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Causes and Factors of Stylistic Differences in Human-Robot Dialogue

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See our "ScoutBot" demo at ACL!

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].
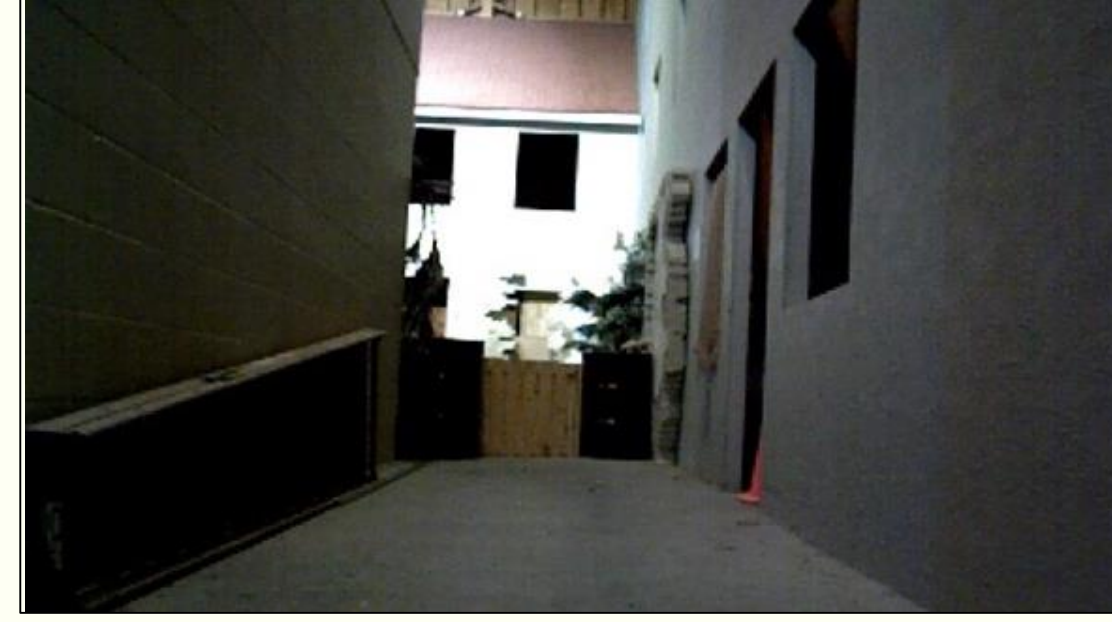
Verbosity Style defined as the number of words per instruction

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

H_1 : Rate of miscommunication is related to verbosity
H_2 : 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 Individual Differences

Hypotheses

H_3 : Individual users differ in verbosity
H_4 : 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 Trust

40-question Trust Perception Scale-HRI [3]

