„Just talk“
An experimental task for investigation of team situation awareness

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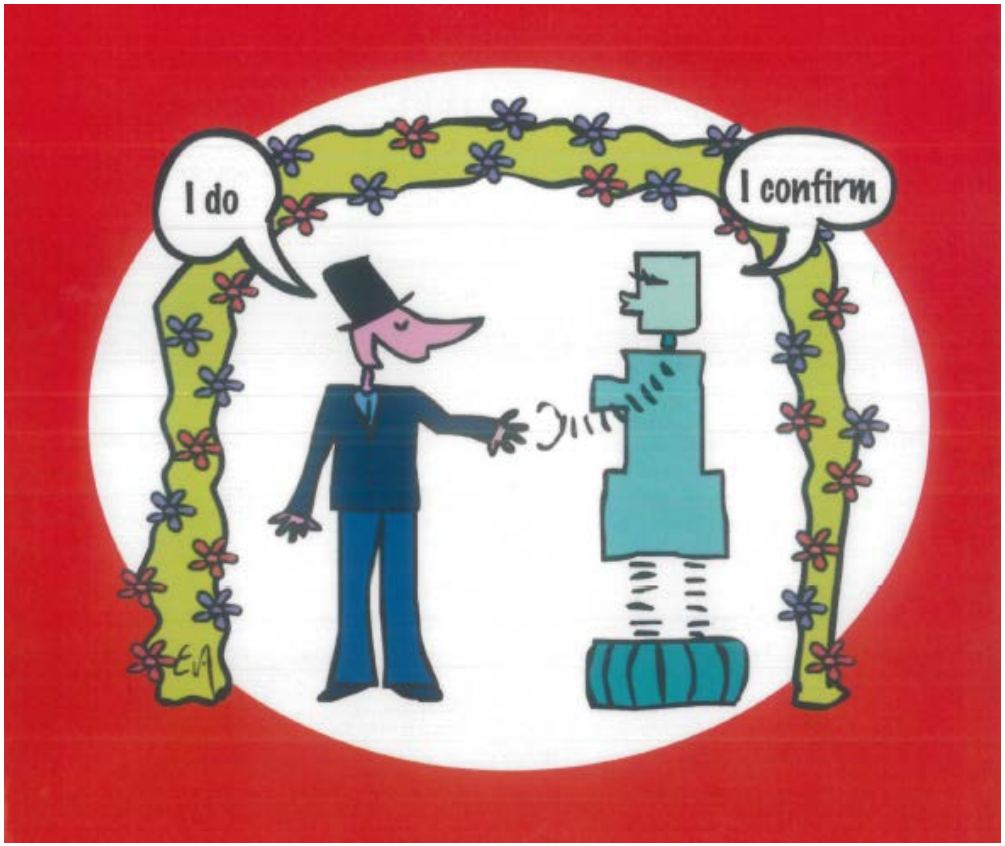
Motivation



[de Waard et al. (2011): „Human Centred Automation“]

Motivation

[http://en.wikipedia.org/wiki/File:Airbus-319-cockpit.jpg]

Motivation

[http://www.intuitivesurgical.com/company/media/images/standard/davinci_surgical_system.jpg]

Definition of Team Situation Awareness (TSA)

1. cognitive state within the team *[cf. Gorman, Cooke, & Winner, 2006; Klein, 2001]*

2. good TSA means:
   – team members have comparable interpretations of cues / situation assessment
   → degree of „overlap“ of individual assessment

3. Synchronization of individual SA via
   – shared mental models *[e.g. Salas et al. 1994]*
   – exchange of information and interpretations

