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Automated modeling of complex systems to answer prediction questions. (English)
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Summary: A question about the behavior of a complex, physical system can be answered by simulating the system – the challenge is building a model of the system that is appropriate for answering the question. If the model omits relevant aspects of the system, the predicted behavior may be wrong. If, on the other hand, the model includes many aspects that are irrelevant to the question, it may be difficult to simulate and explain. The leading approach to automated modeling, "compositional modeling", constructs a simplest adequate model for a question from building blocks ("model fragments") that are designed by knowledge engineers. This paper presents a new compositional modeling algorithm that constructs models from simpler building blocks – the individual influences among system variables – and addresses important modeling issues that previous programs left to the knowledge engineer. In the most rigorous test of a modeling algorithm to date, we implemented our algorithm, applied it to a large knowledge base for plant physiology, and asked a domain expert to evaluate the models it produced.

MSC:

93A30	Mathematical modelling of systems (MSC2010)
68T35	Theory of languages and software systems (knowledge-based systems, expert systems, etc.) for artificial intelligence

Cited in **5** Documents

Keywords:

Automated modeling; Reasoning about physical systems; Large knowledge bases

Software:

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