

Safe Intersections At the Crossing of Hybrid Systems and Verification

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Title

Safe Intersections: At the Crossing of Hybrid Systems and Verification

Authors

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Abstract

Intelligent vehicle systems have interesting prospects for solving inefficiencies and risks in ground transportation, e.g., by making cars aware of their environment and regulating speed intelligently. If the computer control technology reacts fast enough, intelligent control can be used to increase the density of cars on the streets. The technology may also help prevent crashes at intersections, which cost the US \$97 Billion in the year 2000. The crucial prerequisite for intelligent vehicle control, however, is that it must be correct, for it may otherwise do more harm than good. Formal verification techniques provide the best reliability guarantees but have had difficulties in the past with scaling to such complex systems. We report our successes with a logical approach to hybrid systems verification, which can capture discrete control decisions and continuous driving dynamics. We present a model for the interaction of two cars and a traffic light at a two lane intersection and verify with a formal proof that our system always ensures collision freedom and that our controller always prevents cars from running red lights.

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