Virtual prototyping of PLC-based embedded system using object model of target and behavior model by converting RLL-to-statechart directly

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Abstract

A domain-specific virtual prototyping approach is proposed that can reduce the risks involved in programmable logic controllers (PLCs)-based embedded system programming. The proposed approach is based on an object-oriented real-time modeling concept, plus an algorithm is defined that can mechanically convert a PLC program, written in relay ladder logic (RLL), to a statechart model. In the field of virtual prototyping, statechart models are widely accepted as representing the behavior of target systems. Accordingly, the direct use of an RLL program enables a virtual prototype to be built quite easily, thereby eliminating complex behavior remodeling of the objects used in PLC embedded systems. As a case study, virtual prototyping of a target example was performed and analyzed to evaluate the benefit of the proposed approach.

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