POLICY BRIEF

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Spatio-Temporal Road Charge: A Potential Remedy for Increasing Local Street Congestion

Alexandre Bayen, PhD and Teddy Forscher

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 is only going to increase.

App data need to be shared with transportation agencies to anticipate excess traffic caused by apps in real time and integrate it in their traffic management systems.

Ultimately, these rising problems can be remedied through partnerships between the private and the public sector.

Spatio-temporal road charges are one possible avenues to exercise regulation.

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

TOPIC/ISSUE

In the early ages of the mobile Internet, routing apps appeared as a viable tool for the few motorists equipped with an in-vehicle navigation system or an aftermarket navigation device. With market penetration increasing, and recent market consolidation, a few companies are now the sole providers of driving directions to the majority of the US population. Additionally, the emergence of large ridesourcing or transportation network companies (TNCs) totaling up to tens of thousands of registered drivers in single cities (all using the same routing app), there is further consolidation. Across the US, this has led to new or increased congestion patterns that are progressively asphyxiating local streets due to so-called "cut-through traffic."

As neighborhoods have started to realize this, private citizens have begun to resist, by trying to sabotage or trick the apps, or shaming the through traffic through opinion articles, and news stories, and other methods. Municipal agencies/planners are pursuing more institutionalized ways to handle the situation, adding stop signs, speed bumps, and turning restrictions to make local traffic slower in the hope that the apps will "learn" not to send through-traffic to their neighborhoods (since apps systematically provide the route most beneficial to the user, not necessarily to the community). In other countries, lawsuits from cities against these app providers have already started, potentially forecasting similar approaches in the US.

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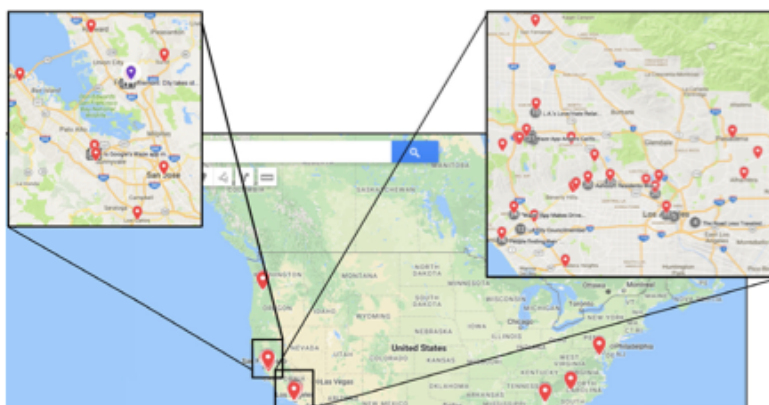
The extent of the issue in the United States, as collected via targeted online research

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

- This phenomenon 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.
- It is a growing problem and will likely only accelerate 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.

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FINDINGS (continued)

- Theoretical analysis going back to the Nobel Prize of John Nash (1994) shows that the non-cooperative approaches of navigation apps provides solutions that leave the entire transportation system worse off than if apps were cooperating.
- 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.
- Analysis shows that the lack of coordination between app providers and public agencies (States, Metropoliation Planning Organizations, cities) further decreases the efficiency of the transportation network because the transportation infrastructure (traffic signals, metering lights, operations of HOT/HOV) cannot anticipate spatio-temporal disruptions in demand.
- The transfer of highway-traffic into city-traffic in its current form can in some cases locally decongest freeways, but it always decreases the efficiency of the arterial network.

Potential solutions:

- Through coordination of routing services, it is possible to avoid the current asphyxiation of the city networks.
- It is further possible to increase the efficiency of the overall transportation network by integrating the information available from the app providers with highway and arterial operations.
- Technology to support these two avenues exists today.

APPROACH

The application of a spatio-temporal road charge could prevent the uncontrolled rise of city congestion caused by demand disruption. Policy and technology need to be considered together for adaptive solutions to exist.

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 (like for the Golden Gate bridge). If the approach takes off globally, other technologies are needed, using connected devices (including phones running the corresponding apps and app providers themselves) to address issues of group and procedural equity and historical inequities influencing neighborhood design.

Operations: public agencies can be the operators of this new paradigm. Data sharing mechanisms can be implemented, so in addition to the fees, real-time traffic demand becomes available to the public agencies in charge of operations.

CONCLUSION & RECOMMENDATION

Short term action items need to be undertaken to gain understanding and control of the problem, including:

- A full inventory of the affected sites must be created and updated in an ongoing manner as the problem continues to grow.
- Policy needs to be written to enable a sharing process so public agencies can gain real-time access to the data (in particular traffic demand) from app providers, to anticipate excess traffic.
- Public agencies need to obtain the proper resources to integrate these data into their 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) among other digitally collected charging options.
- Technology to achieve this goal needs to be determined, as well as a pricing structure.
- Concepts of operations need to be written, so the resulting mechanisms benefit all stakeholders.