Pluralism and Computational Individuation

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Outline

Introduction: Computational Individuation

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- Among those that perform the same task, what distinguishes those that perform the same task, in the same way, from those that don't?

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Input 1	Input 2	Output
H	H	H
H	M	M
H	L	M
M	H	M
M	M	M
M	L	M
L	H	M
L	M	M
L	L	L

Tri-stable circuit adapted from Shagrir (2018).

Grouping 1: OR

Input 1	Input 2	Output
H	H	H
H	M	M
H	L	M
M	H	M
M	M	M
M	L	M
L	H	M
L	M	M
L	L	L

$\Rightarrow$

Input 1	Input 2	Output
1	1	1
1	0	1
0	1	1
0	0	0

Grouping H and M together.

Grouping 2: AND

Input 1	Input 2	Output
H	H	H
H	M	M
H	L	M
M	H	M
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The semantic view

- Computational entities, tasks, and ways of performing them are always individuated at least partly in terms of their semantic properties.[1]

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  - if M, L have same/similar content, favour AND grouping.

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- Here the idea is that it is enough to look at the causal-mechanical structure of a system to determine computational status.[2]

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- Not obliged to consider content to determine computational structure in this case.

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Individuation scheme of Dewhurst (2016).

Input 1	Input 2	Output
A	A	A
A	B	B
A	C	B
B	A	B
B	B	B
B	C	B
C	A	B
C	B	B
C	C	C

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- Given this, why do we have to choose just a single individuation scheme?

Outline

Modeling

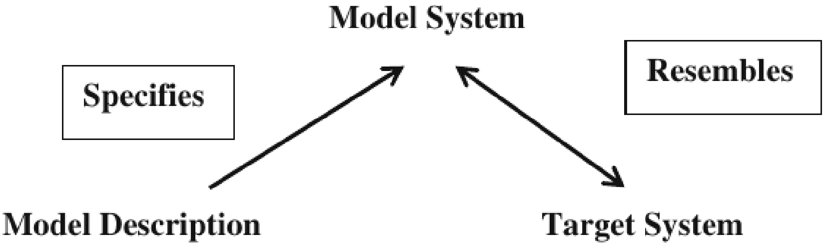

Figure: from Godfrey-Smith 2007.

Modeling

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  - Abstraction: intentional omission. Models in high-level vision.

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  - The above supplemented with particular causal-mechanical, semantic, or teleofunctional properties as needed.

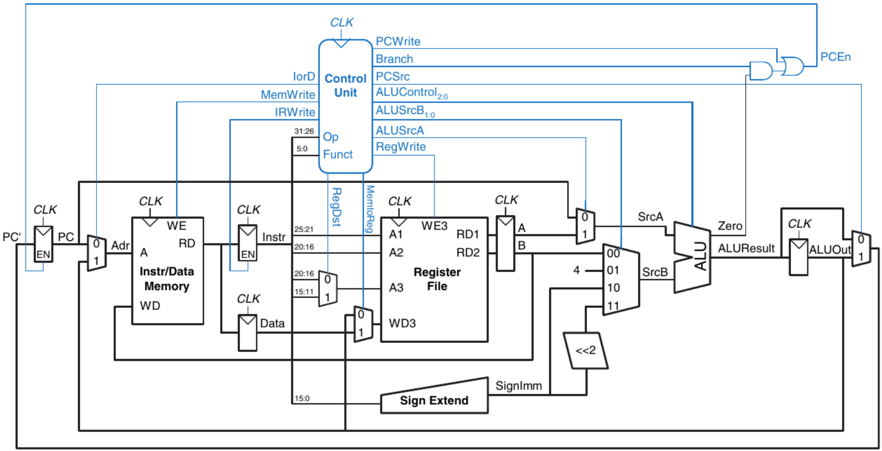

Figure: from Harris and Harris 2013, p. 397.

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- Models are judged to be successful (unsuccessful) to the extent that they are well (ill) suited to certain investigator interests, explanatory aims, etc.
- This suggests that there is no single, privileged model of a given system; instead, we should pluralists about modeling.

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  - And so on...

One road to pluralism

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- Relativism about some subject matter X is the view that something is an X only relative to some Y.
- Pluralism about X arises when Y may take on multiple different but equally legitimate values.[4]

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- To the extent that different models may fulfill different explanatory aims, we get a kind of pluralism about scientific modeling.
- No need to view different models as ‘competitors’.

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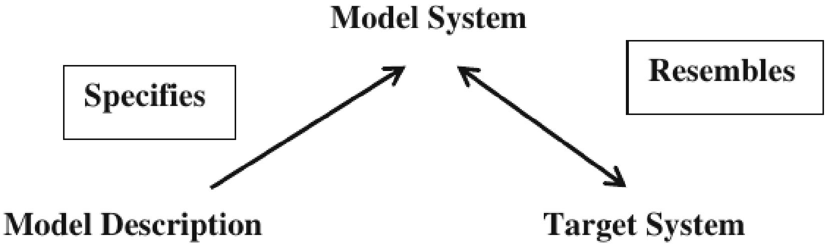
- **Computational pluralism** is the view that that there are multiple different but equally legitimate computational models.
- The semantic and mechanistic individuation schemes (and perhaps others) home in on equally legitimate models, relative to different explanatory aims.
- In keeping with the modeling perspective, we needn't view them as competitors. Instead, they are each better or worse suited to certain explanatory tasks.

Individuation schemes concern resemblance



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- Here instructions are best individuated not in semantic terms – whether it's an add or a multiply or whatever – but in terms of cycles to execute.
- Upshot: in these sorts of cases, a non-semantic model of computation is appropriate.

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- For example: why two systems compute the same arithmetic function.
- Even if this also employs a non-semantic individuation scheme, e.g. of computational vehicles, a semantic scheme is required to answer the question about *function* computation.

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- To the extent that modeling pluralism is correct, even mundane, computational pluralism follows as a special case.
- Questions about computational individuation turn out to be questions about which computational models are appropriate for different explanatory purposes – but there no special problems here for computation.

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