



***Accuracy Assessment
of the
Sensys™ Wireless Vehicle Detection System
by
Florida A&M University/Florida State University***

PERFORMANCE CHARACTERIZATION

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The Sensys™ Wireless Vehicle Detection System represents the next generation of vehicle detection technology. As a new technology, the Sensys detection system's performance has been quantitatively assessed by a number of independent studies. Many of these studies, however, have not been published in research journals and have only received limited distribution. The results of one such study conducted by researchers at the College of Engineering of Florida A&M University (FAMU) and Florida State University (FSU) are summarized here.

Test Conditions

Under the direction of Renatus Mussa, Ph.D., P.E., Associate Professor and Director of the Traffic Engineering Laboratory at the FAMU-FSU College of Engineering, data collected by a Sensys Wireless Vehicle Detection System were compared to data collected by a radar system and an inductive loop system as well as to ground truth as established by video tapes and radar gun measurements..

The study employed a Sensys Wireless Vehicle Detection System installed in August 2006 on two eastbound and two westbound lanes of Interstate 10 in Tallahassee, Florida, between the N Monroe St and Thomasville Rd/Capital Circle NE exits. In each lane, two Sensys wireless sensors were installed in the pavement, separated by approximately 20 feet / 6.1 meters in order for the system to derive vehicle speeds from the raw detection data. Detection events from the eight wireless sensors communicate via low-power radio links to a nearby Sensys access point mounted on a concrete post at a height of approximately 35 feet / 10.7 meters. The access point is powered by a solar panel with battery backup, communicating its detection data via TCP/IP over GSM cellular data services (EDGE/GPRS) to a SNAPS (Sensys Networks Application, Proxy, and Statistics) manager for data processing and archiving.

Both short-term and long-term data analyses were performed. In the short-term analysis, volume and speed data collected from the different systems over 11-19 September 2006 in the westbound outside lane were compared to ground truth data based on either video camera records or laser-guided radar speed gun measurements. In the long-term analysis, volume and speed data collected from the three systems between 20 September and 2 November 2006 for all four lanes were compared against each other. At the request of the Florida Department of Transportation, only those results pertaining to the Sensys system versus ground truth are presented here and thus only the short-term analysis results are shown.

Volume Accuracy

In comparing volume data from the three systems against video ground truth, the FAMU/FSU study concludes that the Sensys system was, on average, within $\pm 1\%$ of ground truth. Results for different 15-minute periods are shown below:

15-Min Quarter Number	Vehicle Count		Percentage Error
	Video Ground Truth	Sensys	
1	218	209	-4.1
2	228	234	+2.6
3	213	217	+1.9
4	248	242	-2.4
5	212	207	-2.4
6	193	198	+2.6
7	204	203	-0.5
8	233	229	-1.7
9	236	238	+0.8
10	216	210	-2.8
11	200	194	-3.0
12	216	212	-1.9
13	227	225	-0.9
14	205	206	+0.5
15	184	177	-3.8
16	219	218	-0.5
17	275	271	-1.5
18	199	200	+0.5
19	183	178	-2.7
20	179	177	-1.1
21	239	237	-0.8
22	197	197	+0.0
23	204	204	+0.0
Mean Percentage Error			-1.0

source: FAMU/FSU, "Evaluation of Wavetronics and Sensys Traffic Sensors: Progress Presentation," 8 November 2006

The Sensys Wireless Vehicle Detection System provided average volume accuracy of 99%

Speed Accuracy

In comparing speed data from the three systems against ground truth as established by laser-guided radar gun, the FAMU/FSU study concludes that the Sensys Wireless Vehicle Detection System records speeds fairly close to ground truth:

15-Min Quarter Number	Average Speed		Percentage Error
	Laser Gun Ground Truth	Sensys	
2	67.7	67.4	-0.4
5	66.7	64.7	-3.0
10	64.4	64.4	+0.0
13	66.6	65.9	-1.1
17	67.6	65.6	-3.0
21	66.8	66.1	-1.0
Mean Percentage Error			-1.4

source: FAMU/FSU. "Evaluation of Wavetronics and Sensys Traffic Sensors: Progress Presentation." 8 November 2006

All three systems provided fairly accurate speed measurements over 15-minute intervals

Conclusion

The FAMU-FSU study assessed the accuracy performance of the Sensys Wireless Vehicle Detection System in terms of traffic volume and speed compared to ground truth in a single traffic lane as established by video tapes of the passing vehicles and laser-guide radar gun measurements.

When compared against the video record, the Sensys detection system showed a mean volume (count) error of approximately 1%. When compared against radar gun measurements, the Sensys system provided mean speed measurement data accurate to within 1.4% of ground truth.

For more information about advanced Sensys technology from Sensys Networks, please visit www.SensysNetworks.com or contact info@SensysNetworks.com

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