Offline Share-a-Ride Problem: Taxi Sharing between Passenger and Package

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We propose a multi-commodity sharing system referred to Share-a-Ride problem(SARP). The share-a-ride problem consists of designing vehicle routs and schedules for n multi-commodity requests between origins and destinations. The application of multi-commodity sharing system can raise benefit, reduce cost, and alleviate urban congestion and environment pollution.

Why sharing?

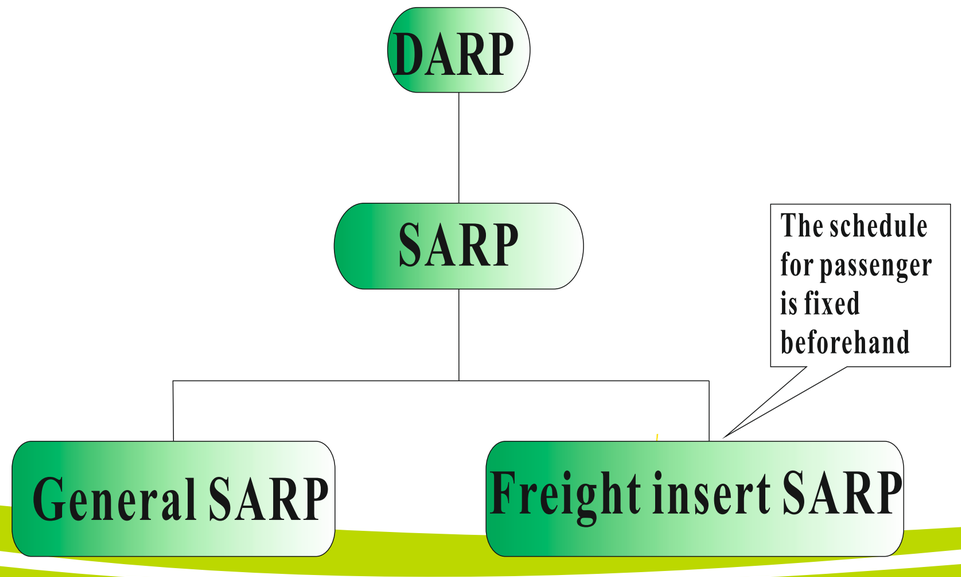
Challenge facing:
- Congestions in urban area
- Low density area larger according the population decline
- Usage of public transport has significantly decreased(low axi occupancy rate)
- Delivery routes to individual consumers and retailers consist of fewer stops over longer distances

VS

High-density areas that haunted by congestion and pollution problems can be alleviated because combining people and freight means fewer vehicles.
Low-density areas combining people and freight can keep public transportation and freight transportation at socially acceptable levels in an economically viable way.

Academic contribution:

Richer the Dial-a-Ride-Problem models



The SARP-Model

Consider the attribute of passenger transport, we add people service constraint to the standard dial-a-ride-model. The objective function is minimize a combination of distance saving and unconvince fee paid to passenger.

Material and methods:

This model is tested on real taxi trajectory data sets of San Francisco and four group of artificial parcel data sets.

--We apply boost library for distance calculation based on shortest path algorithm.
--Use CPLEX and GA for model solving

Result and conclusion:

Combining people and freight flows creates attractive business opportunities because the same transportation needs can be met with fewer vehicles and drivers.

Distance saving according separate delivery

Model \ Parcel distribution (OD)	scatter-scatter	scatter-cluster	cluster-scatter	cluster-cluster
FIM	high distance saving	No	No	No
SARP	high saving	low distance saving	low distance saving	No

Greener
cost discount