4. Requires knowledge about information needs of oneself and of other team members *[e.g. Entin& Serfaty, 1999]*

5. Indicator of good TSA, **if** and **when** relevant information is exchanged

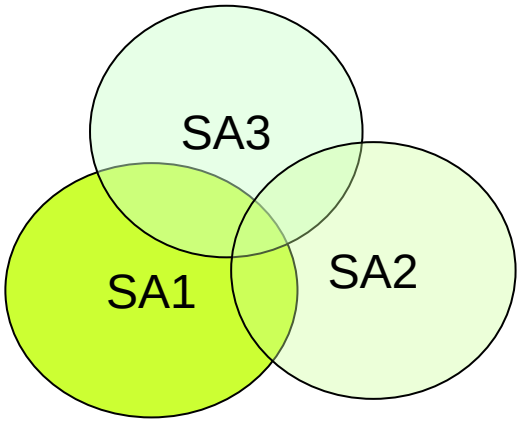
Overview of TSA measurement

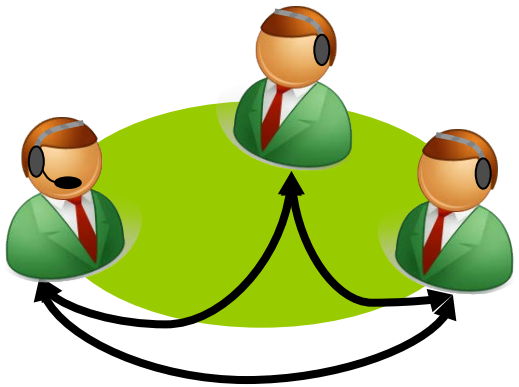
Aspect of TSA	Examples of measurement method	Sources
Cognitive states of individuals become apparent in behavior	Observation, coding	Orasanu & Fischer, 1992, 1999; Bolstad & Cuevas, 2010; Bolstad & Endsley, 2003; Stempfle & Badke-Schaub, 2002; Cooke, Stout, & Salas, 2001
Good TSA leads to appropriate / normative behavior	Testable responses, comparison to SOP	Farley et al., 1998; Wiener et al., 199; Dwyer et al., 1997; Prince et al., 2007; Gorman, Cooke, & Winner, 2006; Entin & Serfaty, 1999
Knowledge / mental models	Paired comparisons, SAGAT	Bolstad & Endsley, 2003; Prince et al., 2007; Stout et al., 1999
TSA as “mutual belief”	Field Studies, Questionnaires	Inoue et al., 2010; Furuta et al., 2009, Nonose, Kanno, & Furuta, 2010
Process of team interaction leads to TSA	Content & structure analysis	Stanton et al., 2006; Walker et al., 2006; Parush et al., 2010

Overview of TSA measurement

<u>Aspects of communication analysis:</u>

1. Speaker, adressee, pragamtics
   e.g. question, advise
2. Content in relation to task
   e.g. goal clarification, process
3. Sequence of utterances
   e.g. close-loop-communication
4. Timing of utterances
   e.g. within planning phase, reaction to testable response





