Matt Buland
February 2^{nd}, 2014
Homework #3.B
Time: 2.5hrs

Response to:

R. Bauza, J. Gozalvez, and J. Sanchez-Soriano, Road traffic congestion detection through cooperative Vehicle-to-Vehicle communications, Proceedings of the IEEE Local Computer Networks (LCN) Conference, pp. 606-612, 2010.

Summary

To classify traffic congestion better, a method of taking vehicle sourced density and speed is proposed to identify the level of traffic in localized areas. The model depends on cooperative communication between cars, and assumes that the required methods of communication are available.

Goal

The goal is to accurately depict localized areas of traffic using simple (non-GPS) sensing techniques and vehicle to vehicle communications to transfer the local data, and possibly add total to the traffic data, depending on the model.

Do

First, the paper outlines the different levels of traffic there can be. Of key note is the overlap in the areas, which gives a more gradual scale, as opposed to discrete categories. This classification comes from the Skycomp Highway Control Manual, and the overlaps are an exercision of fuzzy-logic on the possible values. The bulk of the work done comes in with the Cooperative Traffic Estimation, which aggregates the total traffic from the path that the message from the lead car takes. There are four ways to use the path to determine the total traffic: mean of all the cars' values in the path, median of all the values, median based on individual ranges, or median based on individual ranges with neighbor increments. The first two are relatively straight forward: each vehicle estimates their local traffic, and aggregates or adds their estimation to the running calculation. The frequency based techniques require pre-specified ranges for congestion level. At each step in the traffic stream, a value is added to the running total of that frequency, and the median taken from the end mapping. The difference between the two is the value added to the map: either 1 or the number of neighbors. The neighbor addition will likely add a large bias to the median, making it the obvious median choice.

Results

The four methods of aggregate traffic collection were compared in the traffic simurator SUMO. The levels and errors were compared against a centralized caclulation, showing that the median frequency with neighbors had the least error, with the median closest behind.

Field Impact

The impact of this paper directly on the wireless sensor field is very minimal. Since all the sensing parts are assumed, this work only has an effect on post processed data. Despite lacking in sensing, the paper does take a good look at the methods of estimating a value in a system that propogates its data in a stream of hops. In the event that someone did the other 95% of the work required to actually do vehicle to vehicle communication, this paper would be useful in determining the aggregation of a sensed feat across all the nodes.

Discussion

A lot, and I mean a LOT of the paper is spent talking about pointless systems that are just handwaved over in the end. The values in the LOS F level table has no explanation of the values (specifically the overlapping areas), and could have been summarized in ONE paragraph. That specific section had a massive amount of fluff from repition and unneeded information.

The background section is a bit long winded, but I felt it appropriately described the scenario.

Throughout the paper, there many, many, maaannnyyy assumptions made. The sensing part of the system is by far the hardest part. How do you know how many neighbors there are? What if only a few cars are “smart cars.” How is time synchronized? How do you prevent packet loss and packet congestion?

Once the data has been analyzed, what good is it? I can almost guarantee that most people dont change roads (effectively) because of traffic. Usually, if one path is busy, they all are; switching wont help. It can be useful for future road planning, but the author doesnt mention it.