RUTGERS
Center for Advanced Infrastructure and Transportation

QUARTERLY PROGRESS REPORT

Project Title:	Automated Pedestrian Counter
RFP NUMBER: 2008-06	NJDOT RESEARCH PROJECT MANAGER: **Vincent Nichnadowicz**
TASK ORDER NUMBER: TO 217 / RU Acct 4-27252	PRINCIPAL INVESTIGATOR: Dr. Kaan Ozbay/Ranjit Walia
Project Starting Date: 01/01/2008 **Original** Project Ending Date: 12/31/2009 **Modified Completion Date:**	Period Covered: 4th Quarter 2009-FINAL

Task #	Task	% of Total	Fixed Budget	% of Task this quarter	Cost this quarter	% of Task to date	Total cost to date
1	Literature Search	9.04%	$ 15,000	0.00%	$ -	100.00%	$ 15,000
1	Task 1: Comprehensive Literature Review & Policy Analysis	12.06%	$ 20,000	0.00%	$ -	100.00%	$ 20,000
2	Task 2: Selection of Pedestrian Counters	4.52%	$ 7,500	0.00%	$ -	100.00%	$ 7,500
3	Task 3: Select Deployment Sites	3.32%	$ 5,500	0.00%	$ -	100.00%	$ 5,500
4	Task 4: Develop Evaluation Plan	12.42%	$ 20,600	0.00%	$ -	100.00%	$ 20,600
5	Task 5: Implement Evaluation Plan	35.68%	$ 59,192	10.00%	$ 5,919	100.00%	$ 59,192
6	Task 6: Develop Recommendations & Guidelines	17.32%	$ 28,723	60.00%	$ 17,234	100.00%	$ 28,723
7	Task 7: Project Management, Final & Quarterly Reports	5.64%	$ 9,361	25.00%	$ 2,340	100.00%	$ 9,361
	TOTAL	100.00%	$ 165,876		$ 25,493		$ 165,876

Blue text is entered once at the beginning of the project

Green text is updated ever quarter

Black text is automatically updated or static

Project Objectives:

Objective 1: Scanning

Step 1. Assess current state-of-the art in pedestrian sensors

a. Conduct literature review related to the pedestrian counters

b. Develop and conduct interviews with a number of States

c. Develop Recommendations

Objective 2: PILOT STUDY

Step 2. Develop experimental set-up

i. In close cooperation with NJDOT, select pedestrian counters to be tested.

ii. In close cooperation with NJDOT, select sites where field tests will be implemented.

Step 3. Develop an evaluation plan

Step 4. Implement the evaluation plan

i. Conduct field tests

ii. Analyze data

Step 5. Interpret results of the field evaluation

Objective 3: SYNTHESIS

Step 1. Develop recommendations and guidelines

Project Abstract:

NJDOT needs to collect **accurate** pedestrian related information in a **cost effective way**. According to the RFP issued by NJDOT, there are key gaps for pedestrian planning and mobility including the "*number of pedestrians using any given sidewalk, path, crosswalk, or other pedestrian facilities*". The lack of such data is in turn clearly one of the one of the most significant barriers to the development of *safety conscious transportation plans* that includes pedestrians as well as vehicles. The same RFP states two important types of information needed for reliable decision-making:

1. better understanding of pedestrian behavior,
2. more accurate and complete inventory of pedestrian flow rates.

In the past, pedestrian count information was generally collected manually. However, since the manual collection of accurate pedestrian counts can be quite expensive and time-consuming, this approach is used sporadically and as a result does not yield comprehensive data from which to make informed policy and planning decisions. In fact, because of extensive time and labor requirements of manual

data collection, which might also be relatively inaccurate, reliable pedestrian flow information is most of the time not available to the planners and decision makers. In addition to the lack of meaningful pedestrian flow data, other information related to the understanding of "pedestrian behavior" is almost never available. Unfortunately, even the literature is quite limited in terms of this information. Most recently, researchers at the UC Berkeley Safety Center conducted a comprehensive feasibility study along with a pilot test to assess the best ways to collect both types of information namely, flow and behavior (Greene-Roesel et al., 2007). One of the main findings if their report is the fact that automated counters are the most feasible way of collecting pedestrian data that is reliable and statistically significant in terms of its sample size. In turn, this study provides support for the need to assess the feasibility and use of automated pedestrian counters in New Jersey. Such data could fill a key information gap for the lack of this information which is one of the key parts of the overall puzzle for decision makers and planners who would like to consider pedestrian oriented multi-modal transportation options when developing their planning projects.

