Toward Consistent Agreement Approximation in Abstract Argumentation and Beyond

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Motivation

Often, it is not possible to achieve full agreement among different stakeholders. Partial agreements are more realistic and sufficient (example: strategic stakeholder alignment in software development organizations). Hence, formal foundations of agreement technologies (i.e., formal argumentation dialogues) should support approximating agreements.

Research Questions

1. How can a set of agents determine to what degree they are agreeing on a topic (set of arguments)?
2. How do an agent’s subjective value preferences affect the degree of agreement on a topic?
3. How can an agent evaluate the reliability of another agent’s inference process w.r.t. the maintenance of a previous approximated agreement?

Abstract Argumentation

Consider the concepts sketched out to the right. We have the following agreement scenario:

- Our argumentation framework $AF_1$ is the one displayed by Figure 1.
- Our topic set is \{a, b, c\}.
- We have three agents $A_0$ (stage semantics), $A_i$ (preferred), and $A_3$ (grounded).

Stage/preferred/grounded extensions of $AF_1$: \{\{a, b, c\}\}/\{\{b, c\}\}/\{\{\}\}.

The minimal/mean/median degrees of satisfaction and agreement are $\frac{1}{3}$/$\frac{2}{3}$/$\frac{1}{3}$.

The minimal/mean/median degrees of agreement is:

<table>
<thead>
<tr>
<th>Agent</th>
<th>Minimal</th>
<th>Mean</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>b</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>c</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 1: Degrees of satisfaction.

Value-Based Argumentation

Consider the concepts sketched out to the right. We have the following agreement scenario:

- Our argumentation framework $AF_2$ is the one displayed by Figure 2.
- Instead of different semantics we have different value preference: we have preferred semantics, the values $a_v$, $b_v$, $c_v$, $d_v$ and each argument $arg$ is mapped to $arg_v$. The value preferences of our three agents are as follows. $A_0$: $a_v$ is preferred over $b_v$; $A_1$: $b_v$ is preferred over $a_v$; $A_2$: $c_v$ is preferred over $d_v$.
- Our topic set is \{a, b, c, d\}.
- The agents’ subjective extensions are as follows. $A_0$: \{a, d\}; $A_1$: \{b, d\}; $A_2$: \{a, c, d\}.
- The minimal/mean/median degrees of agreement are: $\frac{1}{3}$/$\frac{2}{3}$/$\frac{1}{3}$.
- The impact of value $b_v$ on the minimal/median/mean degrees of agreement is: $\frac{1}{3}$/$\frac{2}{3}$/$\frac{1}{3}$.

Theoretical Analysis. When normally expanding agreement scenarios, we prove suprema for changes in the degree of minimal agreement, given a semantics satisfies any relaxed monotony principle, and given some constraints to the change that is introduced by the normal expansion.

Implementation: http://s.cs.umu.se/mhfrcp

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