RODAT

Improving Operational Response on London's Roads

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EVERY JOURNEY MATTERS

Improving Operational Response on London's Roads using RODAT (Real-time Origin & Destination Analysis Tool)

Summary

London is growing by nine residents every hour and with the population expected to reach c.10 million by 2030, road space in central London needs to be more efficient. Currently over 80% of all passenger journeys across London and nearly all freight movements use the road network in London. With London's strategic roads 40% more densely occupied than other UK conurbations, congestion costs the London economy £5.5 billion annually (Traffic Master 2014/2015 data). Prioritising sustainable transport is imperative for meeting future needs and to do this, Transport for London (TfL) needs to manage its road network more innovatively.

A key measure that TfL uses to better understand the performance of the road network is Journey Time Reliability (JTR) [1]. TfL is working hard to find ways to maintain JTR as London grows whilst the road space is transformed to encourage a greater use of active travel modes. Previously it was only possible to calculate JTR metrics for the preceding day, limiting its usefulness to inform real time operational decisions in our control room.

To improve real-time congestion management, TfL, along with Deloitte Digital, designed and built RODAT (Real-time Origin & Destination Analysis Tool). RODAT is an innovative ITS solution combining analysis and the visualisation of information from hundreds of roadside ANPR sensors. RODAT gives TfL the ability to understand every journey made into central London by road, informing operational decisions when actively managing the network. This allows roadworks, incidents and planned events to be more precisely managed with less impact on other road users, improving reliability and customer journey experience. RODAT also provides a rich insight into the modal composition of every trip made on the network, allowing TfL to target improvements more effectively and understand how this changes over time in response to policy and interventions. This is the first time that such a tool has been attempted in the transport sector.
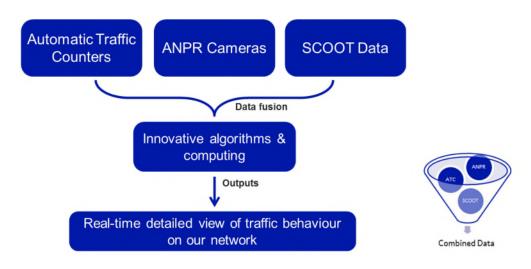
How it works

RODAT is made up of two major innovations:

1. A real-time algorithm that matches vehicle number plate data and cross-references against a variety of sources, before calculating actual journey times and traffic flows. As data arrives into the system from the roadside, it undertakes several steps to process the data and combine it with other sources.

These include:

- Capturing data from TfL ANPR (Automatic Number-Plate Recognition) cameras, comparing time stamps and removing duplicates.
- Determining the origin and destination points where vehicles are observed.
- Using other sources of data, such as automatic traffic counters on the roadside and SCOOT [2] loops/ magnometers, to uplift the number of vehicles observed in the case of 'lost' vehicles.
- Identifying modal split using a vehicle look-up against the national vehicle database (DVLA), TfL's bus fleet, Registered Taxis and information on private hire vehicles in London.
- Aggregating the data geographically to provide journey times and flows along major road links.

The real-time processing operates like a pipeline, continuously ingesting data, applying the algorithm and aggregating the results every 15 minutes.

2. Visualisation - RODAT can generate views of the current traffic data on a dashboard and map, against a baseline state of historic road conditions for that time of day and day of week. This is focused on ease of use for both control room staff and signal engineers, it allows the user to see the traffic flow data on a map in near real time and make appropriate interventions.

The Dashboard

TfL adopted open source tools, such as R, to provide agile dashboards and interfaces that were developed in house to meet our needs. The RODAT dashboard uses an intuitive graphical tool to rapidly highlight abnormal traffic, allowing informed decisions on traffic management for incidents and congestion to be made in near real-time. It is primarily used as an operational dashboard enabling TfL to smooth traffic around the network and ultimately reduce congestion and air pollution.