Requirements of Experimental Task

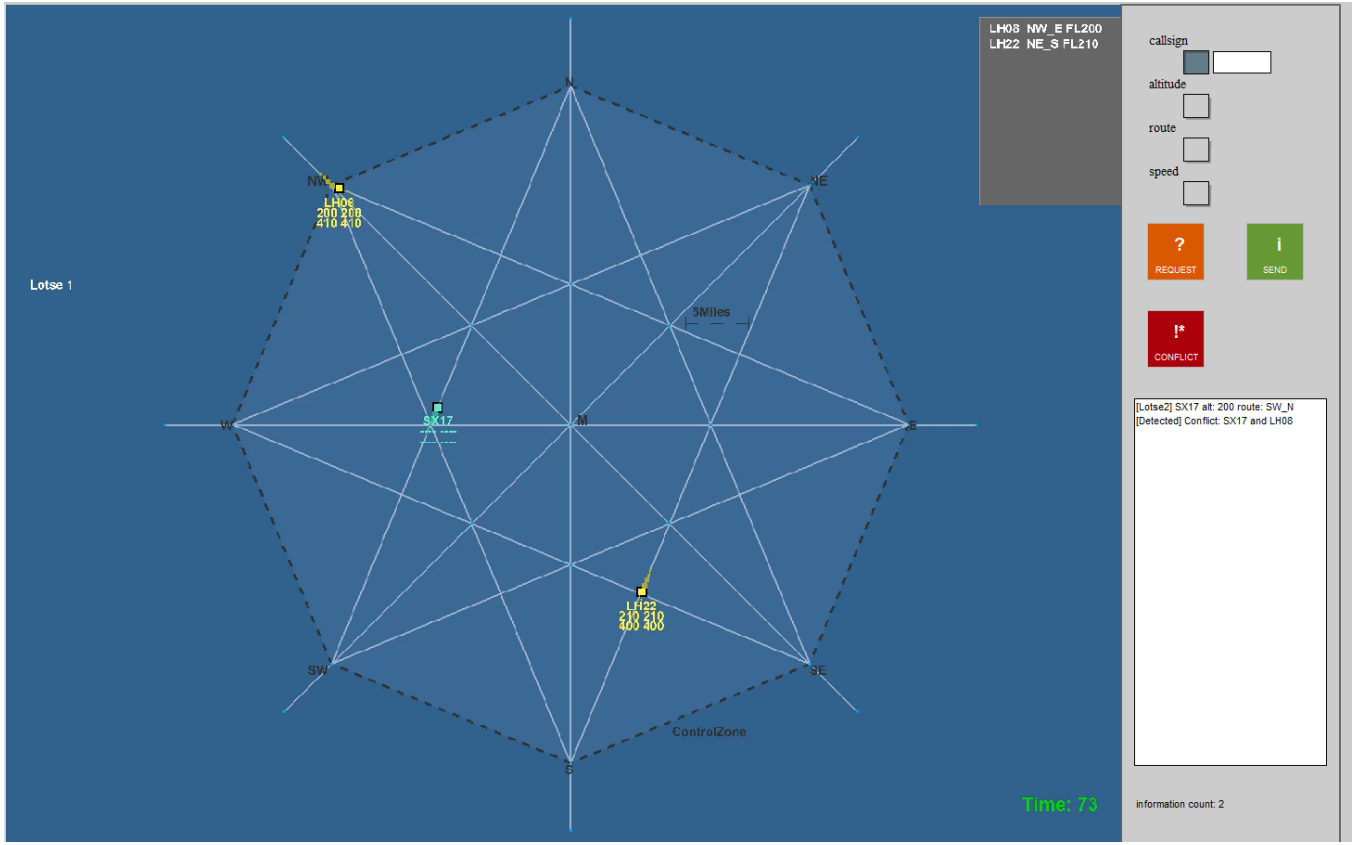
1. Operationalization of observable communication within the team and TSA

2. Metrics derived by communication analysis should allow transfer to other domains

- Objective measures of interaction process
- Experimental runs should be comparable
- Clearly defined / understood interaction process
- Ecological validity

