Addendum to "A Formal Framework for Representing Mechanisms?"

Abstract: In (Gebharter 2014) I suggested a framework for modeling the hierarchical organization of mechanisms. In this short addendum I want to highlight some connections of my approach to the statistics and machine learning literature and some of its limitations not mentioned in the paper.

In (Gebharter 2014) I presented a marginalizing method for modeling the hierarchical organization of mechanisms. It turned out that this method is essentially some kind of a "slim" version of the mixed ancestral graph representation developed by Richardson and Spirtes (2002) for latent variable models. While I still prefer my "slim" representation for this paper – it does the job I wanted it to do and it is easier accessible –, I want to encourage readers who agree with representing mechanisms the way I suggest to have a closer look at the statistics and machine learning literature (for some references see below), which, among other things, also investigates the following questions relevant for modeling mechanisms not touched in my paper: questions about how to parameterize graphs featuring bi-directed arrows in such a way that conditional probabilities can be computed (see, e.g., Richardson 2009), questions about how the effects of interventions can be computed in models featuring bi-directed arrows (see, e.g., Tian and Pearl 2002), and questions about causal discovery, especially about how the existence of latent variables and causal relationships among latent variables can be uncovered (see, e.g., Spirtes, Meek, and Richardson 1995).

Finally, I want to point at the limits of the representation method I suggest in the paper. While it nicely fits systems such as the water dispenser mechanism, there are mechanisms involving certain compositional causes, such as the various minerals that make up a rock and contribute to its reflectance spectrum (cf. Ramsey, Gazis, Roush, Spirtes, and Glymour 2002), which seem to be not well representable by marginalization techniques.

I'm indebted to Clark Glymour for pointing out to me the above-mentioned points and for highlighting the limitations of representing mechanisms by marginalization methods.

References

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