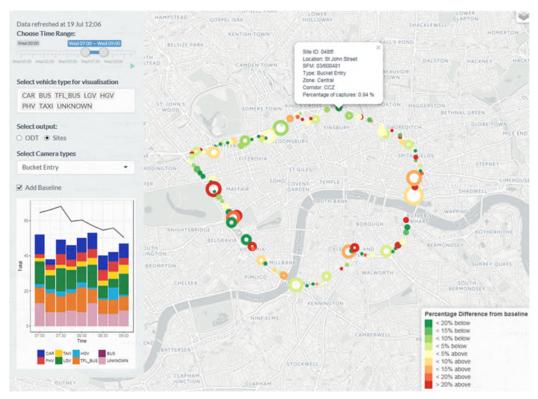The RODAT interface has two main views, below is the route monitoring view:

The route monitoring view shows a segmented view of London, broken down into 1 km sections. In this mode, RODAT displays the relative usage of each segment as vehicles complete their journey towards Central London.

It does so by giving the following information:

1. The colour of the segment shows how many vehicles used this segment along their route.

2. This view can be relative to all journeys, or for a specific start/ end point.

3. To support Active Traffic Management (ATM)[3] strategies a histogram of the busiest routes is displayed, this provides a quantifiable number of vehicles that could be influenced through targeted signal timing interventions at key junction on routes into central London.

4. Popup information is supplied to give further details about that area, and the tool displays blue and red markers indicating the most prominent start and end positions relative to that area. The size of these markers represent the significance of these positions.

RODAT also displays a junction monitoring (sites output) view:

The Sites Output View highlights the key junctions at which vehicles enter the Congestion Charging Zone (CCZ), in central London. This view gives information on:

1. The number of vehicles entering at each junction, shown by the size of the circular marker, with the most significant entries having the largest circles.

   This quickly demonstrates where vehicles are entering the CCZ and where protection may be required to maintain reliable journeys.

2. The percentage difference from the baseline flow at each junction, shown by the colour.

   T*his highlights where there may be a critical area which is under performing or affected by incidents on the network.*

3. The comparison between the baseline and current activity on the network, in a clear graph.

   This also highlights the modal split of cars, buses (both TfL's and non-TfL), LGVs, HGVs, Taxis and Private hire vehicles.

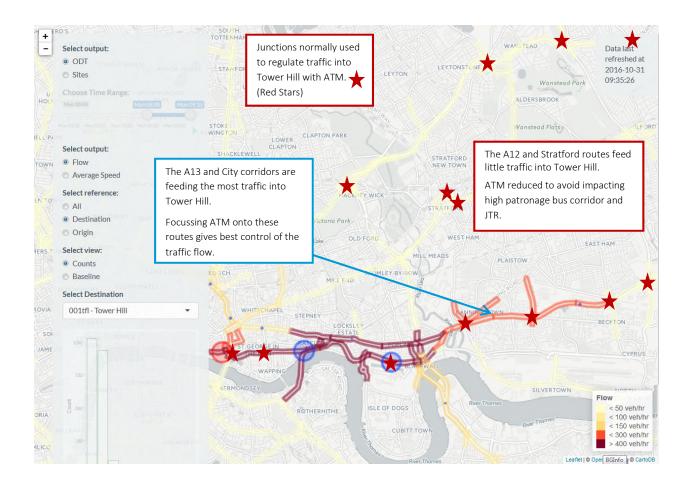4. The CCTV available at that junction, as well as information from our UTC (Urban Traffic Control) database.

This enables the user to quickly identify the key site and observe the cameras/ system to check for issues.

RODAT in action

Below are two specific examples of how RODAT was used in the last 12 months to benefit both traffic operators and customers, demonstrating its use in both planned and unplanned events.
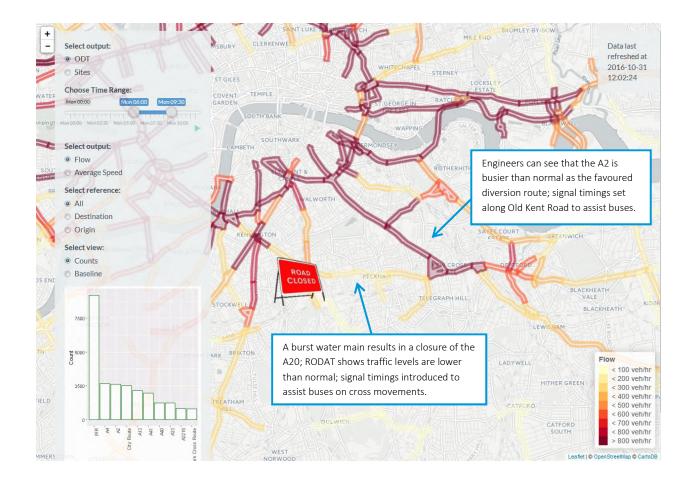
1. Tower Bridge Closure

