


ARL

Causes and Factors of Stylistic Differences in Human-Robot Dialogue

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Motivation

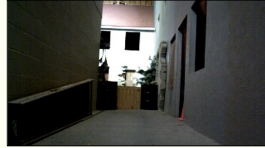
- Analytic understanding of **stylistic differences** and **their possible causes** in human-robot dialogue to influence an adaptable dialogue policy sensitive to individual and situational differences.
- Define a **taxonomy** of styles and **examine taxonomy** in unconstrained human-robot instruction-giving dialogue (Wizard-of-Oz) [2].

See our "ScoutBot" demo at ACL!

Verbosity Style defined as the number of words per instruction

Lower Verbosity

Take pictures in all four directions
 Executing... Done



Higher Verbosity

Robot face north, take a picture, face south, take a picture, face east, take a picture
 Executing... Done

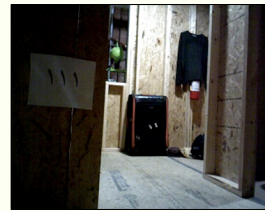


Instruction Structural Style defined as number of intents per instruction

Minimal Structure

Go through the other door
 Executing... Done

Take a picture
 Executing... Done



Extended Structure

Face your starting position and send a picture
 Executing... Done



Hypotheses, Results, & Future Work

Hypothesize relationships between style and miscommunication, individual differences, trust, and experience

Miscommunication

Miscommunication taxonomy [1] applied to *user* utterances:

— **Response-Level:** Missing Information, Unclear

Go to the wall behind you, face north, and then take a picture
 Unclear

Do you want me to back up to the wall behind me, or turn to go to it?



— **Environment-level:** Ambiguous, Impossible, Capabilities

Can you move forward to take a picture of the object
 Ambiguous

I'm not sure which object you are referring to.



Hypotheses

H₁ : Rate of miscommunication is related to verbosity

H₂ : Rate of miscommunication is related to structure

Results

Verbosity not significantly correlated with miscommunication.
 For Minimal, miscommunications significantly more likely Ambiguous.
 For Extended, miscommunication tend to be Unclear.

Future Work

Analyze substance of instructions to uncover if content is a factor.
 Turn-by-turn analysis to understand *where* style shift occurs, and *why*.

Style and Trust

40-question Trust Perception Scale-HRI [3]

Hypotheses

H₅ : Trust in the robot is related to verbosity

H₆ : Trust in the robot is related to structure

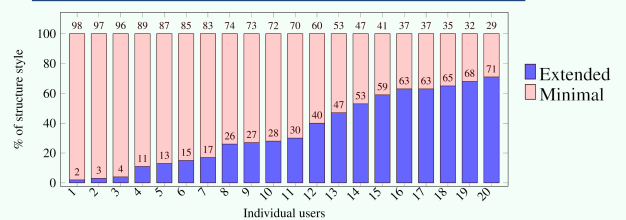
Results

Higher trust significantly related to higher verbosity.
 Nonsignificant trend for higher trust with more Extended use.

Future Work

If the users' trust in the robot is gauged during an interaction, the system can expect adjustments to verbosity and structure, and appropriate feedback can be provided.

Style and Individual Differences



Hypotheses

H₃ : Individual users differ in verbosity

H₄ : Individual users differ in structure use

Results

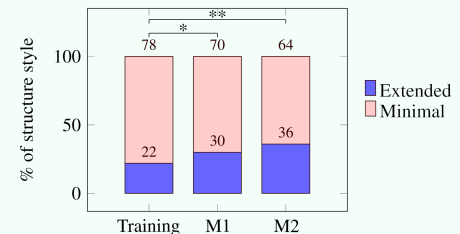
Users differ in verbosity and in structure.

Future Work

Explore influence of introspection, personality, perspective-taking.

Style and Time & Experience

Users participated in three trials with the robot



Hypotheses

H₇ : Time/experience with the robot is related to verbosity

H₈ : Time/experience with the robot is related to structure

Results

Significant increase of verbosity from Training to M1 and M2.
 Significant increase of Extended use from Training to M1.

Future Work

Understanding of interaction time or experience effects could better support changes of styles that emerge with repeated interactions.

References

- [1] Higashinaka et al. 2015. "Towards Taxonomy of Errors in Chat-oriented Dialogue Systems". SIGDIAL.
- [2] Marge et al. 2017. "Exploring Variation of Natural Human Commands to a Robot in a Collaborative Navigation Task". Workshop on Language Grounding for Robotics.
- [3] Schaefer. 2016. "Measuring Trust in Human Robot Interactions: Development of the 'Trust Perception Scale-HRI'". Robust Intelligence and Trust in Autonomous Systems.