

Argumentation for Reactive Reasoning

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Motivation

reactive Multi-Context Systems

- Plethora of formats and languages for Knowledge Representation, designed for specific needs of applications
- Nowadays information shall be divided through different applications (“connected worlds”)
- Multi-Context Systems (MCS): exchange knowledge between KR-formalisms
- in practice, many applications are provided with constant flow of information
- most KR-formalisms:
 - assume one-shot computations
 - do not reason over knowledge in a continuous manner

Abstract Dialectical Frameworks

- Dung’s Abstract Argumentation Frameworks (AFs) are widely used in argumentation
- Solutions found via Semantics of Argumentation frameworks also provide justifications for the results
- AFs are often criticised for the limitation to simple attacks
- Abstract Dialectical Frameworks (ADFs) generalise AFs and allow arbitrary relations between one argument and a set of parent arguments
- ADFs are a new formalism and many results already known for AFs need to be resolved for them (e.g. equivalences, realisability, minimal change, ...)
- Lack of tools for research and computation on ADFs

- Safety critical applications (e.g. health care, aeroplane controlling, ...)
- Need for on-demand computations and reevaluation
- Need for justifications of some decisions

Goals

Reactive Reasoning

- Generalisation of (managed) Multi-Context Systems
 - handling of continuous (infinite) streams of information
 - continuous reasoning (on-demand calculations)
- Field of application for other formalisms (e.g. ASP, SPARQL, Web-services, ...)
- Asynchronous variant of MCS (semantics for classical MCS are on a global level)
- Identify Properties for reactive MCS

Abstract Dialectical Frameworks

- Semantics revisions for ADFs
- Development of a software toolkit for ADF researchers and users (with ASP)
- Fundamental results
 - Realisation
 - Equivalence
 - Minimal change
 - Enforcing

- Embed ADFs into reactive MCS
- MCS to represent the ADF toolkit
- Real world example instantiations

Progress so far

- **reactive Multi-Context Systems**
 - Foundations for reactive managed Multi-Context Systems (ECAI 2014)
 - Foundations for asynchronous Multi-Context Systems (ReactKnow 2014)
- **Abstract Dialectical Frameworks**
 - Semantics Revised (IJCAI 2013)
 - Additional Fundamental results (Work in Progress)
- **DIAMOND**
 - **Dialectical Models Encoding**
 - ASP (Potassco clingo) based set of encodings, whose stable model results correspond to various ADF semantics
 - Provides additional tools like ADF subclass decisions, input format conversions, compute additional instance informations, ...
 - Utilize Python as a command line interface for more convenience

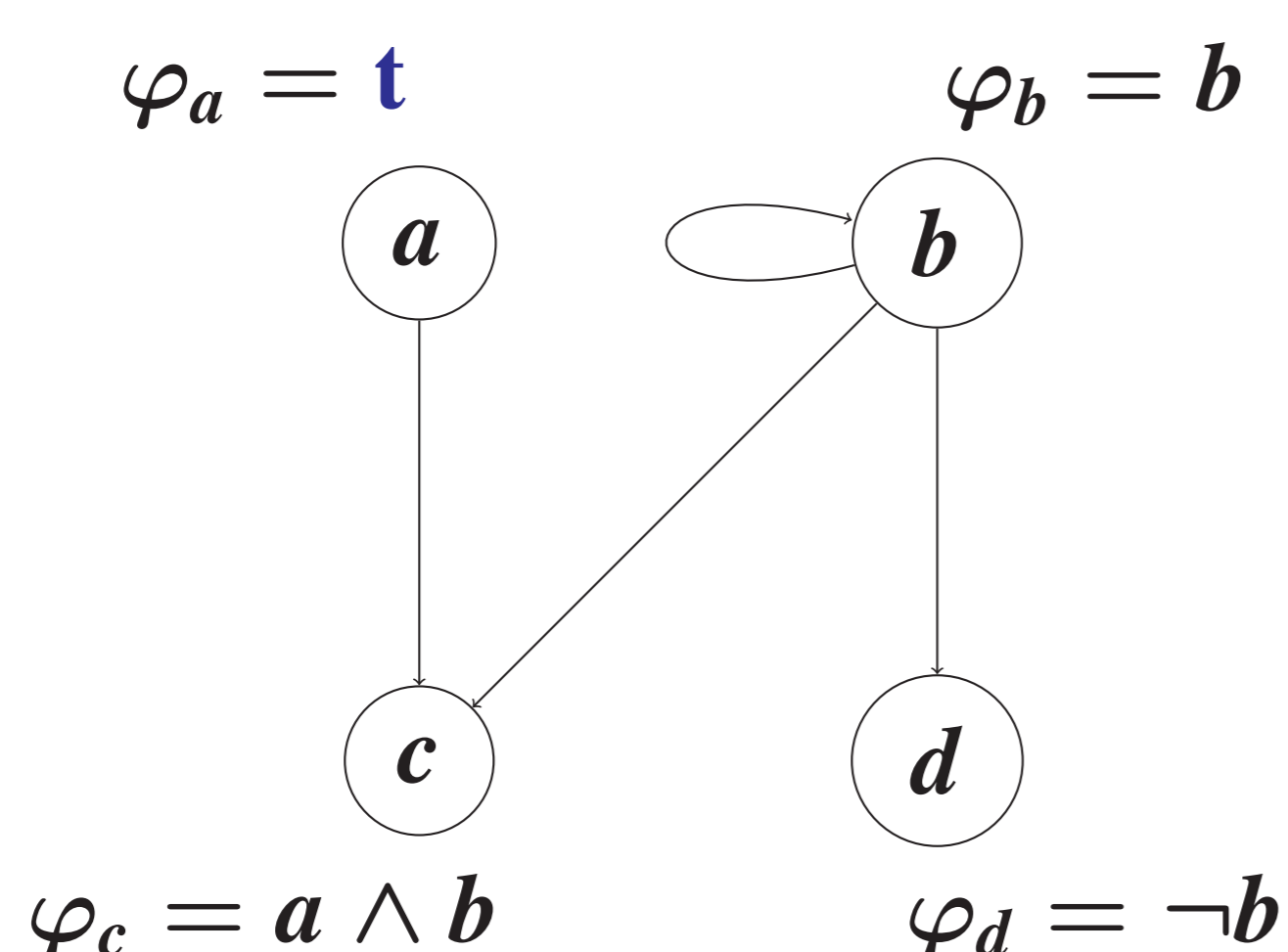


Figure: Example of an ADF

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