Title : Conflict-point formulation of intersection control for autonomous vehicles
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Abstract : Reservation-based intersection controls, in which vehicles reserve space-time paths through the intersection, have the potential to make greater use of intersection capacity than traffic signals. However, the efficiency of previous microsimulations of reservations has been severely limited by a protocol that requires vehicles to request reservations and the intersection manager to accept or reject them. We propose a new protocol, AIM$_*$, in which the intersection manager assigns reservations to vehicles, to greatly increase the optimization possibilities. Then, we present a mixed integer linear program for optimally choosing vehicle reservations under AIM$_*$. The formulation is similar to conflict resolution models for aviation, and ensures separation at all points that vehicles might intersect. We therefore present a rolling-horizon algorithm to extend the method to larger numbers of vehicles. Results show that the optimal reservation assignments from AIM$_*$ significantly reduce delays over previous protocols. Furthermore, the rolling horizon solutions have similar delays to a fixed horizon, thereby providing an efficient method of implementing AIM$_*$