Scoring of Driver Compliance to Variable Speed Limit Systems

Master‘s Thesis of Gary Riggins

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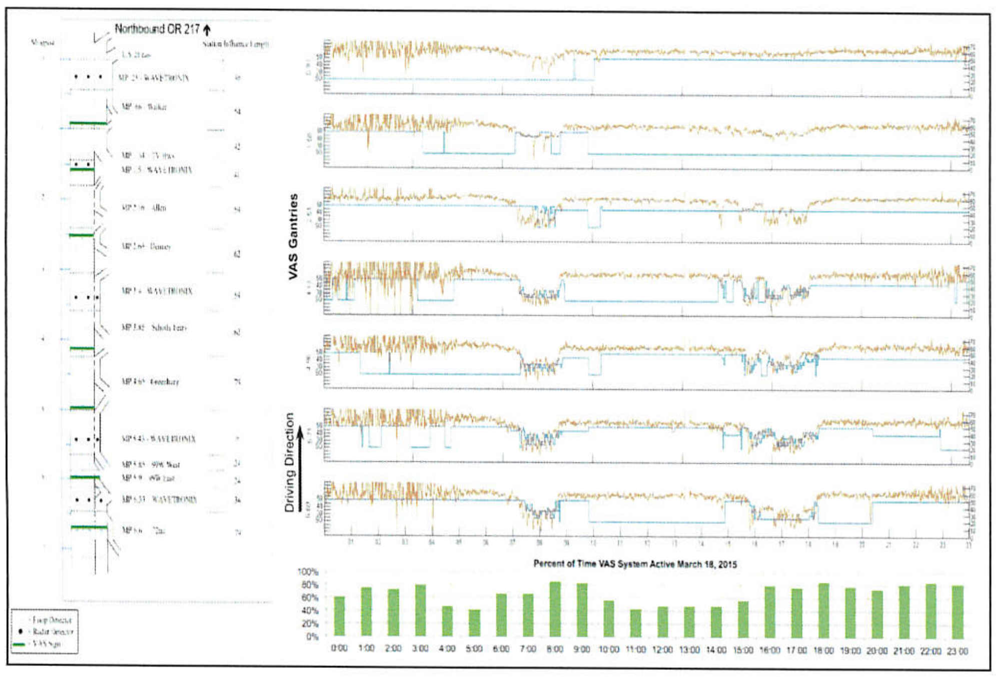
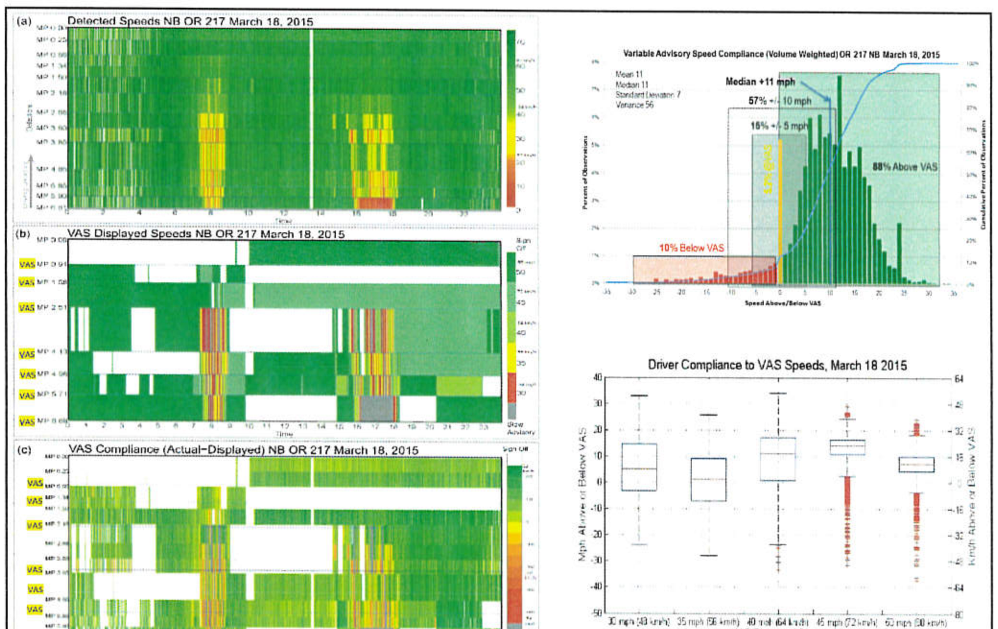
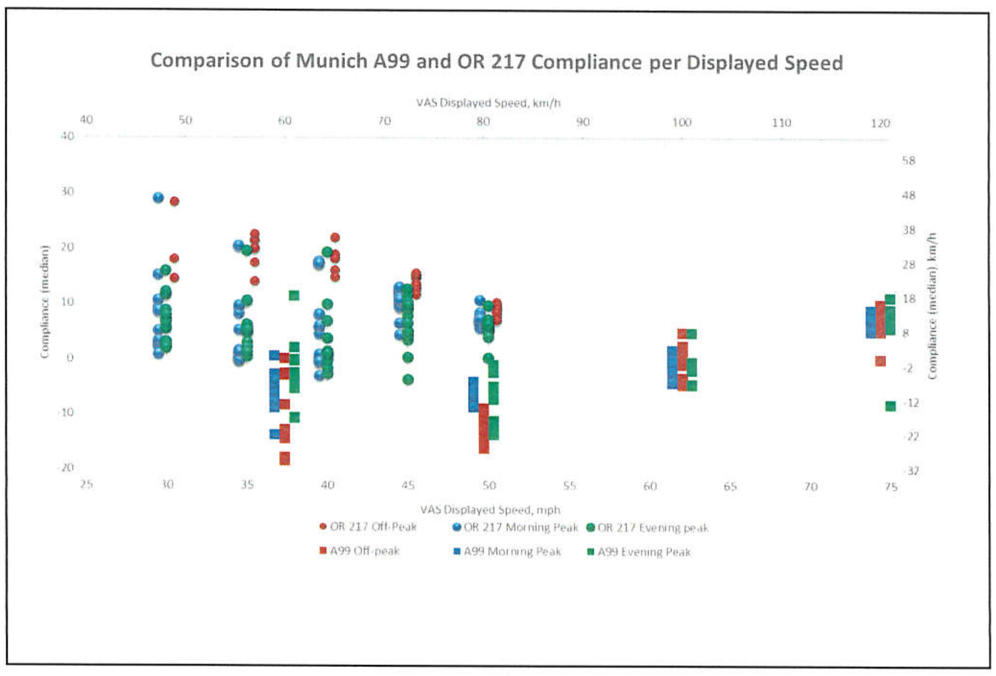


