Distributed Urban Data Gathering and Congestion Tracking in a Vehicle-to-Infrastructure Architecture

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Abstract **–** Much of the research in intelligent transportation systems (ITS) assume that vehicles will be able to communicate speed and location data to roadway infrastructure and to other vehicles. Although many applications have been proposed based on this data, there does not currently exist a simulator based on live data that allows researchers and ITS developers to test their applications.

FreeSim (http://www.freewaysimulator.com) is an open-source traffic simulator that allows ITS researchers to test their applications against live data. In Anchorage, there are currently 15 vehicles equipped with vehicle-tracking devices that report speed, location, and direction data to a central server via a Vehicle-to-Infrastructure network every 10 seconds. This data is exposed to users of FreeSim to use in their own applications, which allows users to test their applications on live data before actually deploying in a live environment.

Other institutions are attempting similar projects, including UC Berkeley and MIT, who have partnered with cellular companies to determine the flow of traffic based on the location of cellular phones within an area. This approach has come under a lot of scrutiny based on the privacy concerns of the users. Although this approach does reach a larger user base, it is possible that both approaches can be integrated to provide an even better representation of the current traffic conditions.

In Anchorage, this data has already been analyzed with respect to times of heavy congestion around the University of Alaska, Anchorage/Providence Hospital. This is an area that is notorious for heavy congestion during times of people arriving to work and departing from work. The extent of the added delay and the impact to the surrounding arterial streets is being studied using the vehicles containing the tracking devices. Gathering the data from individual vehicles provides for actual trip delay information rather than merely providing the speed at certain discrete locations. Overall route data has never been provided or studied as it has been done in this research.

In this paper, I discuss preliminary results that have been determined from having vehicle-tracking devices installed in such a small number of vehicles. Although the percentage of vehicles containing the devices is less than 0.1% of the vehicles in the city of Anchorage, the results on the arterial roadways around the University are still extremely accurate during times at which vehicles containing the devices are commuting. Over the past 60 days, at least one of the vehicles has been commuting between 7:30a.m.-8:30a.m. and one has been commuting between 4:30p.m.-5:30p.m. on each weekday. The overall delay on the arterials has been graphed and compared to the time to traverse the arterials with no congestion. The paper is concluded with future enhancements to the current system.