GoDiS and the Dialogue Move Engine Toolkit*

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1 Introduction

A Dialogue Move Engine is the part of a dialogue system responsible for updating the systems information state according to dialogue moves performed by the participants of a dialogue, and for generating appropriate moves to be performed by the system itself. In the TRINDI project, a toolkit for building and experimenting with dialogue move engines and information states is being developed. Apart from a general system architecture, the toolkit also specifies formats for defining information state update rules, dialogue move selection rules, dialogue moves and associated algorithms, and provides a set of tools for experimenting with different information states, rules, and algorithms. Simple intepretation, generation, input and output modules are also provided. To build a dialogue system, one needs to provide definitions of rules, moves and (optionally) algorithms, as well as the structure of the dynamic information state (DIS).

One may also add inference engines, planners, plan recognizers, dialogue grammars, dialogue game automata etc., which can then be used as resources by the DME.

2 General architecture

The general architecture we are assuming is shown in Figure 1.

The central components in the architecture are the following:

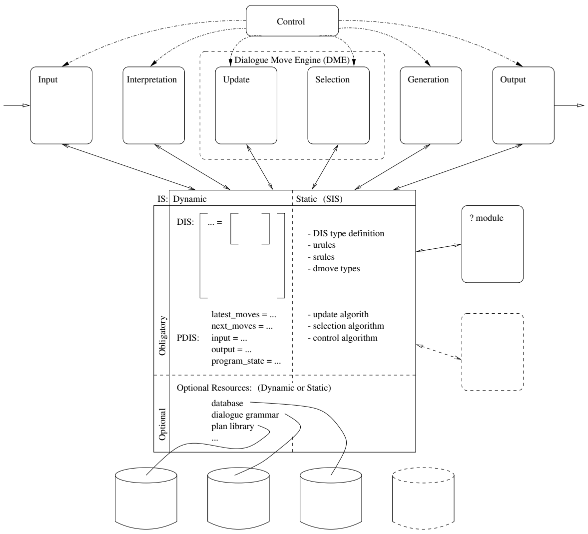

Figure 1: General DME Architecture

Information State

- Static Information State (SIS). Contains (at least) u-rules (rules for updating the DIS), s-rules (rules for selecting d-moves, dialogue move definitions, DIS type definition, and algorithms for the update, selection and control modules
- Dynamic Information State (DIS)
- Provided Dynamic Info State (PDIS) (toolkit reserved variables, accessible by U-Rules and S-Rules)
- Additional Resources

Modles

- Update module: Applies update rules to the DIS according to the update engine algorithm
- Selection module: Selects d-move(s) using the selection rules and the move selection algorithm. The resulting moves are stored in the

*We are grateful to the members of the TRINDI and SDS projects for clarifying discussion relating to this research. Work on this paper was supported by TRINDI (Task Oriented Instructional Dialogue), EC Project LE4-8314, SDS (Swedish Dialogue Systems), NUTEK/HSFR Language Technology Project F1472/1997 and INDI (Information Exchange in Dialogue), Riksbankens Jubileumsfond 1997-0134.

$$
\begin{bmatrix}
\text{private} & : & \begin{bmatrix}
\text{plan} & : & \text{List(Action)} \\
\text{agenda} & : & \text{Stack(Action)} \\
\text{tmp} & : & \begin{bmatrix}
\text{bel} & : & \text{Set(Prop)} \\
\text{qud} & : & \text{Stack(Question)} \\
\text{lm} & : & \begin{bmatrix} \text{speaker} & : & \text{Speaker} \\ \text{move} & : & \text{Move} \end{bmatrix}
\end{bmatrix}
\end{bmatrix} \\
\text{shared} & : & \begin{bmatrix}
\text{bel} & : & \text{Set(Prop)} \\
\text{qud} & : & \text{Stack(Question)} \\
\text{lm} & : & \begin{bmatrix} \text{speaker} & : & \text{Speaker} \\ \text{move} & : & \text{Move} \end{bmatrix}
\end{bmatrix}
\end{bmatrix}
$$

Figure 2: Information State Type

DIS. The update engine and the selection engine together make up the dialogue move engine.

- Control module: wires together the other modules, either in sequence or through some asynchronous mechanism.

All resources (including DIS, PDIS and SIS) are viewed and defined as abstract datatypes, i.e. by a set of conditions and operations applicable to them. This provides a uniform way of integrating diverse resources in a dialogue system. Rule definitions include a set of preconditions (conditions on datatypes) and a set of effects (operations on datatypes). DIS, PDIS and SIS can all be checked by conditions in u-rules and s-rules (and by modules). Only the dynamic resources (DIS and PDIS) can be changed by updates in the rules.

3 GoDiS

GoDiS (Gothenburg Dialogue System) is an experimental dialogue system built using the DME toolkit. It uses simple default algorithms for the control, update and selection modules, as well as for input, interpretation, generation and output.

The notion of information state we are putting forward here is basically a modified version of the dialogue game board which has been proposed in (Ginzburg(1996)). We represent information states of dialogue participants as records of the type shown in Figure 2.

The main division in the information state is between information which is private to the agent and that which is shared between the dialogue participants. The PLAN field contains a dialogue plan, i.e. is a list of dialogue actions that the agent wishes to carry out. The TMP field keeps track of shared information that has not yet been grounded. QUD is a stack of questions under discussion. These are questions that have been raised and are currently under discussion in the dialogue.

The update rules include rules for question and plan accommodation, as well as rules for handling grounding and rules for integrating the latest move with the DIS. As an example, the u-rule for accomodating questions (which is necessary when the user answers a question that the system has yet to ask) is shown in (1). This rule allows the system to handle dialogue such as (2).

(1)
$$
\begin{array}{ll}
\textsc{u-rule}: & \text{accommodateQuestion} \\
\textsc{pre}: & \left\{\begin{array}{l}
\text{valRec(shared.lm.speaker, usr)} \\
\text{inRec(shared.lm.moves, answer(A))} \\
\text{emptyRec(shared.qud)} \\
\text{inRec(private.plan, raise(Q))} \\
\text{domain: relevant\_answer(Q, A)}
\end{array}\right. \\
\textsc{eff}: & \left\{\begin{array}{l}
\text{delRec(private.plan, raise(Q))} \\
\text{pushRec(shared.qud, Q)}
\end{array}\right.
\end{array}
$$

(2)
```
system> Welcome to the travel agency!
user  > flights to paris
system> From where do you want to go?
```

The text-based WWW demo of GoDiS allows inspection of the dynamic information state and the rules applied to it between each utterance in the dialogue.

References

Ginzburg, J. (1996). Interrogatives: Questions, facts and dialogue. In *The Handbook of Contemporary Semantic Theory*. Blackwell, Oxford.