

**State of Wisconsin/Department of Transportation**  
**RESEARCH PROGRESS REPORT FOR THE QUARTER ENDING: March 31, 2007**

<b>Program: SPR-0010(36) FFY99</b>	<b>Part: II Research and Development</b>
<b>Project Title:</b> Vehicle Classification from Single Loop Detectors	<b>Project ID:</b> MRUTC 05-02
<b>Administrative Contact:</b> Jason Bittner	<b>Sponsor:</b> MRUTC
<b>WisDOT Technical Contact:</b> Nicki Hatch	<b>Approved Starting Date:</b> Oct. 1, 2004
<b>Approved by COR/Steering Committee:</b>	<b>Approved Ending Date:</b> Mar. 31, 2007
<b>Project Investigator (agency &amp; contact):</b> Ohio State University, Benjamin Coifman	

**Description:** The goal of this research is to utilize the advances in velocity and length estimation from single loop detectors to develop a vehicle classification methodology. It is envisioned that the classification work will also improve length-based classification at dual loop detectors. The research promises to extend vehicle classification to existing stations using only single loop detectors and offers viable options in the event that one of the loops in a dual loop detector fails.

- Task 1: Meet with ODOT engineers and potentially teleconference with other state departments of transportation (DOT's) in the MRUTC to establish properties of existing classification systems and desired properties of the classification system, e.g., number of bins and length thresholds between bins.
- Task 2: Collect additional detector data. Particular emphasis will be on stations with significant truck demand. Each location will need an external measure for verification. ODOT will be the primary source to log individual vehicle data from several of their stations. The researchers will collect concurrent video at several stations to manually verify the vehicle class.
- Task 3: Develop and test the single loop detector classification against the Weigh in Motion or axle classification. In parallel, the researchers will further improve the length estimation techniques from single loop detectors.
- Task 4: Use the manually extracted vehicle class from video to verify the methodology.
- Task 5: Work with ODOT and other state DOT's to deploy the resulting length-based classification methodology for single loop detectors.

Total study budget	Current FFY budget	Expenditures for current quarter	Total Expenditures to date	Percent Complete
<b>\$39,998</b>	<b>\$39,998</b>	<b>\$3,441</b>	<b>\$36,557</b>	<b>95%</b>

**Progress This Quarter:**

(Includes project committee mtgs, work plan status, contract status, significant progress, etc.)

(1) We finished ground truth generation on I71 and compared it against the algorithm performance. Except for item (2) below results were good.

(2) Pulse breakup Analysis

While performance on I70 was quite good, evaluating the ground truth data on I71 revealed the fact that the detectors tend to drop out in the middle of long vehicles. Comparing the counts and vehicle lengths from this station to adjacent stations suggests that the drop-out problem is common in the corridor. Catching such detector errors is beyond the intended scope of this research, however, for our methodology to be practical it must work with existing detectors. So we undertook a small pilot study to see if we could catch such errors using just the detector data. The difficulty lies in differentiating between a tailgating vehicle and a long vehicle that drops out in the middle. At least within the limited scope of the work at hand it proved too difficult to catch drop out problems during congestion (vehicles may stop over the detector and the impacts of acceleration/deceleration make it much more difficult). So for now, our solution is to first establish when traffic is free flow, and under those conditions, look at the on and off times to catch the drop-outs. Performance was good for the limited amount of ground truth in hand, but a follow up study on this issue is likely warranted.

(3) Looked at the performance in vehicle classification at all dual loop stations

Compared the vehicle length estimate and class from just one loop in a dual loop detector against the measured length and class if one used the dual loop. Then we tested the output for vehicle classification across all dual loop stations in I71. Error rates were typically under 5 percent.

(4) ODOT meeting

We met with ODOT Mar 22, 2007 to present our analysis of their classification station and the performance of our methodology.

(5) Preparing a final report

The final report preparation has been delayed. It includes two student theses and progress was slower than expected. All research is complete and a first draft now exists

**Work Next Quarter:**

Finish final report

**Circumstances affecting progress/budget:**

The original proposal consisted of two companion proposals submitted, each approximately \$20,000, submitted independently to MRUTC and ODOT, with the remaining funds and matching coming from OSU. It took considerably longer for the red tape to be worked through than anticipated.

Both halves of the project reached the original completion date, the MRUTC portion had a no-cost extension without delay, while the ODOT portion was frozen for several weeks while the no-cost extension was being approved. The latter finally came through in September, and we are now able to continue work on this project.