During the three month closure of Tower Bridge last year, TfL were able to use insight from RODAT to help reduce congestion. The tool gave a clearer picture of where the traffic was originating, allowing a more targeted approach to managing the traffic flows. There was 24/7 network monitoring and deployment of ATM to minimise travel impact by protecting buses and key junctions, as well as a strategy to encourage use of alternative routes.

2. A20 Burst Water Main

In the Traffic Control Centre, RODAT allows us to react to real time traffic flows during both planned and unplanned incidents.
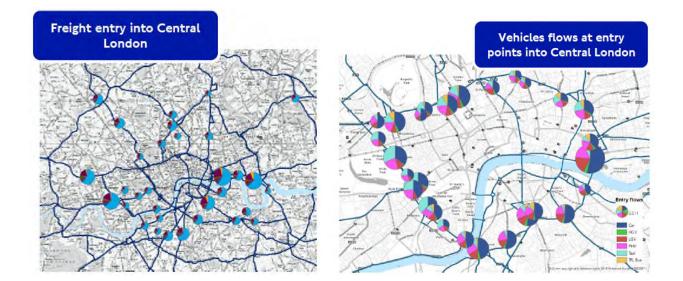
When a burst water main resulted in the closure of the A20, a key London corridor, RODAT was used to see what the favoured diversion route was and where traffic levels had risen. This allowed traffic operators to target specific locations with traffic signal timing contingency plans to assist buses through the disruption.

Further Uses

RODAT also informs the business of suitable congestion charge rates, areas and operating hours. It has helped us to understand which entry points into the London Congestion Charging Zone (CCZ) are busiest and at which time of day or how Private Hire is rapidly growing as a travel mode.

The tool can provide key information on how different vehicle types use the network, giving TfL a better understanding of modal split at different times of day. Users can now see, on a real-time basis, the main entrance points, the volume and any increase or decrease of a particular vehicle type across Central London. For example, freight, private hire, buses and taxi vehicle flows can be monitored, delivering valuable information that allows for improvements in current policies and innovation for the future.

Away from the direct operational benefits, TfL can use RODAT to support many existing performance measures, as well as help steer new ones, such as:

o   Quality bus network – Reducing EWT

o   Reliable Roads – Sustainability of freight

- Safer and more efficient journeys – Protecting JTR

- Monitoring modal growth and movement – Reducing Casualties

- Improving the environment – Reducing congestion

Conclusion

It is estimated that approximately 18 percent of congestion on London's roads is caused by demand outweighing capacity, therefore by smoothing traffic flow and precisely managing demand using RODAT and intelligent ATM, TfL can reduce congestion in central London. Alleviating overly restrictive traffic management will help to reduce air pollution and congestion by reducing the number of gridlock points on the network. RODAT also enhances our engineers situational awareness to identify incidents quickly and mitigate them before they become serious. This has significant benefits for all Londoners, such as reduced casualties, faster incident response times and more reliable roads, resulting in wider economic improvements and reduced environmental impacts.

Appendix

1. Journey Time Reliability (JTR) - *The percentage of nominal 30 minute average length journeys completed within 5 minutes of this time.*

2. SCOOT - *Split Cycle Offset Optimisation Technique, allowing TfL to vary signals according to current traffic conditions.*

3. Active Traffic Management (ATM) - *a sophisticated system to dynamically control traffic signals to keep traffic flowing at critical locations, by limiting traffic into the network at a manageable level.*

Contact

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