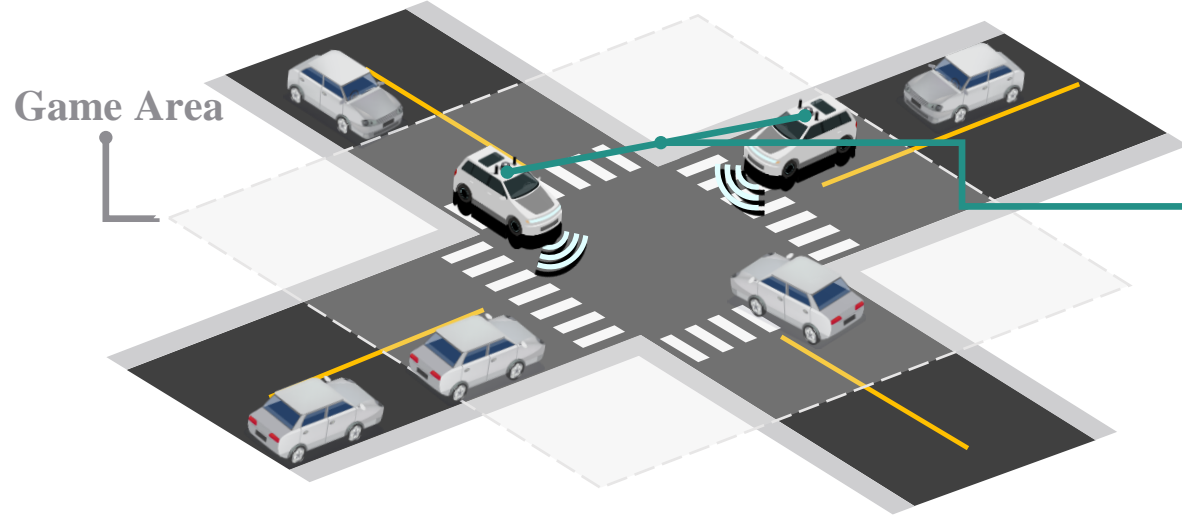


1 Unsignalized Intersection



HDV

- CAVs & HDVs mixed traffic
- Uncertain dynamic characteristics of HDVs
- Better Cooperation of CAVs



CAV

Individual Reward Function

Safety + Efficiency + Comfort

$f_i = \sum_{i=1}^3 w_i f_i$

$= w_{1i} f_{1i} + w_{2i} f_{2i} + w_{3i} f_{3i}$

Model Representation

$$\max_{A_{SCAV} \in D_{SCAV}} F_{SCAV}(A_{SCAV})$$

s. t. $\theta_j = \theta_{j_k}^*$

$$a_j^* = \arg \max_{a_j \in D_j} f_j(A_{SCAV})$$

2 Cooperative Driving Model for CAVs



$$\max_{A_{SCAV} \in D_{SCAV}} F_{SCAV}(A_{SCAV}) = \sum_{i \in S_{CAV}} f_i$$

s. t. $a_i^{\min} \leq a_i \leq a_i^{\max}$

$$v_{i_1}^2 - 2a_{i_1} \Delta L_{i_1 i_2} \leq 0 \text{ or } v_{i_2}^2 - 2a_{i_2} \Delta L_{i_2 i_1} \leq 0$$

$$i, i_1, i_2 \in S_{CAV}$$

CAVs calculated action

$$A_{SCAV} = (a_1, a_2, \dots, a_{|S_{CAV}|})$$

Best Game

$$\theta^* \rightarrow TG_* \rightarrow a^*$$

HDV

calculated action a^*

Twin Game

$$\left. \begin{array}{l} \theta^1 \rightarrow TG_1 \rightarrow a^1 \\ \theta^2 \rightarrow TG_2 \rightarrow a^2 \\ \dots \\ \theta^n \rightarrow TG_n \rightarrow a^n \end{array} \right\} a_{\text{real}}$$

Updated Optimal θ^*

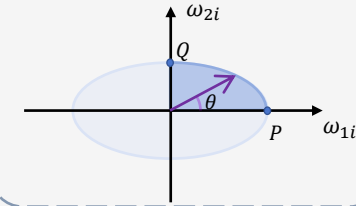
$a^* \& \theta^*$

Leader

Follower1

Twinning Parameter

$$\begin{cases} w_{1i} = P \cos^2(\theta) \\ w_{2i} = Q \sin^2(\theta) \end{cases}, \theta \in [0, \frac{\pi}{2}]$$



Follower2

3

Interaction Decision-making Model between CAVs & HDVs