Negotiating Shared Intentions in Virtual Space for Intelligent Mobility On-Demand

Introduction
Existing user interfaces for ad-hoc ride sharing are rigid. Derived from algorithms in operations research and transportation theory, they require that all trip information be disclosed a priori in a single step. However for a client this results in two issues: service knowledge and location privacy. Addressing these OppRide [1] was developed to provide a client with a lens into the ride matching process. The 2-step negotiation (Fig. 1) requires that only discrete drop-off constraints be initially disclosed. From this information, a relevant set of rides is identified and the client’s potential pick-up locations are communicated in the form of interactive features called launch pads (Fig. 2).

OppRide: Client Perspective

A Client mobility request
Drop-off only location, $d$, arrival time $t_a$ with flexibility $f_{min}$ and an additional factor, $a$, for some minimum decision making time.

\[ Q = [t_{max} + t_a , f_{min} + f_{max}] \]

B Vehicle network time prism
Three dimensional $(x,y,t)$ network time prism (NTP) [2].

C Service coverage map
An aggregate representation of all active vehicles’ service potential.

D Deriving launch pads
Applying the client’s query, a space-time slab is derived from each relevant vehicle’s NTP. Projecting the slab $\mathbb{R}^3 \rightarrow \mathbb{R}^2$, the vector map, $X$, is created.

Addimg Dimensions
To improve the pick-up choice set, launch pads can be extended to 3D $(x,y,colour)$. Revisiting map algebra theory, we examine the suitability of operators for various types of choice factors to aggregate individual vehicle maps into launch pads (Fig. 3).

References: