Using Geofencing to Actively Monitor, Collect, and Share Information

Traffic management systems (TMSs) operated by State departments of transportation (DOTs) are faced with challenges in monitoring, collecting, or sharing information with travelers in advance of their reaching en route destinations where travel decisions may be influenced by traffic information. The prevalence of mobile devices connected to third-party service providers that deliver travel condition information has prompted many State DOTs to change how they relay information to travelers. To support sharing information with travelers, agencies are exploring a technology known as geofencing, which uses the Global Positioning System (GPS) to create a virtual geographic boundary. When a mobile device enters or exits the boundary of an area, software automatically collects traffic and incident data and can send travel alerts or information to devices in that specific geographic (geofence) location.

DESIRED OUTCOMES

- Augment traditional methods to deliver traveler information (e.g., changeable message signs, highway advisory radio, and 511 services).
- Support TMSs in collecting data, actively monitoring travel conditions, and sharing information with agency staff, service providers, and the public.
- Deliver automatic, immediate, and directly relevant information to travelers that is directly relevant to their specific trip via an application (app) installed on a mobile device connected to the internet from the agency or a third-party service provider.

KEY ISSUES TO CONSIDER

- Technology is enabled by application programming interfaces, which allow computer programs to communicate with each other.
- Travelers need to receive only information relevant to their location. Geofencing provides a mechanism to only deliver location specific information.
- Alerts are typically provided audibly using hands-free technology for driver safety.
- Technology relies on location information from a connected mobile device requiring consent from the user.
- Agencies have successfully developed geofencing tools or partnered with service providers.

CURRENT PRACTICES:

Caltrans QuickMap

https://quickmap.dot.ca.gov

- System was developed by the California DOT (Caltrans) IT department and is operated by traffic management centers (TMC) staff.
- Travelers can use a website or a mobile app to sign up for alerts.
- Authorized TMC staff can create geofences and send customized messages, including notifications for road/lane closures and traffic incidents, to drivers within the geofenced areas.

Colorado DOT (CDOT) COtrip Planner App (figure 1)

https://maps.cotrip.org/help/section/about-cotrip.html#cotrip-app

- Developed by third-party service provider.
- Includes a feature called TellMe that detects a user's location and immediately provides a summary of traffic incidents within a 5-mile radius.
- Identifies the vehicle's direction of travel and speed and automatically distributes information to travelers in a geofenced area.

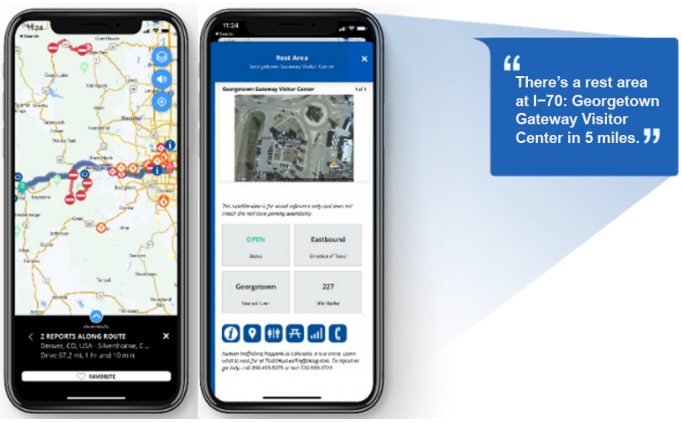

FIGURE 1. Illustration. Layout of the COtrip planner app.
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Pennsylvania DOT (PennDOT) 511PAConnect (figure 2)
https://511pa.com/511paconnect.aspx

- A third-party service provider developed and manages the application.
- Users can select to receive alerts within a 1- to 500-mile radius from all directions or just the direction of travel.
- PennDOT plans to evolve its system by incorporating push notifications to travelers when they cross a geofenced location.

FIGURE 2. Illustration. Illustration of the 511PAConnect app.
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Florida DOT
https://data.fdot.gov/road/projects

- Developed by third-party service provider.
- Uses an application, which allows work zone supervisors to map closures and deliver real-time alerts about the status of work zones including which lanes are open and speed limit.
- Validates the status of the work zone by geofencing the construction crew's location, and work zones are geofenced using GPS-based connected cones.
- Sends information to navigation apps to disseminate back to the traveler.

BENEFITS

- App users become probe vehicles that allow traffic information to be collected without the expense of installing sensors.
- Geofencing enables delivery of up-to-date information on construction work zones to help drivers navigate through work zones more safely and efficiently.
- Geofencing to support work zone management reduces the time and effort required for agencies to make real-time work zone data available to the public.

LESSONS LEARNED

- Geofencing has proven to be a cost-effective option for agencies to improve the quality and relevance of their traveler information.
- Agencies and travelers that have used geofencing have provided positive feedback.
- Agencies are in the early stages of exploring how geofencing can support other traffic management functions.

AVAILABLE RESOURCES

- American Association of State Highway and Transportation Officials. 2022. "Caltran Launches New 'QuickMap' Notification Feature" (web page). https://aashtojournal.transportation.org/caltrans-launches-new-quickmap-notification-feature, *last accessed June 2, 2023.*
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- CDOT. 2021. "CDOT launches new, user-friendly road condition and travel planner website and mobile app" (web page). https://www.codot.gov/news/2021/september-2021/new-cotrip-app-launches, *last accessed June 2, 2023.*
- Edinger, J. 2022. "Florida DOT Tries New Tech to Improve Work Zone Safety." *Government Technology*. https://www.govtech.com/transportation/florida-dot-tries-new-tech-to-improve-work-zone-safety, *last accessed June 2, 2023.*
- PennDOT. n.d. "511PA Mobile App" (web page). https://www.511pa.com/mobileapp.aspx, *last accessed June 2, 2023.*
- PennDOT. 2022. "Pennsylvania's Operation Initiatives to Improve Safety" (Document no longer available online).
- USDOT. 2022. "Work Zone Data Exchange" (web page). https://www.transportation.gov/av/data/wzdx, *last accessed June 2, 2023.*

FOR MORE INFORMATION on other practices or the TMC Pooled-Fund:
Traffic Management System Portal (NOCoE): https://transportationops.org/traffic-management-systems-and-centers.
TMC PFS website: https://tmcpfs.ops.fhwa.dot.gov.

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