Hypotheses

H_5 : Trust in the robot is related to verbosity
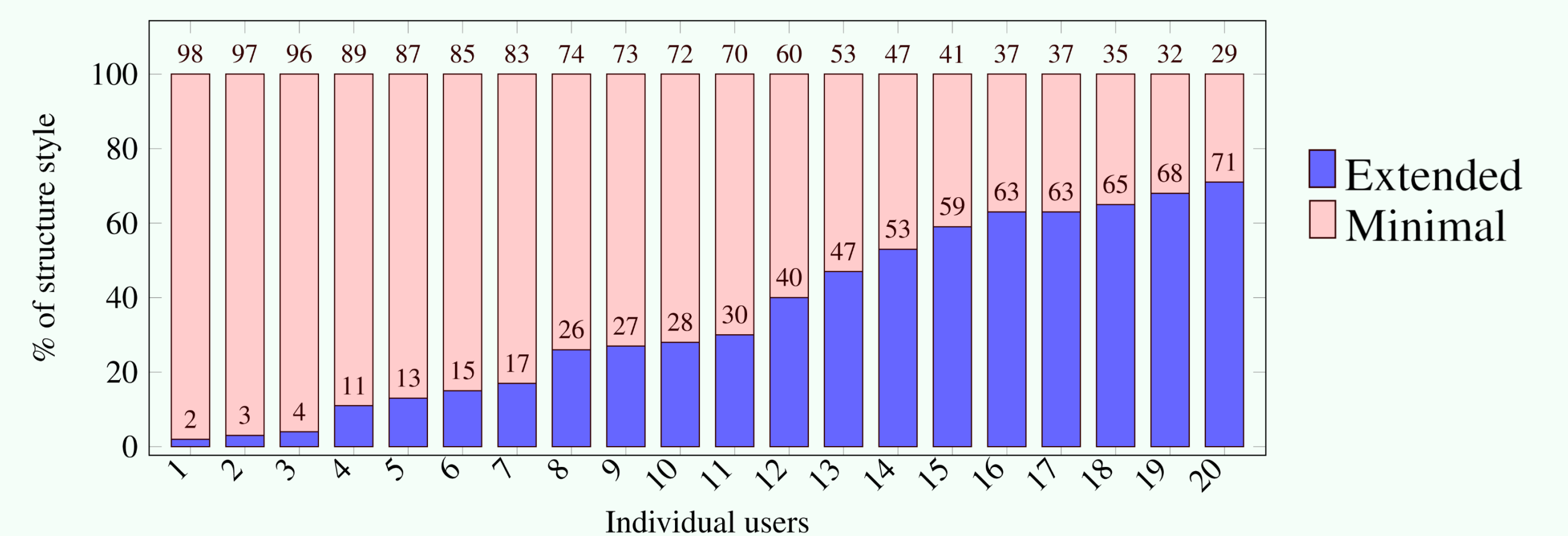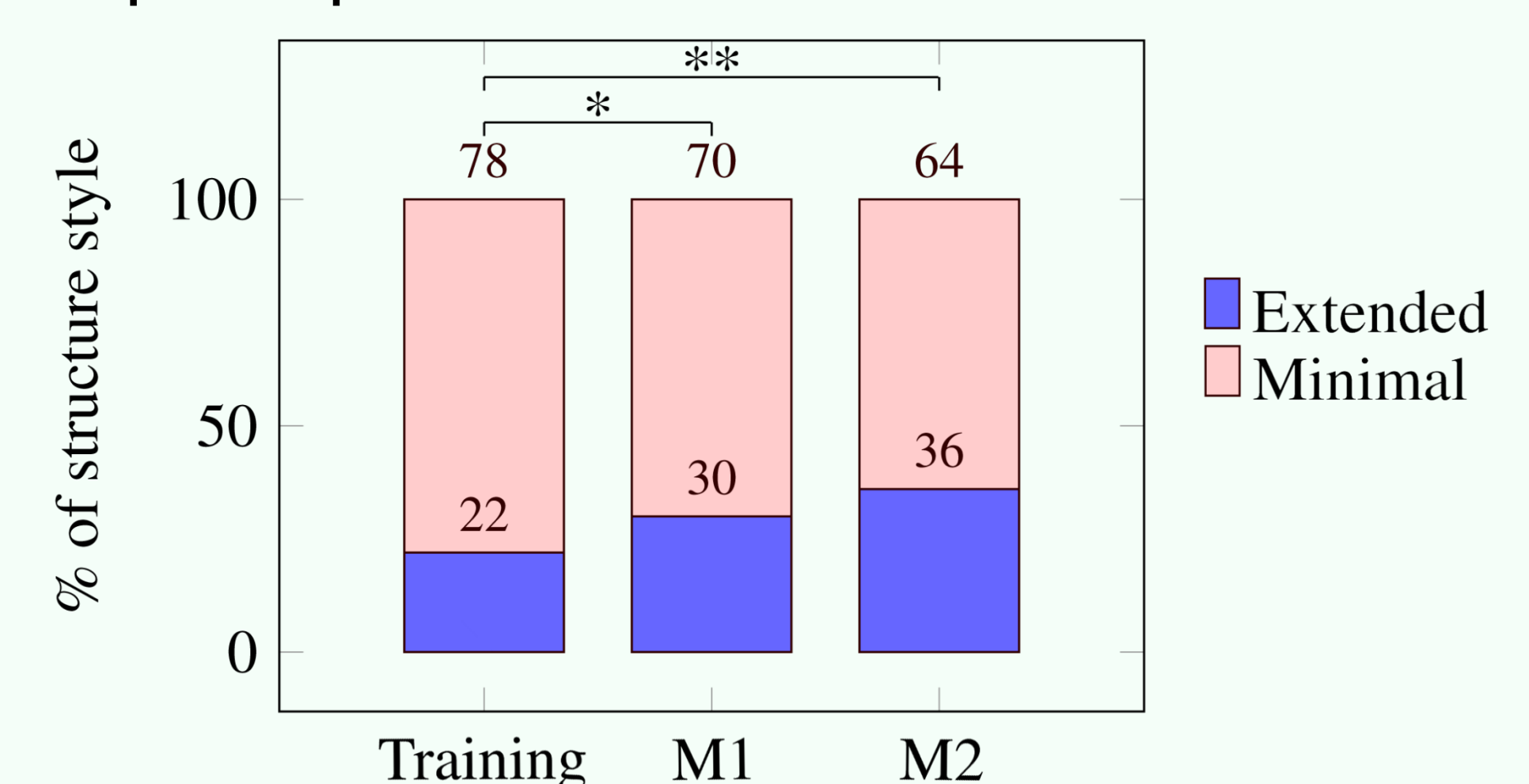H_6 : Trust in the robot is related to structure

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 Time & Experience

Users participated in three trials with the robot

Hypotheses

H_7 : Time/experience with the robot is related to verbosity
H_8 : 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.