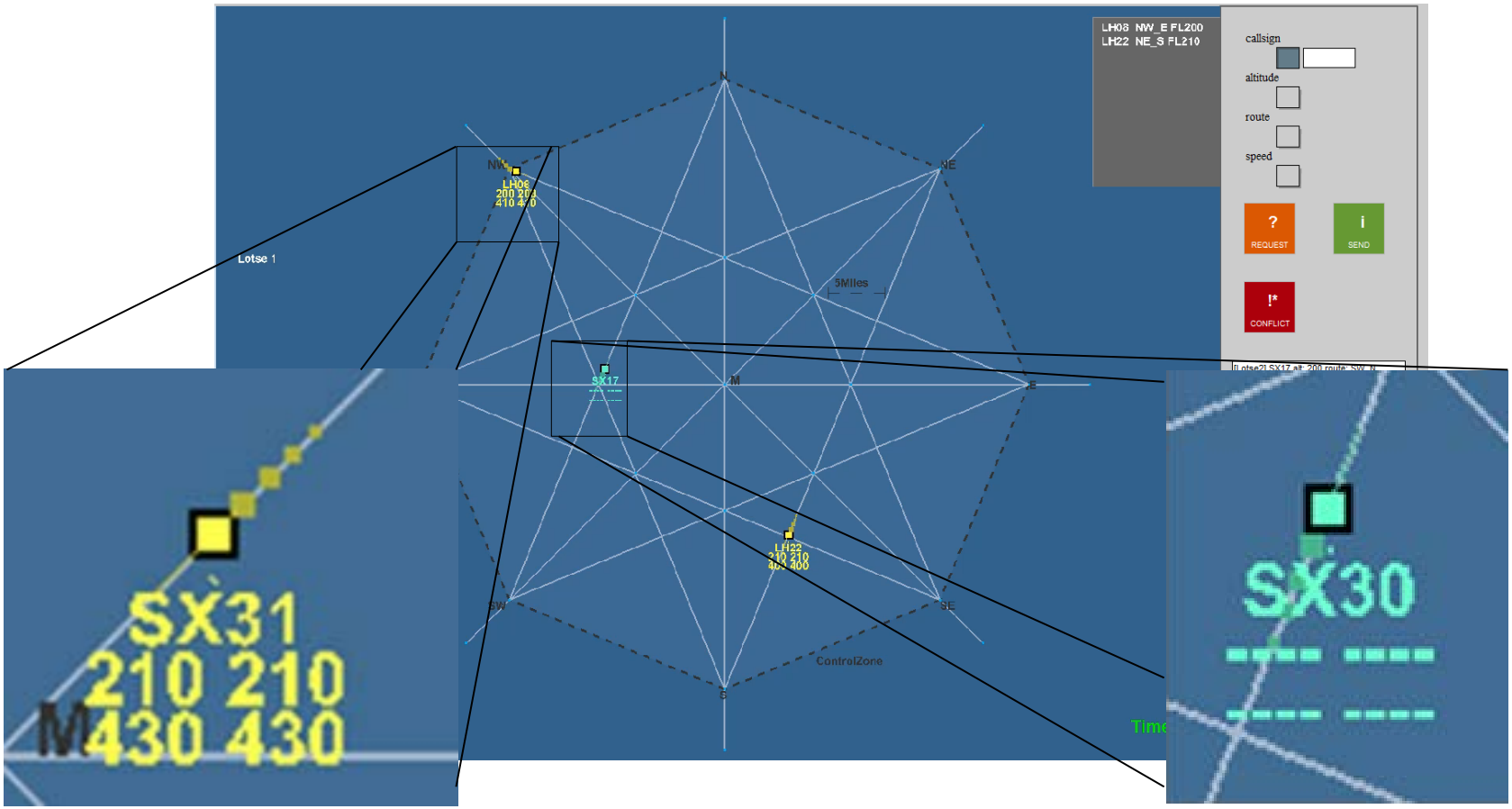
→ dynamic and complex taks that allows high degree of experimental control

Experimental Task



[MAGIE microworld by Obeheid, Hasselberg & Söffker, 2011]

Experimental Task



Pilot Study

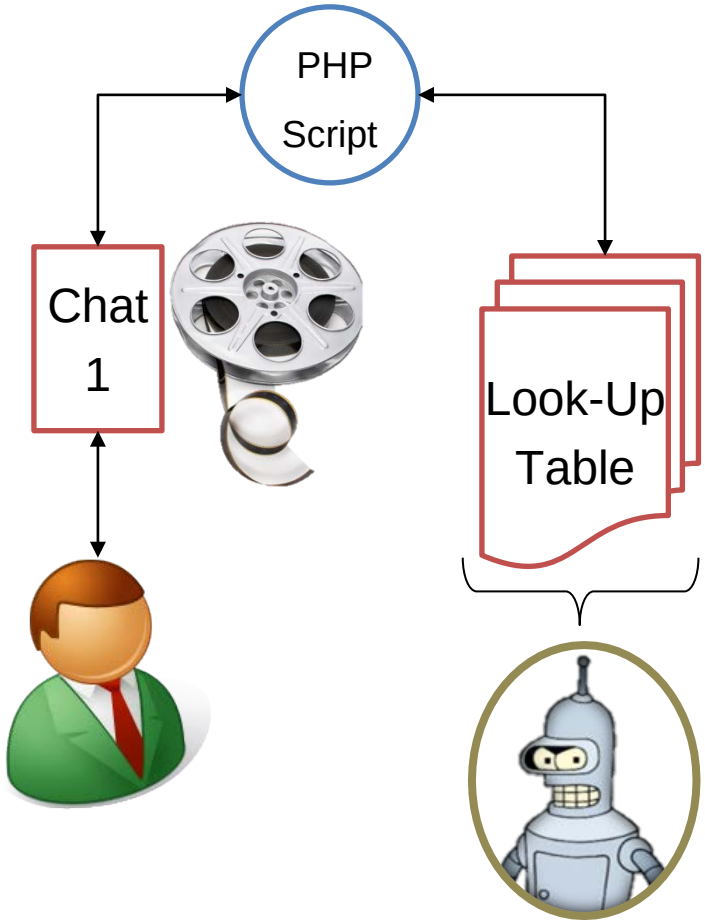
Explorative Research Question:
have individuals different communication behaviors?

