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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

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.)

Architecture

Language Understanding

• 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

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]