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Spatio-temporal road charge: a potential remedy for increasing local streets congestion

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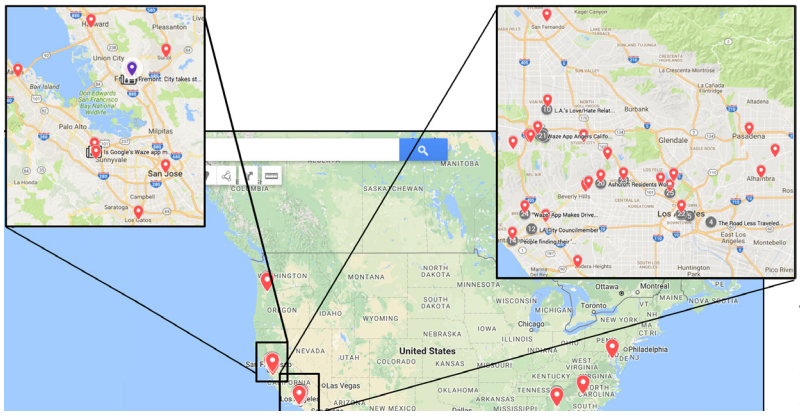
Topic / Issue

The recent and growing ubiquity of mobile-enabled navigation, combined with the emergence of large ridesourcing or transportation network companies (TNCs) with tens of thousands of registered drivers in single cities (all using the same routing app) has led to new or increased congestion patterns that are progressively asphyxiating local streets, due to so-called "cut-through traffic."

Noticing the new traffic in their neighborhoods, private citizens have tried to sabotage or trick the apps, or shame the through drivers in op eds, and in news stories. Planners at municipal agencies are pursuing more institutionalized ways to handle the situation, adding stop signs, speed bumps, and turning restrictions to "teach" the apps not to direct through-traffic to their neighborhoods (since apps systematically provide the route most beneficial to the user, not necessarily to the community). In other countries, cities have sued app providers, potentially forecasting similar approaches in the US and ultimately class actions against them.

Research Findings



The extent of the issue in the United States, as collected via targeted online research.

The following facts appear, either gathered from interviews, publication surveys, mathematical analysis and simulation.

- This phenomenon of "cut-through" traffic is happening in most major cities and suburban areas in California, with dozens of affected sites already inventoried in the Los Angeles basin and in the Bay Area.
- The problem will likely worsen with further increases in app usage, population growth, and rise of ridesourcing/TNC services.
- The defense mechanisms used by private citizens and cities are currently only designed to make traffic slower in their neighborhoods.

KEY TAKEAWAYS

- Giving all motorists the fastest route to their destination does not necessarily reduce congestion, most of the time, it makes it worse.
- Without coordination between driving apps with public agencies, the problem of app-induced cut-through traffic will worsen.
- Real-time app data need to be shared with transportation agencies so traffic resulting from these apps can be integrated into local traffic management systems.
- Ultimately, these rising problems can be remedied through partnerships between the private and the public sector.

"Through collaboration between the public and private sector, apps can contribute positively to the problem of traffic congestion."

Findings (continued)

- Lessons from theoretical research, such as that of Nobel Prize of John Nash (1994), show that the navigation apps' current non-cooperative approaches are worse for the entire transportation system than cooperating approachs would be.
- From Nash's theory, sending all motorists via the fastest route at the time they query the app does not necessarily reduce congestion, it usually increases it.
- Our analysis shows that the lack of coordination between app providers and state and local public agencies decreases the efficiency of the transportation network, as the transportation infrastructure (traffic signals, metering lights, operations of HOT/HOV) are unable to anticipate spatio-temporal disruptions in demand.
- The transfer of highway-traffic to city streets can locally decongest freeways, but always decreases the efficiency of the arterial network. **Potential solutions to this problem include :**
    - Coordinate routing services to avoid the current asphyxiation of the city networks.
    - Integrate the information available from the app providers with highway and arterial operations.

Approach

The application of a spatio-temporal road charge could prevent the uncontrolled increase in urban congestion caused by app-related demand disruption. Adaptive solutions require the application of both policy and technology.

Policy: a local road user charge (digital impact fee) can be enforced on either motorists or routing app providers (or both) to counterbalance the negative effect of induced congestion on cities and to control it.

Technology: for initial phases, wherever geography allows, license plate readers can be used to provide the mechanism to collect the fees (as is done for the Golden Gate bridge). Long-term, other technologies are needed that involve the app provides and the phones running the apps.

Conclusion / Recommendations

Short term actions to understand and control the problem include:

- Creating and maintaining a full and up-to-date inventory of the affected sites.
- Writing policy that enables public agencies to gain real-time access to app data (traffic demand in particular) from the app providers.
- Providing public agencies with the necessary resources to integrate app data into traffic management systems

Long term, the following should happen:

- Policy needs needs to be written to enable cities to collect a fee (spatio-temporal road charge) and use methods of digital collection for these charges.
- The appropriate technology and a pricing structure needs to be determined.
- Concepts of operations need to be written, so the system's mechanisms are clear to all stakeholders.

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