Preordered Norms in Formal Argumentation

Dustin Tucker[1] [0000−0003−0324−4441]

Colorado State University, Fort Collins, CO 80523, USA
dustin.tucker@colostate.edu
https://sites.google.com/site/dusttuck/

1 Extended Abstract

Beishui Liao, Nir Oren, Leendert van der Torre, and Serena Villata [2] show how to embed three approaches to prioritized normative reasoning within a hierarchical abstract normative system, or HANS, and also that if the prioritization is a total ordering of the norms, then these three approaches are equivalent to three different Dung-style systems of formal argumentation [1]. The notion of a HANS is based on that of an abstract normative system, due to Tosatto et al. [6], which is in turn based on the input/output logic of Makinson and van der Torre [3]. Norms in these systems are represented by ordered pairs (ϕ, ψ), which are intended to capture the idea that ϕ is a reason, of some sort, for ψ. In an abstract system, ϕ and ψ are literals, while in a structured system, such as input/output logic, they are formulas.

The three approaches to prioritized normative reasoning Liao et al. consider are important, but the restriction to total orders is substantial. In this paper I prove analogous results for a different approach to prioritized normative reasoning, the reusable simple-minded output (or out_3) of input/output logic [3, 5], which requires merely that the prioritization of the norms be a preorder. This is a significant departure from the results of Liao et al., as preordered norms need not even form a hierarchy, as required by a HANS. That is, they need not be ranked: for norms x, y and z, we can have $x < y$ and $z \not< y$ while also having $x \not< z$.

I also depart from Liao et al. in the approach to argumentation I employ. We can understand input/output logic, and out_3 in particular, in terms of hypothetical reasoning, or reasoning about the choices one faces if one follows certain norms. This in turn can be understood in terms of the norms one chooses not to follow—in terms of the norms one violates. Thus, rather than endorsing an argument because it can defeat all its attackers, or something along those lines, as one does in a Dung-style framework, one instead endorses an argument because there are no arguments that violate a better set of norms, with the intended sense of "better" to be defined. I present a novel approach to argumentation that straightforwardly and perspicuously captures this sort of hypothetical reasoning.

While I depart from a Dung-style system, however, I retain its primary benefit. Modgil and Prakken summarize this benefit:

> Argumentation theory thus provides a characterisation of both human and logic-based reasoning in the presence of uncertainty and conflict,

> through the abstract dialectical modelling of the *process* whereby arguments can be moved to attack and reinstate/defend other arguments. The theory's value can therefore in large part be attributed to its explanatory potential for making non-monotonic reasoning processes inspectable and readily understandable for human users.... [4, p. 362]

Although the argumentation system I define does not codify the notions of attack, defeat, or reinstatement, it does provide a process for evaluating arguments that is easily carried out and readily understood. Thus, while I do not use the same approach to argumentation, I still answer of the main research question of Liao et al. [2, p. 219], as applied to reusable simple-minded output: How can the detachment procedure of reusable simple-minded output, proposed in the context of normative reasoning, be represented in formal argumentation?

Before turning to the details of this answer, I mention one further, if relatively unimportant, difference between my results and those of Liao et al. I work with structured, rather than abstract, normative systems. Liao et al. observe that one benefit of abstract normative systems over structured ones is that "the central inference of detachment can be visualized by walking paths in [a] graph," and this is undeniably a virtue. I choose to work instead with structured normative systems because this allows for complete agreement with out_3, which is defined in the context of full propositional logic. It is not difficult to translate these results to abstract normative systems, but by working with the full out_3, the core result of this paper can be of broader general interest without compromising the primary focus on preordered norms in formal argumentation.

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