

MAi : An Intelligent Model Acquisition Interface for Interactive Specification of Dialog Agents

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Abstract

The state of the art in automated conversational agents for enterprise (e.g. for customer support) require a lengthy design process with experts in the loop who have to figure out and specify complex conversation patterns. This demonstration looks at a prototype interface that aims to bring down the expertise required to design such agents as well as the time taken to do so. Specifically, we will focus on how a meta-writer can assist the domain-writer during the design process and how complex conversation patterns can be derived from simplifying abstractions at the interface level.

Designing Dialog Agents: State-of-the-Art

Current enterprise-level automated dialog agents require significant expertise, time and effort to build (Sreedhar 2018). The process usually requires domain experts to sit down with engineers to construct complex interaction patterns in the form of explicit dialog trees. This process quickly becomes intractable. Existing end-to-end solutions to chatbots, on the other hand, require little expertise to build (but a lot of data) and offer little to no control over the operational properties of the bot (Metz 2018). Further, the complexity and robustness of dialog patterns seen in such agents is quite limited.

Interactions on MAi

MAi attempts to address this problem in two ways, by –

- Reducing the expertise and effort required to specify a dialog agent by abstracting away key dialog components in the interface and providing iterative assistance during the design of the bot.
- Allowing the designer to examine the agent created by investigating the dialog tree generated in the backend or by directly chatting with it.

The key features of the interface are shown in Figure 1. The domain writer can choose to design an agent either using the panel in the middle or the one on the left. The former allows specification of the dialog model directly in terms of dialog actions, their realizations in implementation (determiners), context variables they operate on and their relationships between themselves. The latter allows specification of the

domain at a higher level of abstraction – i.e. in terms of the domain knowledge that the dialog is supposed to occur in. The key insight here is that procedural knowledge of the dialog process is largely (if not entirely) transferable across domains, and thus a generic dialog agent can be bootstrapped on given domain knowledge. The designer can, of course, interactively refine this model further based on the needs of that particular domain. We anticipate that this modeling paradigm will not only reduce the effort in building robust chatbots for enterprise use but also make the design process of chatbots more easily accessible to a wider range of users (and thus to a wider range of uses).

The attached video walkthrough of the interface touches upon three use cases that build upon these concepts.

Dialog Model Abstraction. The interface (middle panel) requires the domain-writer to specify what information the dialog agent would need to gather, and how (e.g. by asking versus looking up on the internet) and relationships among these variables, if any, in terms of pre/post-conditions of the actions. They can also specify if these actions need to have follow-ups (such as changing of the information or confirmation of the same in course of the dialog). The backend compiles this specification into two forms – one to be consumed by the implementation of the bot in terms of what endpoints to hit for executing an action, the other to be used by a non-deterministic planner that can orchestrate the dialog process. The domain-writer can also visually inspect the dialog tree generated at any point to better understand the dependencies in the domain and anticipate possible undesired dialog patterns or identify unmodeled constraints.

Bot in a Click. The interface (left panel) also allows the domain-writer to only specify the high-level features of the domain (in terms of tasks in it and dependencies among them) and generate a basic dialog agent directly from this. This mode of specification thus does not require any consideration of the dialog patterns but rather the domain in which the agent is going to converse. The domain-writer has the option of using this mode, or the previous one which required direct specification of dialog actions, or a mixture of both.

The Meta-Writer. The automated generation of the bot from the domain description is done by a “meta-writer” that casts the domain writing process as a planning problem. This

