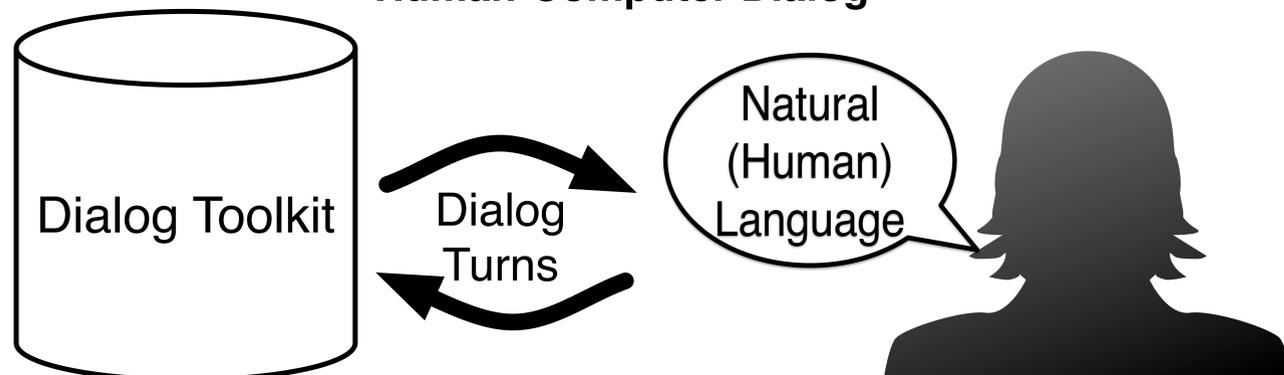




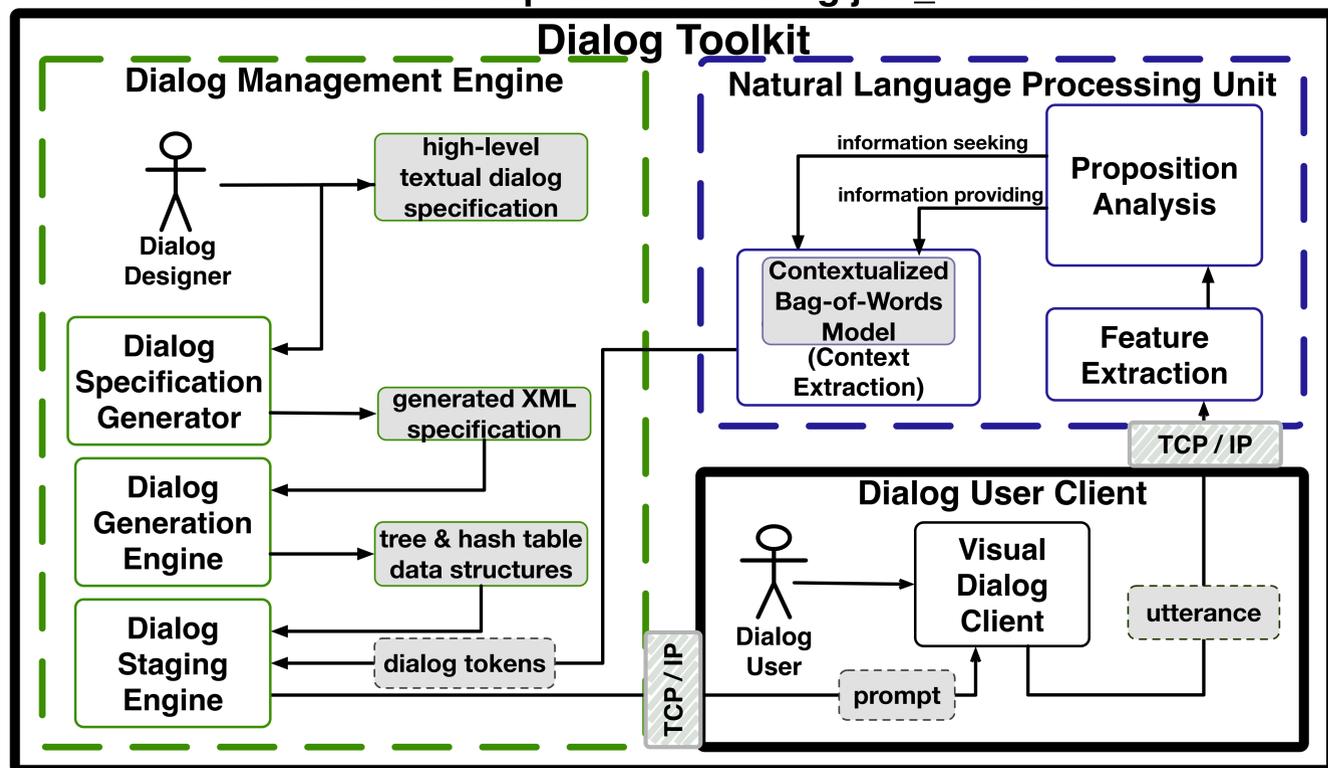
Human-Computer Dialog



Abstract

Specification and implementation of flexible human-computer dialogs is challenging because of the complexity involved in rendering the dialog responsive to a vast number of varied paths through which users might desire to complete the dialog. To address this problem, we developed a toolkit for modeling and implementing task-based, mixed-initiative dialogs based on metaphors from lambda calculus. Our toolkit can automatically operationalize a dialog that involves multiple prompts and/or sub-dialogs, given a highlevel dialog specification of it. Our current research entails incorporating the use of natural language to make the flexibility in communicating user utterances commensurate with that in dialog completion paths.

