feedback for HRI

Restrictions:

- **no prosody synthesis**
- **no real time deep semantic analysis**
- **no non-verbal behaviours available**
 - no demonstration
 - no feedback signals





Designing Feedback for HRI

- relevant nexts

 - is this part of the living room area?

 - is this the place to watch TV or to switch it on or off?

 - is this where you want to be to open it?

- clarification requests as relevant nexts

 - I'm sorry, which kind of table?

- partial repetition

 - the armchair?

 - the what?

 - did you say coffee table?



Designing Feedback for HRI

- explicit acknowledgement

okay, thank you.

oh okay, I see which object you mean.

- clarification question concerning object recognition

is it the object in the corner?

am I in front of it?

just to get this right: I am in front of it, is that right?

- verbatim display

ah, the dining table.



Example Dialogue

R013: (1) and now we will go to the couch.

Rolland: (15) is this part of the living room area?

R013: yes,

Rolland: (2) which name do you prefer, couch or living room area?

R013: (1) couch.

Rolland: (1) okay, thank you.

R013: (1) `<at="slow">and now,</at>` - the, (1) the easy chair.

Rolland: (3) I'm sorry?

R013: -- the `<at="loud">chair,</at>`

Rolland: (7) am I in front of it?

R013: -- yes. --

Rolland: Oh okay, I see which object you mean.

R013: (3) `<at="slow">and, -- now,</at>` -- to the, coffee pot.



Orientation to Displays

R013: (1) and now we will go to the couch.

Rolland: (15) is this part of the living room area?

relevant nexts

R013: yes,

Rolland: (2) which name do you prefer, couch or living room area?

R013: (1) couch.

Rolland: (1) okay, thank you.

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Rolland: (3) I'm sorry?

acknowledgements

R013: -- the `<at="loud">chair,</at>`

Rolland: (7) am I in front of it?

R013: -- yes. --

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R013: (1) <at="slow">and now,</at> - the, (1) the easy chair.

Rolland: (3) I'm sorry?

R013: -- the <at="loud">chair,</at>

clarification question concerning
object recognition plus account

Rolland: (7) am I in front of it?

R013: -- yes. --

Rolland: Oh okay, I see which object you mean.

R013: (3) <at="slow">and, -- now,</at> -- to the, coffee pot.



Orientation to Displays

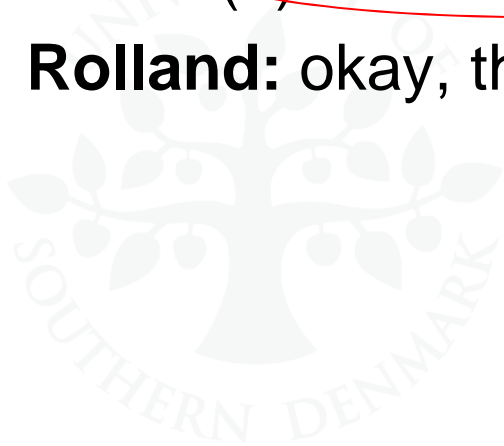
Example: Am I in front of it?

R013: (1) and <at="prominent">now,</at> (1) we will go, (1)
<at="slow">to my desk.</at>

Rolland: (5) am I in front of it?

R013: (1) almost. (4) yes, --

Rolland: okay, thank you.





R017: an' now to the table, (5) an' straight,

Rolland: (3) I'm sorry, which kind of table?

R017: (1) a small, -- table, (1) that has a cup,

Rolland: (3) is this part of the living room area?

R017: (1) uh, yes.

Rolland: (4) am I in front of it?

R017: -- yes,

Rolland: (1) Oh okay, I see which object you mean.

R017: (1) and now the couch, (7) now I'm in front of it.



Rolland: Where are we going to?

R022: (3) we are <at="slow">going to</at> the writing desk.

Rolland: (12) Am I in front of it?

R022: - not yet, (9) now you're in fron' of it.

Rolland: (1) Okay, thank you.

R022: -- you're welcome,





R043: we are going to the dining table, (1) this is the dining table,

Rolland: -- I'm sorry, which kind of table?

R043: <at="prominent">di</at>ning table, (1) this is the table where we <at="prominent">eat,</at> -

Rolland: Ah, the dining table. (3) Just to get this right: I am in front of it, is that right?

R043: (1) you are near one of the corners. (1) we'll go in front of it in a minute. (9) (hnoise) - we are now in front of it.

Rolland: -- Okay, thank you.



Results

Feedback not only

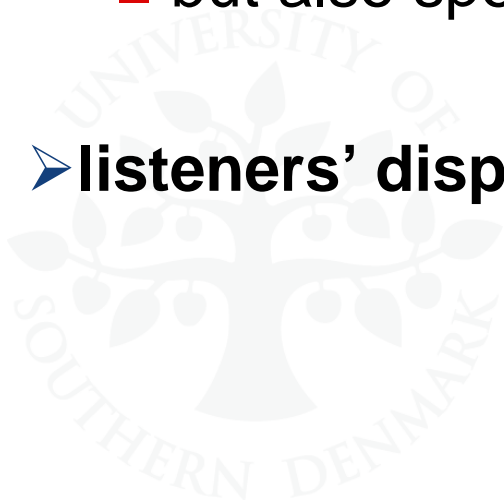
- continuer
- grounding device
- **but it is also attended to as a resource for recipient design by the participants**
- **this is consistent with other studies**
 - e.g. Schober (2009): spatial competence
 - e.g. Warren-Leubecker & Bohannon (1982): linguistic competence in native – non-native interaction



Conclusion: The Puzzle

Efficiency due to understanding of partners' needs

- this may concern the understanding of the previous utterance
 - as well as the interactional understanding of the previous utterance as complete, simple, unproblematic
 - but also speakers' hypotheses about listeners' capabilities
- **listeners' displays are interpreted locally and globally**





Conclusion: HRI as Methodological Tool

- controlled situation, identical for all speakers
 - six of eleven speakers used the same global strategy
- investigation of effects of isolated features
 - participants' orientations to different methods (relevant next, verbatim display, partial repetition etc.) of providing feedback could be investigated individually
- observe recipient design in action
 - communication partner is unfamiliar
 - different aspects about the communication partner can be manipulated and investigated systematically
 - participants' own sense-making efforts can be discovered in action



Thank you!