Variable Speed Limit (VSL) and Variable Advisory Speed (VAS) systems are applications of a growing field of active traffic management systems (ATM). Portland, Oregon installed a VAS system (advisory meaning it is not automatically enforced) on a 7 mile segment of heavily congested urban freeway. The Portland region maintains archived, high-resolution data of both VAS sign messages and speed detection loop feedback, permitting reconstruction of traffic and sign data. This thesis analyzes over 30 days of archived data from the Portland site in order to study driver compliance to VAS signs. The focus is to suggest methods and parameters to score system performance. Such an analysis could benefit new rollouts of VAS corridors by providing system performance feedback and shed light on options for improving system performance. Similar compliance data from the Autobahn A99 in Munich was used for a comparison with OR 217 compliance.

The figures (a), (b), and (c) on right show the traffic speeds, displayed advisory speeds, and the difference between the two or the compliance of drivers to the posted speed arranged in a bottom-to-top driving direction. During the morning and afternoon peak periods, congestion forms at a known bottleneck near the middle of the corridor.

The bar plot of compliance speeds shows the distribution of driver's speeds above/below the VAS speed. The mean, median, standard deviation and bins of drivers in speed categories (1 to 5 mph, 6 to 10 mph) above and below were extracted from multiple days of data. In addition, driver compliance was analyzed per VAS displayed speed (30, 35, 40, 45, 50 mph) for all days. The study further divided the daily compliance data into morning and evening peak and off peak hours. The object of dividing the data along time and speed characteristics is to find parameters indicating system success.





In the comparison of compliance data from a segment of the Autobahn 99 with the OR 217, the lowest speed of the German system starts mid-range in the Oregon system. The top speed for the OR 217 system is 50 mph or 80 km/h compared to 75 mph or 120 km/h for the A99 freeway in Munich. In the Oregon system, as the displayed speed increases, driver compliance becomes better. On the A99, drivers tend to drive increasingly faster than the speed limit, as the speed limit becomes higher.

Considering the short time that the OR 217 system has been up-and-running, a year at the time of this thesis, the algorithm has had time to be better tuned to be congestion-responsive. It remains important to evaluate the results of the VAS system influence on traffic in order to increase the effective potential of the system. Increasing effectiveness means making sure that the “ground truth” vehicle speed data is closely reflected within a tight time-space window on VAS sign displays in addition to investigating actual driver compliance to advisory speeds.