- N = 16 DLR employees and interns
- Age: mean = 28 y (sd = 6 y)
- 50 % male

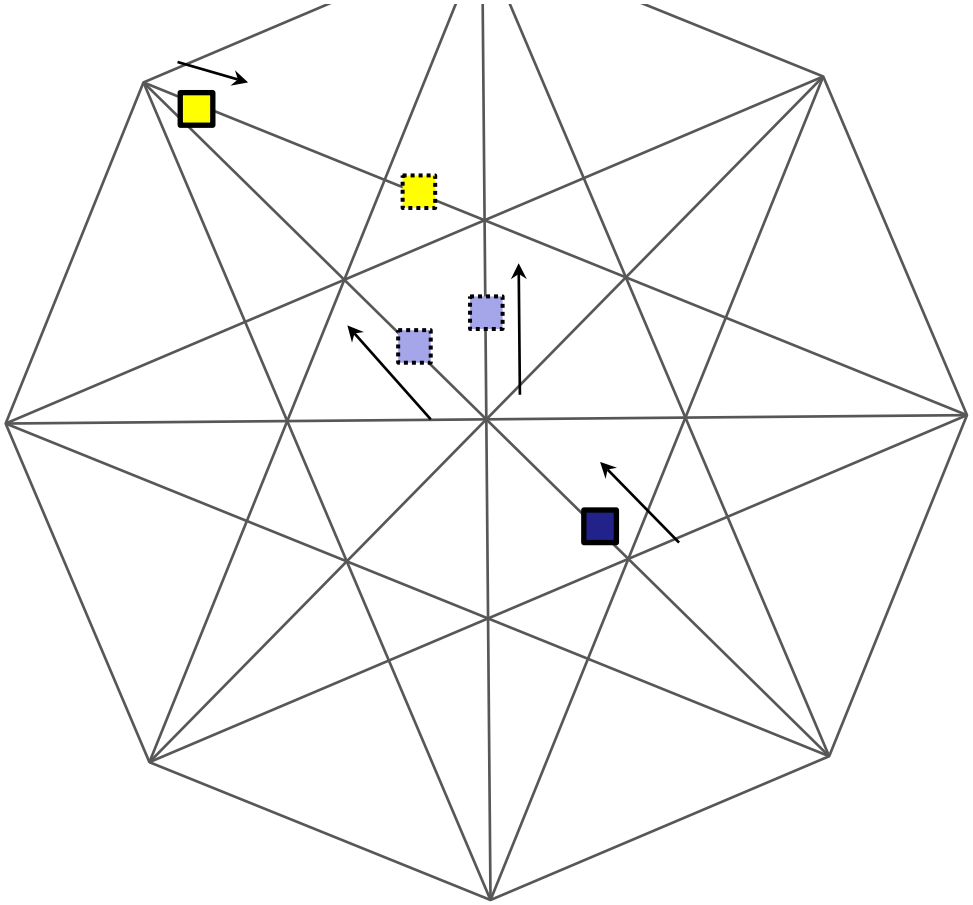
Task: Conflict Detection
Instruction: ask only the most relevant information, because the teampartner is busy

