Ridesharing in AMoD Systems

AMoD SYSTEMS:
- Fleets of driverless cars
- Information processing center
- Passengers
- Infrastructure (e.g., road networks)

OBJECTIVE:
- To promote ridesharing

CHALLENGES:
- Truthful demand needed
- Passengers may not cooperate
  (due to self-interestedness, privacy)

SOLUTION:
- Mechanism design

Problems of Existing Mechanisms for Ridesharing

• Direct valuation revelation
• Additional constraints to satisfy desirable properties
  (e.g., strategyproofness, budget balance)
• Neglecting non-monetary factors (e.g., waiting time)
• Do not work in online settings

Our Contributions

We introduced the first posted-price, online mechanism, called the Integrated Online Ridesharing (IORS) mechanism to promote ridesharing in AMoD systems.

We showed that IORS mechanism is ex-post incentive compatible, and demonstrated the competitiveness of IORS compared with two benchmarks via simulation.

The IORS Mechanism

FARE ESTIMATION:
- For each request \( r_i \) from passenger \( i \) at time \( t \), the mechanism first checks if a vehicle is available.
- If so, the mechanism compares the cost per unit demand before and after adding the request into the coalitions, then selects the maximum fare as the quote.
- If not, the mechanism rejects the request.

PICKUP ASSIGNMENT:
- The mechanism selects the \( n_i \) requests that produces the lowest cost per unit demand for pickup.

PAYMENT CALCULATION:
- The mechanism calculates the final payment immediately after the fulfillment of each trip.

Key References


