Abstract Argumentation Frameworks with Domain Assignments

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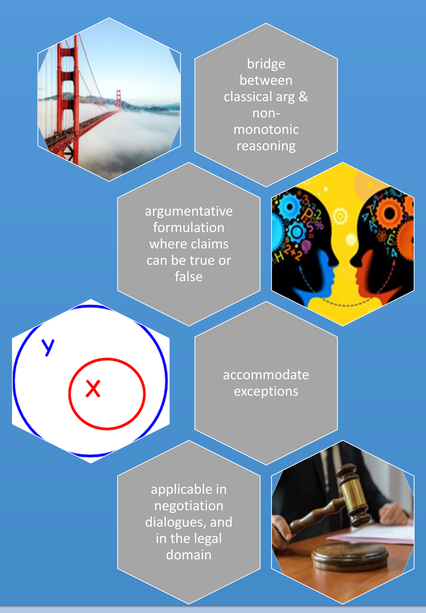
<A> bstract

- Argumentative discourse rarely consists of opinions whose claims apply universally. As with logical statements, an argument applies to specific objects in the universe or relations among them and may have exceptions.
- We propose an argumentation formalism that allows associating arguments with a domain of application.
- Appropriate semantics are given, which formalize the notion of partial argument acceptance.
- We show that our proposal is in fact equivalent to the standard Argumentation Frameworks of Dung but allows a more intuitive and compact expression of some core concepts of commonsense and non-monotonic reasoning.

<C> ontribution



<F> ramework

- To formalize the AAFD, we use **prior** and **posterior domain** of **application**.
- The **prior** domain of application ($\overline{D^u}$) **represents the elements** of the universe that the **argument applies to**.
- The **posterior** domain of application D^U **represents the elements** of the universe that the **argument can be accepted**.
- Attacks among arguments limit the applicability of the attacked argument.

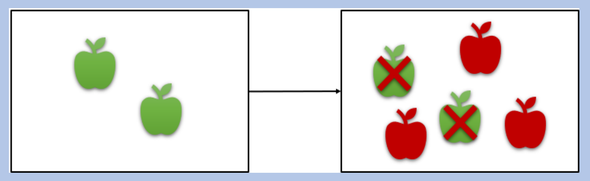
Definition: An AAFD is a triplet $\langle A, R, \overline{D^u}\rangle$, such that A is a set of arguments, $R \subseteq A^2$ is a binary relation among arguments, and $\overline{D^u}: A \rightarrow 2^U$ is the domain assignment of A to U.

<E> xample

Given $\langle A, R, \overline{D^u}\rangle$, $A = \{a, b\}$, and R= $\{(b, a)\}$.

$a =$ *"This fruit is an apple, and since apples are typically red this apple is red"*

$b =$ *"This apple is Granny Smith and Granny Smiths are green. Therefore, this apple is green"*



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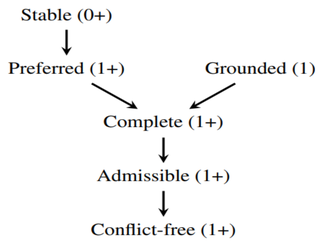


- **Complexity of AAFD:** Given an AAFD F $= \langle A, R, \overline{D^u}\rangle$. Set N_A, N_R, N_D, N_U the size of $A, R, \overline{D^u}$ and U, respectively. Then, $N_R = O({N_A}^2), N_D = O(N_A * N_U)$ and $|\mathrm{F}| = \mathrm{O}({N_A}^2 + N_A * N_U)$.

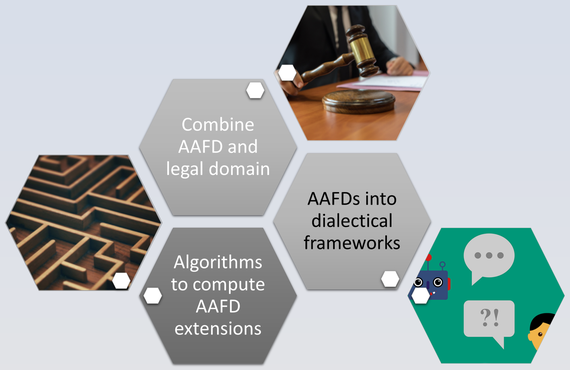
- **Natural Mapping (Φ_{nat})** of an AAFD to an AAF.

$U = \{x, y\}$, A $= \{a\}$, R $= \{(a, a)\}$, $\overline{D^U}(a) = \{x, y\}$, and $D^U(a) = \{x\}$.

- **Natural Mapping with Equivalences ($\Phi_{[nat]}$)** of an AAFD to an AAF.

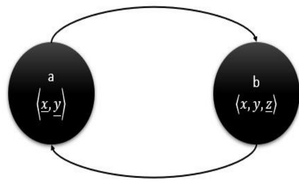
$U = \{x, y, z\}$, A $= \{a\}$, R $= \{(a, a)\}$, $\overline{D^U}(a) = \{x, y, z\}$, and $D^U(a) = \{x, y\}, x \sim y$.

<F> uture Work



- **Example (Extensions)** The AAFD below is *compliant, conflict-free, admissible, grounded, complete, preferred,* and *stable*.

$U = \{x, y, z\}$, A $= \{a, b\}$, R $= \{(a, b), (b, a)\}$, and $\overline{D^U}(a) = \{x, y\}$, $\overline{D^U}(b) = \{x, y, z\}$. Then, $D^U(a) = \{x, y\}$ and $D^U(b) = \{z\}$.



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