

# Game-Theoretic Approach to Decision Making for Multiple Vehicles at Roundabout <sup>\*</sup>

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**Abstract:** In this paper, we study the decision making of multiple autonomous vehicles in a roundabout. The behaviours of the vehicles depend on their *aggressiveness*, which indicates how much they value speed over safety. We propose a distributed decision-making process that balances safety and speed of the vehicles. In the proposed process, each vehicle estimates other vehicles' aggressiveness and formulates the interactions among the vehicles as a finite sequential game. Based on the Nash equilibrium of this game, the vehicle predicts other vehicles' behaviours and makes decisions. We perform numerical simulations to illustrate the effectiveness of the proposed process, both for safety (absence of collisions), and speed (time spent in the roundabout).

*Keywords:* Mission planning and decision making, Autonomous Vehicles

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