U.S. ARMY RDECOM®

Overview

- We examine **dialogue overlap** in a corpus of humanrobot interactions
- Compared to speech overlap, dialogue overlap is at a much higher level; can cause ambiguity re: topics
- This is a natural feature of human conversation
- Robots will need to **replicate** human conversational timing and handle complex dialogue overlap cases

Definitions

- **Transaction units (TU)** : all utterances that roughly comprise one topic in a dialogue
- **Dialogue overlap:** when two or more TUs are active simultaneously, i.e. new TU begins before old TU ends

Domain and Data

- Wizard-of-Oz study: human and remote "robot" collaborate in physically situated search-and-nav task
- Dialogue Manager (DM) communicates on two floors, **mediating** btwn the Commander and Robot Navigator

Dialogue without Overlap



Faster Pace in Human-Robot Dialogue ARL USC Institute for Creative Technologies Leads to Fewer Dialogue Overlaps

Cassidy Henry, Carla Gordon, David Traum, Stephanie M. Lukin, Kimberly A. Pollard, Ron Artstein, Claire Bonial, Clare R. Voss, Ashley Foots, and Matthew Marge

Types of Overlap in Human-Robot Dialogue

There are two types of dialogue overlap observed in our data: single and multi utterance overlap.





- trials and working towards full coverage
- but less structural overlap

20 participants; ~20 hours of audio; 3,573 CMD utterances 5,154 DM utterances 2,727 RN utterances

Dialogue Overlap Analysis

	Free Response	GUI	p
Total TUs	919	1202	
All Overlaps	259 (28%)	234 (20%)	0.010
Single Utt. Overlap	164 (18%)	166 (14%)	0.004
Multi-Utt. Overlap	95 (10%)	68 (6%)	0.004

- Majority of overlaps were single utterance (~67%; 330)
- Remaining cases are more complex
- GUI condition resulted in significant reduction in overlaps overall
- utterance overlaps in the GUI condition

RN

system behaviors

Conditions

• Compared freely typed (free response) replies vs replies constructed using a GUI designed for the experiments • GUI created by compiling responses from free response

• GUI condition \rightarrow faster pace (more utterances and TUs)

Corpus Statistics

• Contained 2,121 TUs and 493 instances of overlap

• Multi-utterance overlaps decrease faster than single

• Suggests the faster pacing of dialogue in GUI condition reduces the number of dialogue overlaps

Conclusion

• Results show *faster paced dialogues* reduced TU overlap • Understanding overlap can help shape *future automated*

APPROVED FOR PUBLIC RELEASE // DISTRIBUTION UNLIMITED