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OpenDial: A Toolkit for Developing Spoken Dialogue Systems with Probabilistic Rules

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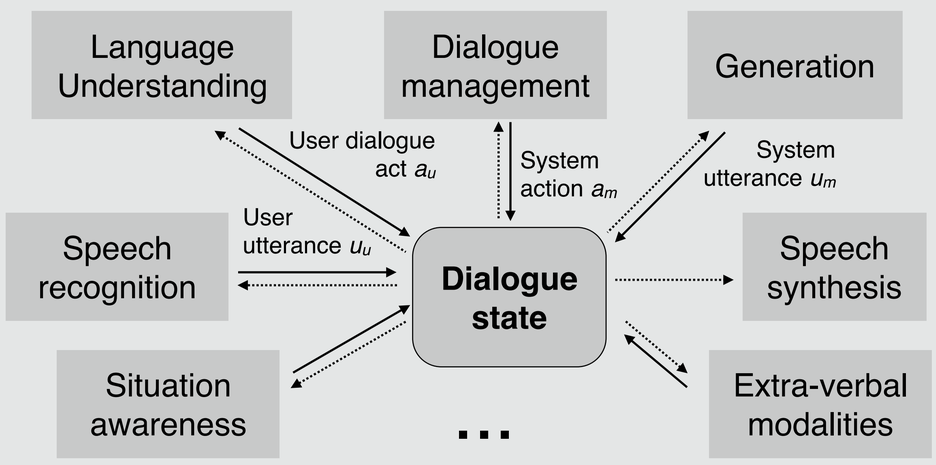
Dialogue modelling

- Hybrid, logical/probabilistic approach to dialogue modelling based on *probabilistic rules*
- The rules are structured as *if…then…else* constructions mapping logical conditions to probabilistic effects
- They can be used to express both conditional probability distributions and utility functions
- Each rule may contain unknown parameters (probabilities or utilities) to estimate from data via supervised or reinforcement learning
- The formalism provides an *abstraction layer* on top of classical probabilistic models
- **Benefits**: reduced size of parameter space, possibility to integrate expert knowledge into the domain models