Scenario: 20 min, 7 situations

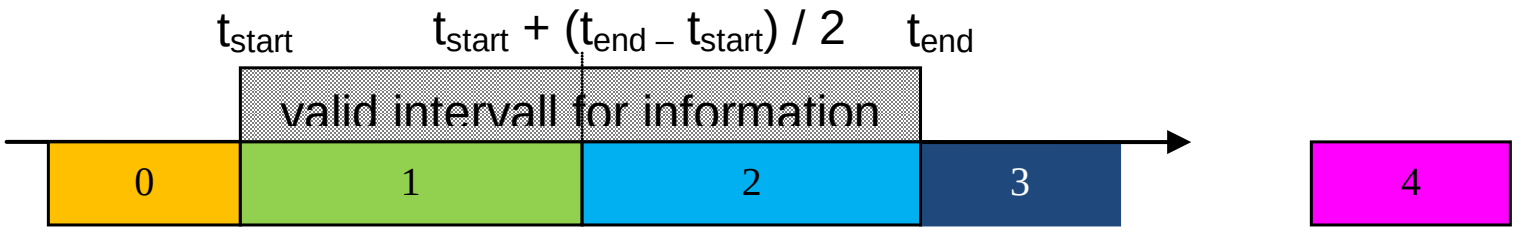
Data: 21 timestamps for information request



