Micro-trading and Micro-instrumenting: Small-data is Big in Transportation

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Outline

• How will the transportation systems change in the near future, and over the next few decades?
• What are the fundamentals of this change, from a mobility theory standpoint?
• Two start-up possibilities.
  • Waytrade – UCI student project near-ready to go.
  • SinWaves – Start-up firm in place, already on the go
Motivation

- **Transportation systems** are in for a *massive transformation in the near future* with shared-usage of facilities (*transportation supply*) and will continue to transform for the next few decades as autonomous systems take hold.
- Changes brought by Uber, Lyft, etc are well known. **Ride-sharing** is for real!
- **Connected systems** and **autonomous systems** are on the way.
- Existing systems’ designs are based on **old paradigms** of users being unable to communicate in real-time with vehicles, or with each other.
- **Users negotiating with each other or with a facilitating broker** is fully a possible now. Example conversations (potentially between programmed devices)
  - “*Can you change lanes for 15 cents, so I can take an exit and leave?*”
  - “*Uger says it is cheaper to pick me up before you. Can we pay you $5 to wait for 10 minutes?*”
  - “*I will pay $2 for a green extension at the intersection right now! Can you 10 cars wait for 15 seconds and get paid?*”
  - [Autonomous Car says] “*FemEx will pay me $5 for an urgent package pick-up and drop near your house. Can I give you $2 to wait?*”
Fundamental Issues

• We always took the fair way to operate transportation systems to be to let the first-come user to be first-served. But do they necessarily want to? What if they are fine waiting, for a payment, and are more satisfied?
• The “fair” system was fair only without communication. We were assuming everybody to have the same value of time, or urgency.
• Dropping FCFS may be better for everybody (with regulatory caveats!)
• P2P Micro-trading is a possibility with the right technologies, and early projections of money transactions are eye-opening.
• Vehicles are tremendously useful in providing data communication across IoT networks for ubiquity.
• “Mule” communication (Mobile ubiquitous LAN Extension) using vehicles with “unlimited” battery power is of tremendous benefit (better than sending it through the cloud). Big data made up of Small-data moved from intersections to intersections or stop-signs to stop-signs could be critical in a system with sufficient data accuracy, so as to make the micro-trades possible.
• Micro-instrumentation (low power) is necessary for locational and data accuracy for autonomous and sharing systems, and “mule”4connectivity.
WayTrade

UCI Student Team Finalists, Butterworth Entrepreneurship Competition

Roger Lloret Batlle, Civil Engineering
Felipe de Souza, Civil Engineering
Si-Yuan Kong, Economics
Amine Mahmassani, Economics
Vaibhav Saini, Computer Science/SW Engrg
Everybody has a value of time

$25/hr

$5/hr
Waytrade solution:

Higher value goes and pays money

Lower value waits and gets money
Backend

App server, Admin interface
WayTrade

Where to?

Your location

Enter destination

How quickly?

New

Saved

Set a new value of time:
How quickly?

Choose a saved value of time:

Leisurely - $10.00
Normal - $25.00
URGENT - $50.00

Preview my trip!
WayTrade

Your trip

Your value of time: $50.00
Estimated trip time: 23 minutes
Estim. cash transfer: $0.20
ETA adjustment: -2 minutes

Go back  Navigate!
WayTrade team

Roger Lloret-Batlle
Transportation Engineer

Felipe de Souza
Transportation Engineer
Traffic Signal Development

Amine Mahmassani
Transportation Economist
Transportation Policy Advocacy

Si-Yuan Kong
Experimental Economics
Hardware Design

Vaibhav Saini
Software Engineer

Binh Dang
Internal Mentor
LendingQB President

Amine Haoui
External Mentor
Sensys CEO
Revenue Model

Based off the red light camera model:

• System provided for free to government and users
  We cover capital costs, maintenance, data services
• Cut taken from transactions
Revenue Model

Based off the red light camera model:

- System provided for free to government and users
  We cover capital costs, maintenance, data services
- Commission from transactions
- Other business models possible

Simulation studies and Projection for 250 intersections (Irvine) estimates transactions of about $15 per month per capita, and $35 million in transactions (about $3.5 million in commission).

- Projected to LA metropolitan area -> $1.5 billion
- Projected nation-wide -> $150 billion
- Commission at 10% -> $15 billion
- Capital equipment installation cost recovered in a year.
Market Analysis

Partnerships with government. Ideal candidates evaluated on the following three criteria:
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  • Priced lanes
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• Financial – Places with high amounts of transactions will be most successful and ensure costs are covered
  • Extensive vehicle use for different types of trips (work, leisure, etc.)
  • High disparity in incomes
We need your help
We need your help

Money

- Alpha test capital costs - $6000
- Full scale alpha operating cost - $50,000/yr
- Beta test capital costs - $1.5 million
- Beta test operating cost - $2 million/yr
SinWaves, Inc.

Safe Smart Streets

www.sinwaves.com
Mountain View CA. 94043
contact@sinwaves.com
SinWaves

- redesign wireless communication as a means to vehicle awareness
- robust universal solution providing an unbiased infrastructure
- embracing “right data” over “big data”
- Localized data rather than cloud services
- designing a roadside infrastructure that helps facilitate intelligent decisions
Team

Timothy Menard
Founder & CEO

- Real-Time Intelligent Transportation Systems, Vehicle Tracking, and Vehicular Communications background
- 6 peer reviewed conference papers in shortest and fastest routes with dynamic edge weights and real-time vehicle tracking
- Member of IEEE and the Intelligent Transportation Society since 2009

Nicholas Johnson
Co-Founder & CTO

- Electronic device design and embedded applications background
- Brought cheap cellular service to Particle.io IoT device
- Member of IEEE since 2010 and SAE since 2014
Technology

- Roadside Communication Network (RCN)
  - Extends Internet of Things (IoT) and Wireless Sensor Networks (WSN)
- Roadside sensor is low-cost, ultra-low power and easily programmable
- Street signs, Traffic lights, Railroad crossings, Construction zones, and other road related entities will be able to wirelessly communicate their message to recipients
- Harvest energy from the environment

Patent Pending
## Market Potential

### Products
- Road & Vehicle Transceiver
- Communication Protocol
- Roadside Infrastructure Database
- Analytics Software

### Customers
- Transportation Agencies
- Automotive Manufacturers
- Consumers
- Fleet Managers, Public Transit

Current Prototype Stop Sign at Scale is 1/20 the price of Standard Stop Sign
Current State

- NSF SBIR Grant Applicant, supportive entities
  - Institute of Transportation Studies (ITS-Irvine) at UCI
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  - Pilot Automotive
  - Baselines Incorporated
- Texas Instruments is providing SinWaves technical support
- SinWaves has its first prototype
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Thank You

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