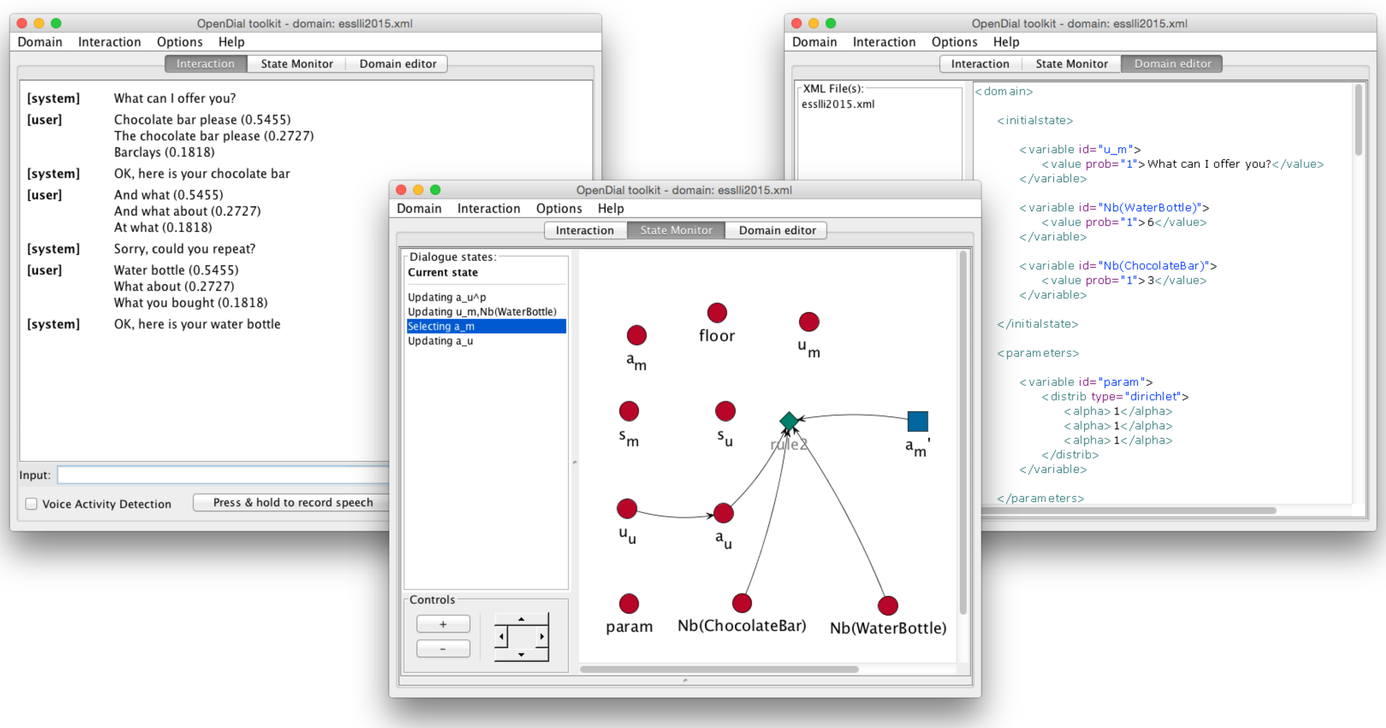
Architecture



- Blackboard design centered on the dialogue state (represented as a *Bayesian Network)*
- Dialogue domain (encoded in XML format) =
  1. initial dialogue state
  2. list of domain models (collections of rules)
  3. settings for the external modules

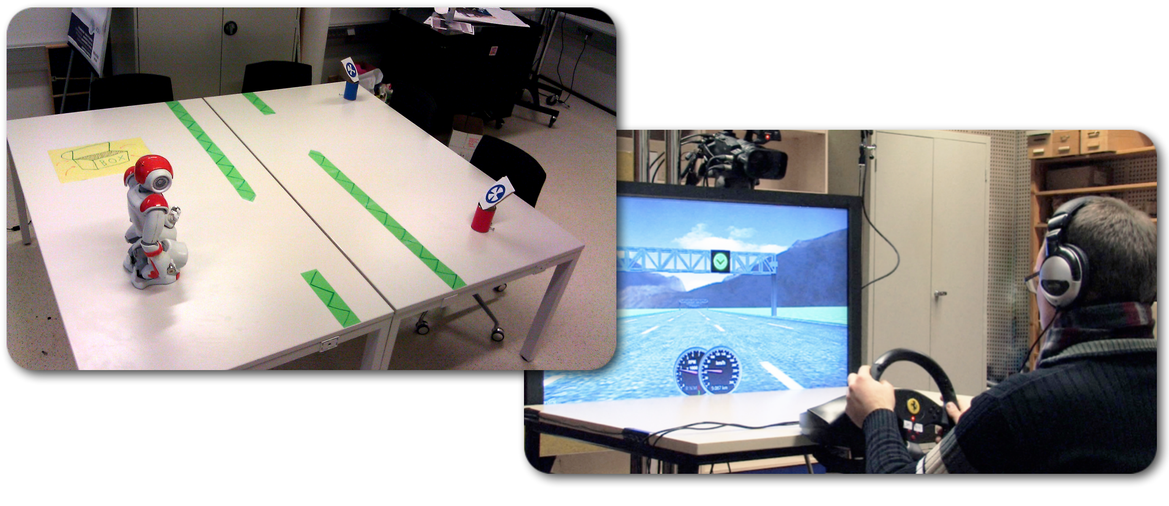
Implementation

- Developed in Java, released under an open-source license
- Efficient algorithms for exact & approximate inference, parameter estimation & forward planning
- User interface to develop, evaluate & monitor dialogue systems
- Plugins for external components (Nuance and AT&T Speech APIs, Sphinx, Mary TTS, MaltParser, etc.)



Application domains

- Experiments in human-robot interaction, with parameters learned from Wizard-of-Oz data (see Kennington et al, 2014, Lison 2015)
- Dialogue manager for a multimodal, in-car driver assistant (Kennington et al, 2014)
- Recently used in advanced courses on spoken dialogue systems in several universities



For details, see the toolkit website at
http://opendial-toolkit.net
[release packages, user docs, step-by-step examples]