Pilot Study
Conflict Detection & Information Exchange

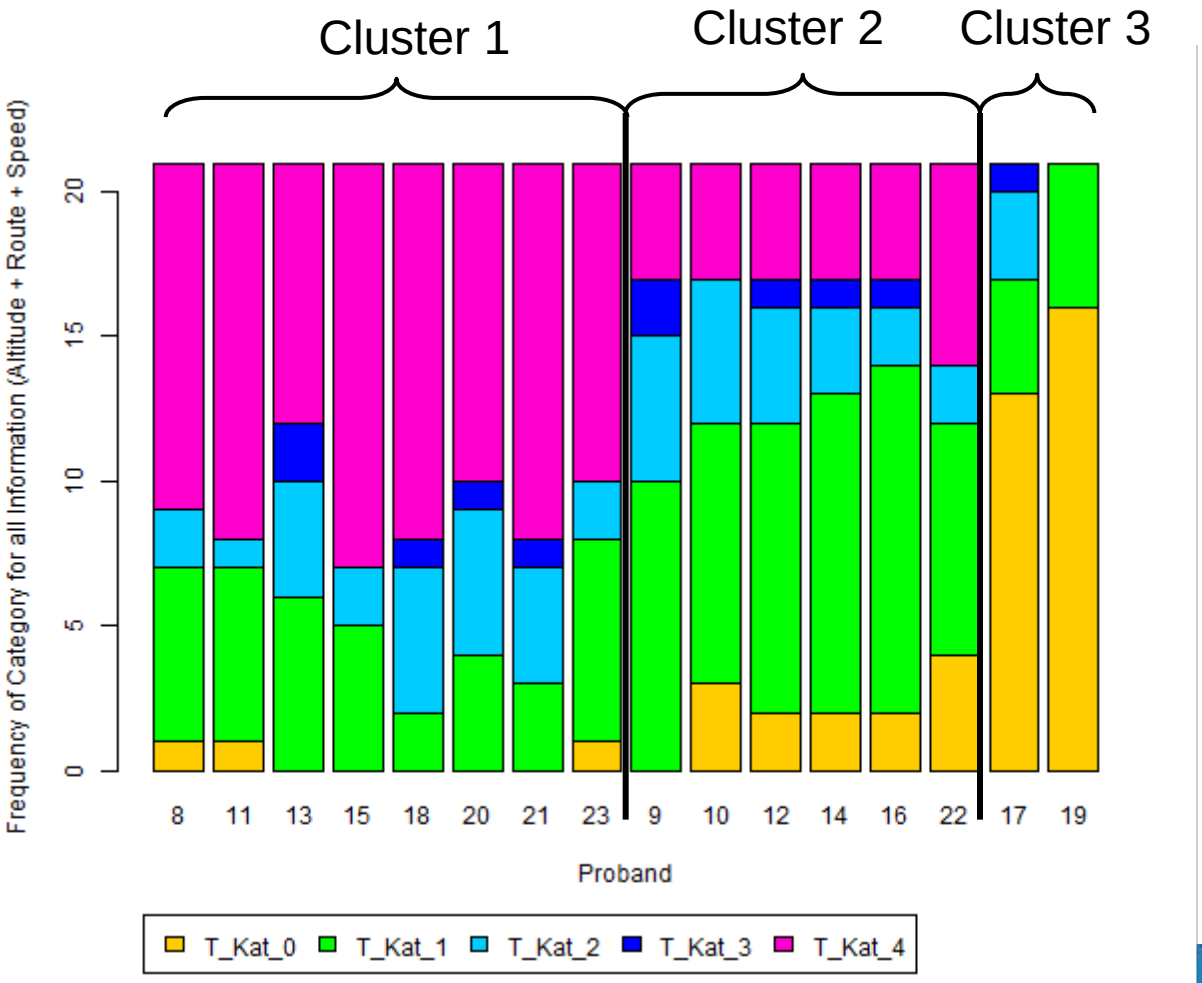


Pilot Study
Strategy for Analysis of Communication Data



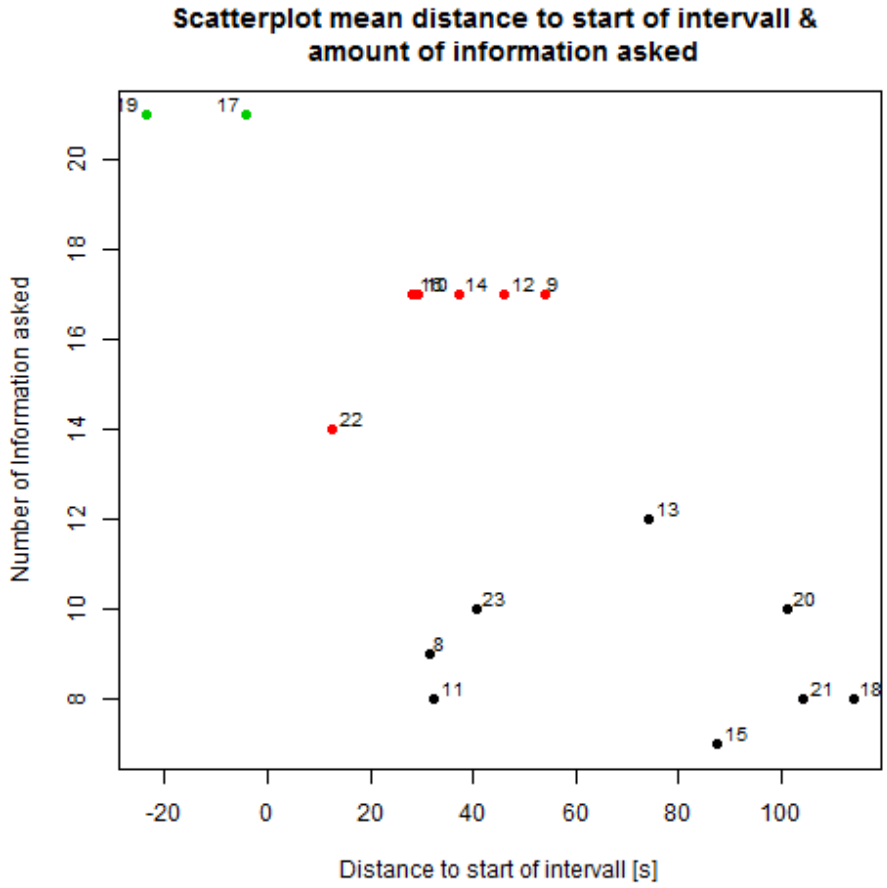
0 = too early, 1 = rather early, 2 = rather late, 3 = too late, 4 = not at all

Results
Clusters for Communication Behavior



DLR

Results
Clusters for Communication Behavior

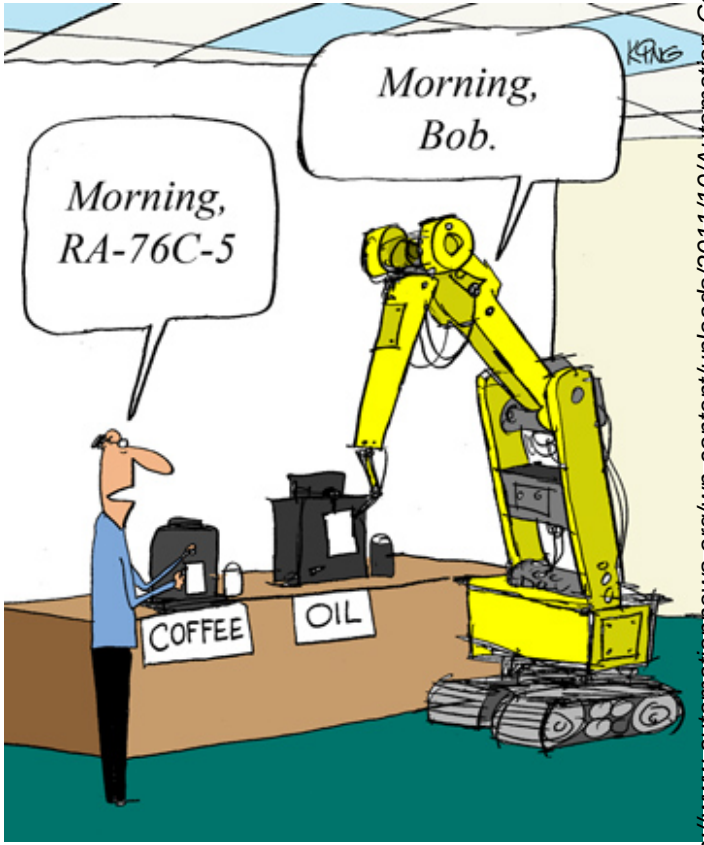


Discussion & Outlook

Pilot Study:
- data analysis allows comparison of communication behavior of participants
- clusters of communication behaviors could be identified
- clusters could be described as „strategies“
- Generate hypothesis about influence on TSA

General Approach:
- link between communication – available information to operators – team situation awareness
- follow-up studies with 2+ participants, more complex interactions

→ **stepwise add more complexity to task**



[http://www.automationnews.org/wp-content/uploads/2011/10/Automation-Cartoon-1.jpg]

Questions?

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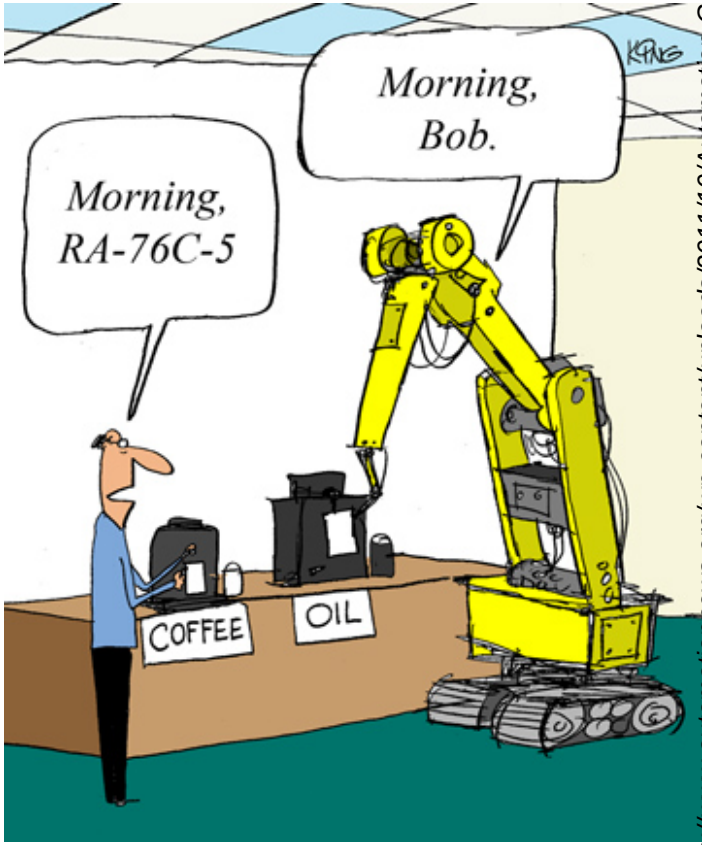

[http://www.automationnews.org/wp-content/uploads/2011/10/Automation-Cartoon-1.jpg]