

Fairness related Conflicts for Autonomous Traffic Agents Praxis der Forschung WiSe 24 - SoSe 25

Motivation. Autonomous Traffic Agents (ATAs) encounter various conflict in daily operation. A conflict is a situation, where goals of an ATA, or traffic rules are endangered. E.g., in case of an emergency vehicle approaching, cars may evade onto else forbidden parts of a sidewalk, to enable the emergency vehicle to pass. Conflicts might also enforce an ATA to sacrifice a less important goal (e.g. timeliness), in order to keep a more important goal (e.d. safety/ collision freedom). Besides well-known system goals like safety and timeliness, fairness is an important ATA property. Fairness could involve friendliness of an ATA that lets a pedestrian cross the road, although they had the right of way. Unfair behaviour of autonomous vehicles could, e.g., lead to frustration in other road users, but also in deadlocks, if each vehicle drives as greedy as possible and never accepts to give way.

Research Question. In this Pdf project, it is to be investigated:

State of the Art: How is fairness defined for ATAs? What different notions of fairness are widely discussed in the research landscape? Can we use fairness notions of other operation domains (e.g. robots, ...), transferring them to ATAs? Can we find examples of traffic conflicts that involve fairness to be endangered (i.e. can we find unfairness in ATA definitions?)?

Discussion of Fairness related conflicts: The goal is to identify and adapt a notion of fairness from state of the art, that we can embed into existing works on conflict resolution for ATAs.

Case Study: A case study either in a simulation environment, or with mobile robots, in which we examine unfair situations for ATAs. The goal is to test how autonomous agents can be designed to be fair. This could be an example of an unknown vehicle that drives always greedy in one set-up and friendly in another set-up. The case-study could measure how unfair behaviour can endanger other ATA goals, e.g. timeliness.

Output / Paper. The final paper would involve:

1. Review of state of the art on ATA fairness
2. Integration of a fairness notion into existing notions of ATA conflicts
3. Case study that visualises/ demonstrates ATA conflicts related to fairness

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