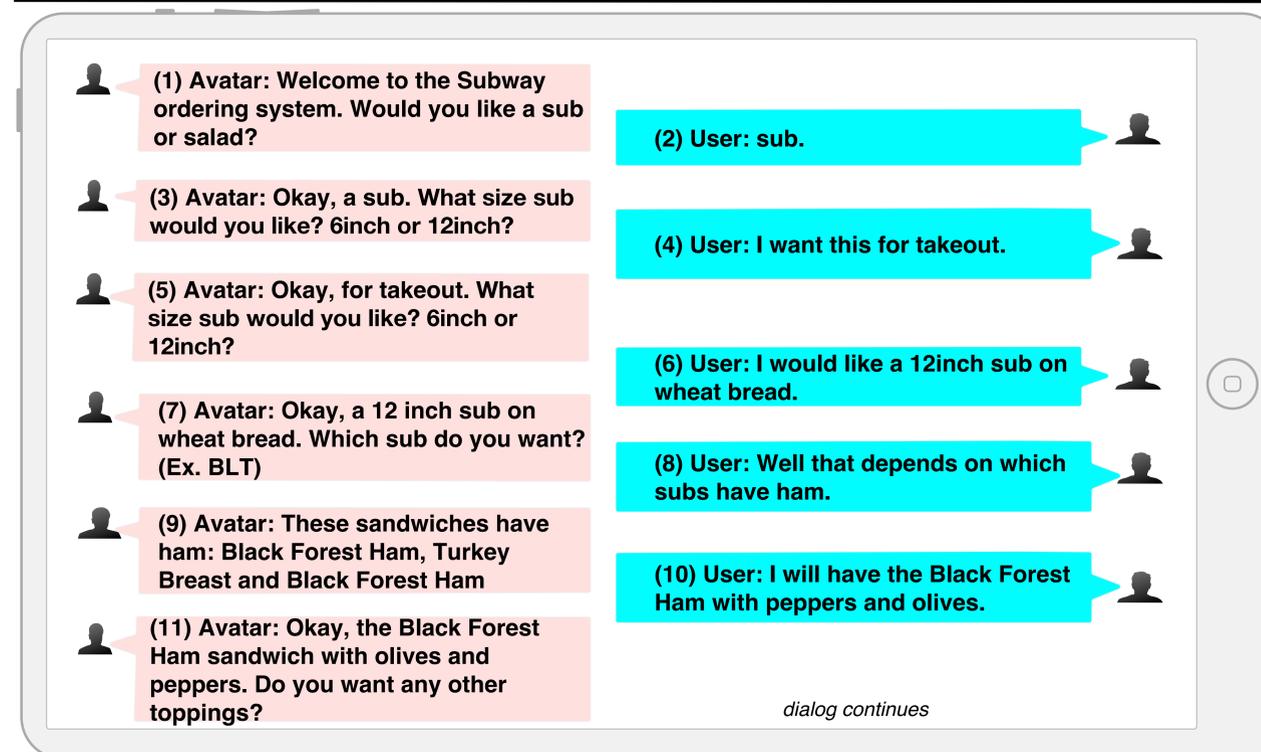
Available at: https://bitbucket.org/jwb_research/



References

- [1] Manning, C., Surdeanu, M., Bauer, J., Finkel, J., Bethard, S., and McClosky, D. (2014). The Stanford CoreNLP Natural Language Processing Toolkit. *In Proceedings of the 52nd Annual Meeting of the Association for Computational Linguistics: System Demonstrations*, pp. 55-60.
- [2] Berg, M.M. (2014). Modelling of Natural Dialogues in the Context of Speech-based Information and Control Systems (Ph.D. Thesis). University of Kiel.
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		Degree of Natural Language	
		no NL	complete NL
Degree of MII	fixed	voice commands	Siri, Alexa, Google Now Stanford CoreNLP [1]
	mixed	our prior work [3]	NADIA [2] OUR CURRENT WORK [4]



Motivation and Results: Enabling Naturalistic Dialog

- The Subway dialog above illustrates a human-computer mixed-initiative interaction that, due to the complexity and variability of the dialog, is not possible to realize with other dialog systems today. Trying to mix even 3 questions results in 8191 possible unique dialog interactions.
- Line (1) starts with a simple prompt for sub or salad and (2) shows the user responding directly to the prompt. This is the extent of flexibility (completely fixed) of most dialog systems today.
- Line (3) shows the system soliciting for the next item in a script, sandwich size, but in (4), the user responds to a different but forthcoming solicitation for takeout. This out-of-turn interaction is a form of mixed-initiative interaction (MII) where the user and the system engage as equal participants in dialog.
- In (5), the system again solicits for the unanswered sandwich size and in (6), the user responds with a size and specifies the type of bread desired, completing another forthcoming solicitation for bread type. This illustrates a form of MII where the user provides information for more than one solicitation in a single utterance.
- Line (7) Shows the system accepting the user information from (6), and asking which specialty sandwich the user wants. In line (8), rather than providing information to the system, the user seeks information from the system, i.e., which specialty sandwiches have ham.
- In (9), the system has successfully understood the user request for information and has provided the specialty sandwiches with ham. The user chooses one of the items with ham and also specifies the toppings peppers and olives.
- Line (11) shows the system accepting the user information and asking if the user wants any additional toppings.
- Our dialog toolkit supports all of these forms of mixed-initiative interaction.