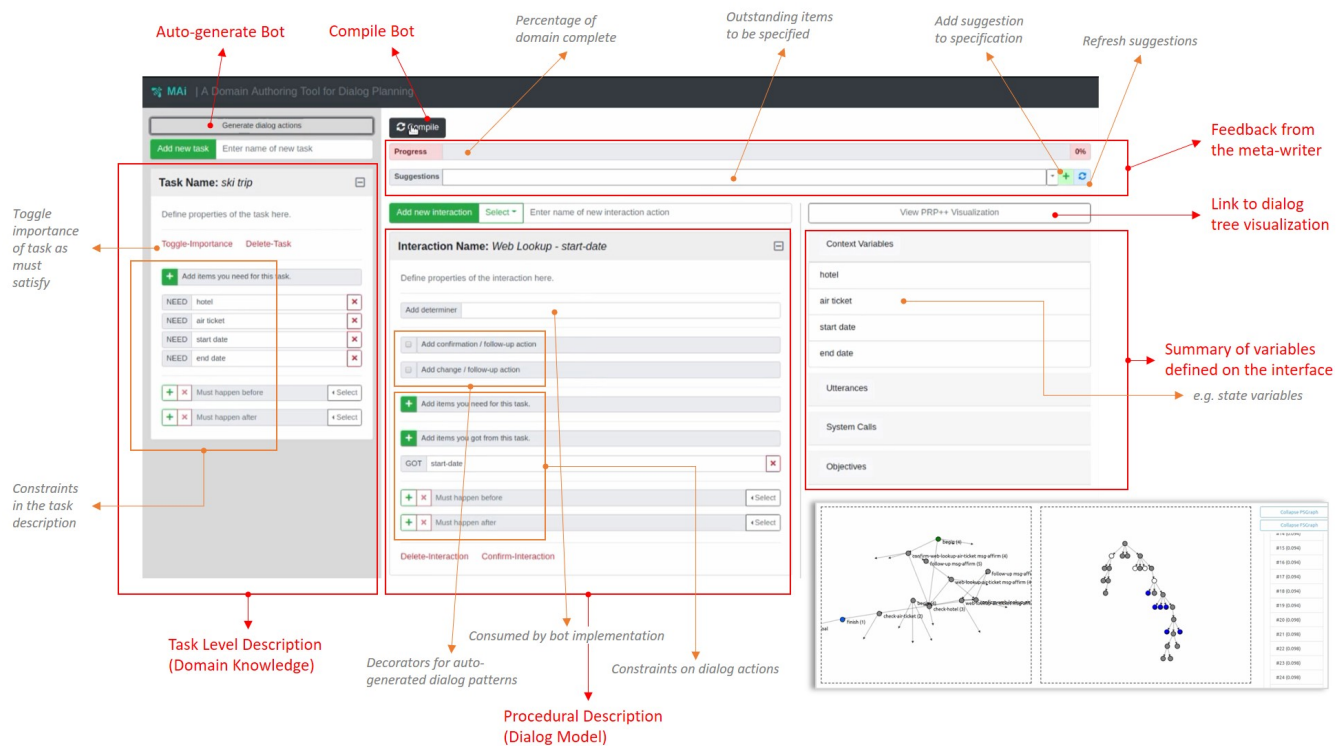


Figure 1: Different functionalities on MAi to aid in the bot specification process. Inset shows the dialog tree generated from the specification.

meta-problem models the minimum requirements of a dialog model given the nature of the domain specification and monitors for fulfillment of those basic requirements as the domain writer is constructing the bot, before the bot can be launched. If there are outstanding items to be modeled, it suggests possible dialog actions to the user who can directly add them into the model of the agent. The meta-problem is the same model that is being used to generate the “bot in a click” as described above by directly populating the model of the bot with its suggested actions and allowing the domain-writer to edit them interactively.

Backend Technologies

The AI components in the backend is primarily built around existing technologies from the planning community.

- The meta-writer uses (Ramirez and Geffner 2009) to compile the domain writer’s actions on MAi into observations that can be compiled into a meta-planning problem, as described before. It uses Fast-Forward (FF) (Hoffmann 2003) as the underlying planner.
- The execution model of the dialog agent itself is realized through a non-deterministic planning domain (Muise, McIlraith, and Beck 2012). This allows for modeling of complex dialog patterns and construction of large dialog trees in a declarative fashion. Details of this are outside the scope of this discussion.

Demonstration Outline

Demonstration participants will be able to:

- Specify a dialog agent from scratch;
- Interact with the MAi interface to iteratively refine the agent’s model;
- Visualize the complex dialog trees generated from the specification; and
- Interact / chat with the resulting bot.

A video of the model specification process is attached (<https://ibm.box.com/v/aaai-19-demo-mai>).

References

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