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One Light, Two Light, Red Light, Green Light: An Analysis of Metro G Line Signal Priority



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Issue

Los Angeles County Metropolitan Transportation Authority (LA Metro) planning staff, working alongside engineers from the Los Angeles Department of Transportation (LADOT) seek to make improvements to the Metro G Line (Orange) busway to address a number of operational problems with the popular line. The Metro G Line is the backbone of transit in the San Fernando Valley, serving more than 22,000 weekday boardings, pre-COVID-19.

In a chronically traffic-congested place like Los Angeles, one major problem for public transit is that buses must often compete for road space with private automobiles. As a result, buses get stuck in traffic. Light rail vehicles, when travelling on surface streets with cars, get stuck in traffic as well. Since the G line busway runs on its own dedicated route, it has a significant advantage. Efforts to further separate the G line from nearby traffic, such as grade-separated over- and under-passes or railroad-style gate arms at street crossings, will require complex planning and take considerable time and resources to implement. However, speeding up the G line with current infrastructure is possible by improving transit signal priority (TSP). TSP extends green time at signals so that priority vehicles (in this case buses) can pass through an intersection without stopping.

Los Angeles's TSP system relies on the Automated Traffic Surveillance and Control System (ATSAC), a sophisticated

traffic control computer housed underneath City Hall. ATSAC was installed in advance of the 1984 L.A. Olympics, and was last modernized in 2013 to upgrade the control room and install newer software. The system, based around inductive loops buried in the pavement and embedded along light-rail tracks, decides when to grant priority to buses along the G line alignment.

Research Findings

- LADOT has certain assumptions about how G line buses progress along the alignment that reflect aspirations from when the line was built, that may not be applicable today. For example, one major development since construction is a "slow order" instituted in 2005, which asks bus operators to slow buses to 15 mph in intersections.
- Dwell time — how long a bus takes to slow to a stop, pick up passengers, and resume cruising speed — is not clearly laid out in the timing charts received from LADOT. A prior study by LA Metro contractors indicated that the methodology for assessing dwell time can be improved.
- ATSAC currently relies on a transponder-based system that detects when particular buses, assigned to certain routes, fall behind on their scheduled runs. LA Metro is redesigning its bus system with the NextGen bus study and desires more flexibility to assign buses to routes than the current ATSAC system allows. Case studies from around the country have shown that flexibility

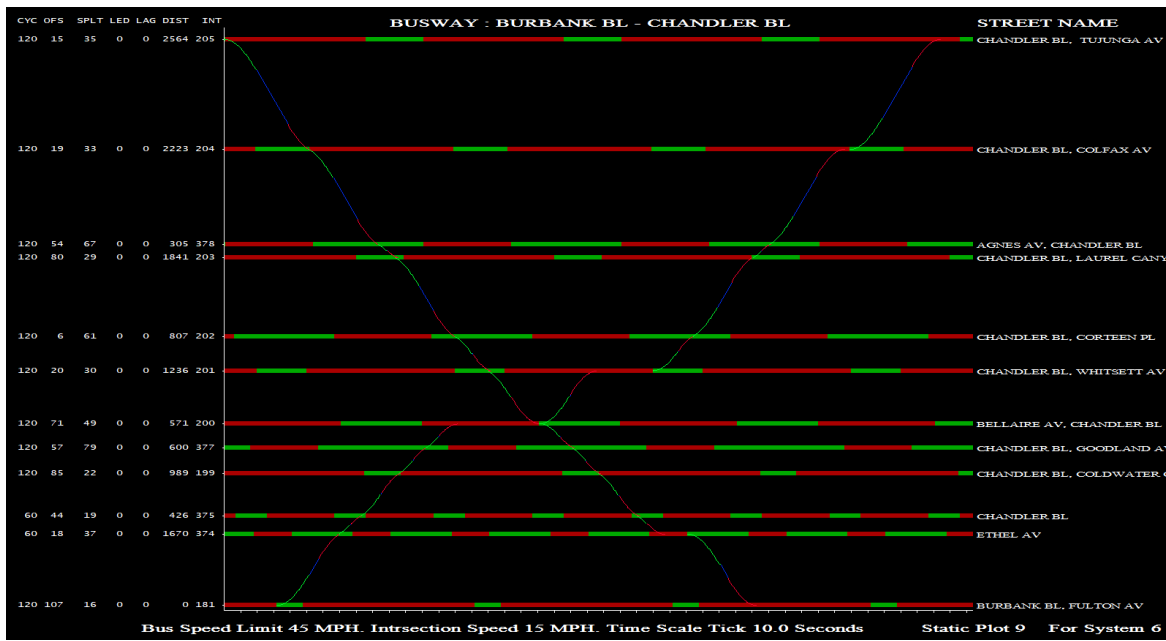


Figure 1: A time-space plot generated by ATSAC, showing the trajectory of two buses between Chandler Boulevard/Tujunga Avenue and Burbank Boulevard/Fulton Avenue. The horizontal lines represent real intersections, with red being a red light shown to the busway at that intersection and green being a green light. The diagonal lines represent buses, with green as acceleration, blue as cruising speed, and red as deceleration.

in signal timing and strong coordination across agencies are vital to a successful priority system. A robust partnership between LA Metro and LADOT will be necessary to create the next generation of traffic control system in Los Angeles

Study Approach

The researcher conducted a literature review to assess how TSP has been implemented in cities across the United States and Europe, then examined the history and challenges of how TSP has been implemented in Los Angeles. The study also included an analysis of signal timing charts, time-space plots, and other information provided by LADOT for the G Line, as well as G Line improvement reports created for LA Metro.

Conclusions

- The G line’s signal timing does not reflect on-the-ground operating conditions and should be updated



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- to speed commuters along this vital transit alignment. LA Metro is in the process of using global positioning system (GPS) data to gather and generate end-to-end run time, speed, and dwell times to deliver to LADOT. These data will be necessary to update the signal-timing system.
- LA Metro aims to create more flexible signal priority logic within the ATSAC framework, and has looked to other cities around the country to inform improvements for the TSP system in L.A. Cities such as Houston and Santa Monica may offer lessons for creating a more robust TSP system in Los Angeles.
- As the L.A. region reimagines its transportation system goals, LADOT and LA Metro may want to fundamentally reexamine the priorities of traffic control in Los Angeles. ATSAC focuses on optimizing vehicle flow, while LA Metro looks to speed passengers moving through on public transit vehicles. Reimagining system metrics, such as using person delay vs. vehicle delay, will help align the goals of the two agencies.