

# DISCUS: a dialogue simulation and context update system

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In this abstract we present DISCUS (Dialogue Simulation and Context Update System), a research tool for simulating dialogues between a user and a system in terms of context update of the system's information state. DISCUS has been developed to test an algorithm for context updating, that builds on Dynamic Interpretation Theory (DIT), (Bunt, 2000). In DIT, meanings of dialogue utterances are viewed as intended context-changing effects that are determined by the dialogue act(s) being performed with the utterance. Dialogue acts in DIT are organized in a multidimensional dialogue act taxonomy (Bunt, 2006). DIT establishes four levels of understanding, that reflect the extent to which an utterance has been processed successfully by the Addressee: *perception*, *interpretation*, *evaluation*, and *execution*. The processing levels are also reflected in the dialogue act types in the auto- and allo-feedback dimensions.

The starting point for the model for context update are the preconditions of the dialogue acts, which represent the motivation and ability for an agent to perform a dialogue act. The preconditions are specified in terms of properties of the information state of the speaker. The model makes explicit how every dialogue act contributes to changing the information state, it defines the types of effects that an utterance provokes in dialogue participants, and it establishes the operations that cause the change of state in the context (Keizer and Morante, 2006). Additionally, the model can determine when information has been grounded.

The primary use of the tool is to simulate the update of the context model of a dialogue system participating in a dialogue with a user. As the update algorithm itself assumes dialogue acts as input, the tool abstracts away from the processes of natural

language understanding and generation. That is, both system and user utterances are represented in terms of dialogue acts, except for user utterances for which the system's level of processing reached is too low: processing problems on the levels of interpretation or perception will prevent the system from being able to associate the utterance with a dialogue act.

The functionality of the tool consists in: 1) allowing the researcher to simulate dialogues between a dialogue system (S) and a user (U), and 2) automatically updating the system's context model by applying the algorithm, and presenting it on the screen.

The interface of the tool (see Figure 1 for a screenshot) allows the researcher to specify system utterances in terms of dialogue acts and user utterances in terms of the level of understanding reached by the system and, provided that level is interpretation or execution, a dialogue act.

The components in the bottom part of the GUI can be used to specify the speaker of the utterance simulated, the system's understanding level reached (in case of a user utterance), a literal text representation of the utterance, and the communicative function (CF) and semantic content (SC) of the dialogue act performed in the utterance. At this moment, the SC is specified in a rather simplistic way by means of at most four slots, in which the parameters for the SC can be specified, depending on the CF. For example, the SC of a dialogue act with CF YN-QUESTION is specified with one parameter, representing the proposition the question is about: "will it rain tomorrow?" is represented as YN-QUESTION(*rain\_tomorrow*); a dialogue act with CF WH-QUESTION requires two parameters, representing the property the

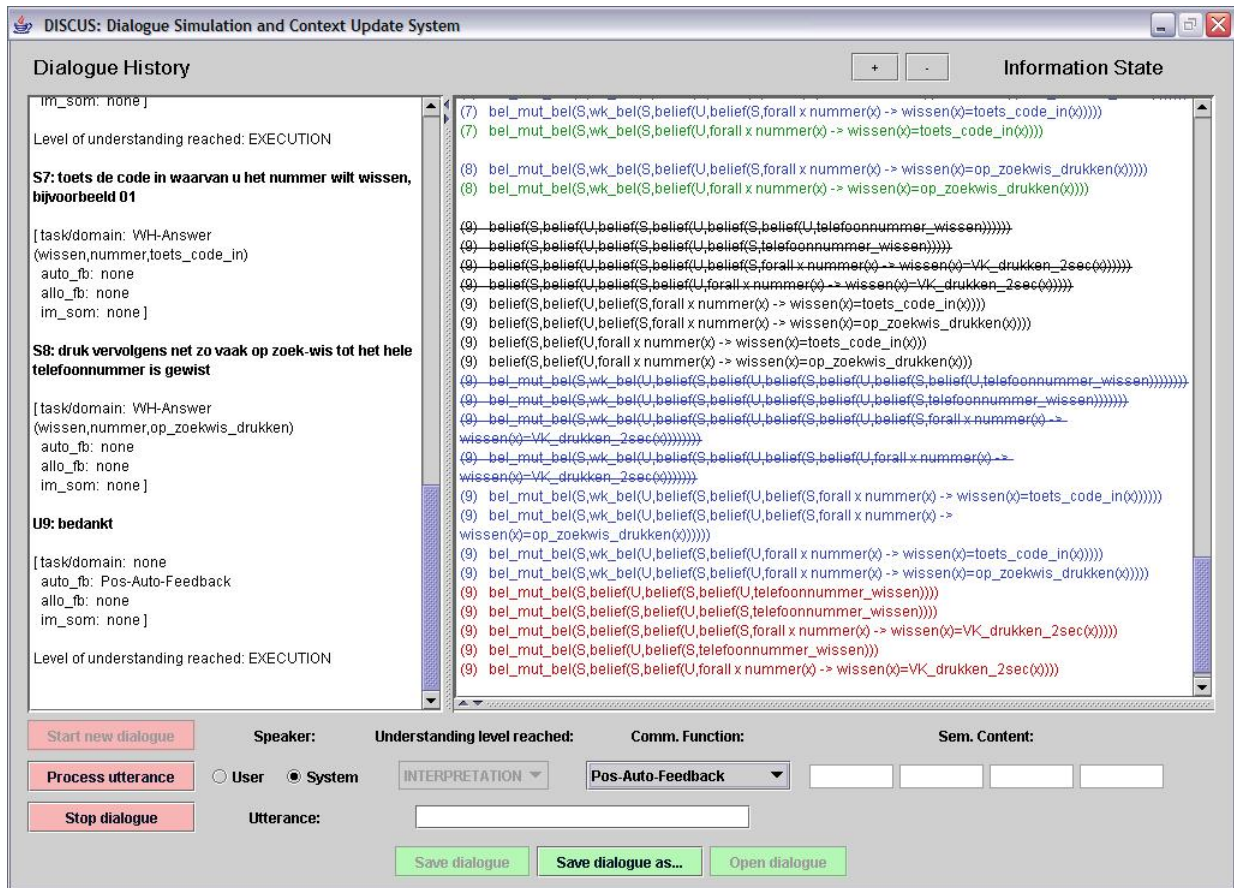


Figure 1: DISCUS Graphical User Interface.

value of which is asked for and the entity to which the property applies: “When does the train to Berlin leave?” is represented as WH-QUESTION(depart\_time, train\_Berlin).

The text panel in the top left part of the GUI displays the simulated dialogue (Dialogue History). For each utterance in the dialogue the literal utterance and speaker (S or U), the dialogue act information along four dimensions, and in case of user utterances, the processing level reached by the system, are indicated.

The text panel in the top right part of the GUI displays the beliefs and goals in the context model (Information State). The various kinds of beliefs (beliefs about understanding, adopted beliefs, beliefs about mutual beliefs about understanding and adoption, and strengthened beliefs) are displayed in different colors; cancelled beliefs get a ‘strikethrough’ font. The information state panel can also be split in two, allowing to show any pending beliefs.

Besides using the GUI components to simulate dialogues and monitor the context model, the en-

tered simulations can also be saved to file in an XML-format. Upon opening existing simulations, the context model is regenerated. In this way, a fixed set of simulations, covering a wide range of dialogue act patterns, can be used to efficiently test different context update models.

## References

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