With the advent of new technologies that make it possible to automatically count and even track pedestrians in a wide variety of settings and transportation facilities, accurate and cost effective data collection has become a possibility. The major goals of this project as also stated in the original RFP can be summarized as follows:

1. Conduct a literature review on this topic and scope out the costs and feasibility of utilizing these technologies in NJ.
2. Create a pilot program where a limited number of automated pedestrian counters are purchased, deployed and field evaluated.
3. Assess the ease of use and value of the data to help the department to make better decisions about the feasibility of "using automated pedestrian counters" at a larger scale in the State.
4. Develop comprehensive yet easy to use guidelines for the deployment of various types of automated counters under various site-specific conditions
5.

1. Progress this quarter by task:

Phase 1- Literature Search: This task is completed.

Phase 2 - Research

Task 1 Comprehensive Review and Policy Analysis:

1. We completed Task 1. We delivered a final report for Task 1 (combined with the findings of Literature Search of Phase 1).

This task is completed.

Task 2 Select and Recommend Pedestrian Counters To Be Evaluated:

1. This task is completed.

Task 3 Select Deployment Sites:

1. This task is completed.

Task 4 Develop a Comprehensive Evaluation Plan

1. This task is completed.

Task 5 Implement Evaluation Plan

We completed the evaluation of the EcoCounter (low volume sensor) under laboratory and real-world conditions. EcoCounter pedestrian detector was installed on Busch Campus on January 20, 2009. The detector was mounted on a traffic sign near Busch Campus dining hall. The sensor was mounted such that only pedestrian volumes would be counted, and there would not be any interruption due to vehicles. Pedestrian volumes are heavy at this location, approximately 4,000 pedestrians per day, because of students walking between the dining hall, classrooms and dormitories. Completed the processing of the data related to this data collection phase.

We completed field evaluation of the "high volume scenario" at two sites suggested by NJDOT namely. New Brunswick and Trenton train stations. We conducted long and short counts at multiple days. We visited these sites at different dates and times to ensure the collection of data under different conditions. We have also completed the processing of sensor and video data and analyzed and summarized our results.

We have also completed the data collection at the low demand site suggested by NJDOT namely, "Pedestrian bridge near Route 1". We visited the site two days namely a week and a weekend day.

We completed the process of processing video data along with sensor data[1]. We also collected additional long-term data for side by side comparison of the two sensors at a high demand location to further support our final data collection recommendations and guidelines. This effort took place in September and early October 2009 to basically validate our calibration guidelines developed by using the data collected previously. We incorporated this new data in our analysis.

Tasks 6: Develop Recommendations and Guidelines

We have prepared scientifically sound analytical guidelines to collect data at low and high volume pedestrian sites using automated pedestrian counters. We have also developed analytical techniques that NJDOT can use to calibrate EcoCounter (low volume) for long-term data collection at both low and high volume sites. Our comparison of the developed analytical models with the long-term data collected at a site that was not used for the calibration of these models produced highly accurate results. Thus, this additional long-term data collection confirmed the soundness of our calibration approach. Once we receive the reviewed draft final report from NJDOT, we will incorporate these additional results that strengthens our conclusions and proposed guidelines. We have also developed a step-by-step installation guideline that can be used to deploy these sensors in the field.

Task 7 Project Management, Final and Quarterly Reports"

This is an on-going task that includes all the project management and reporting activities required by the project. We submitted the draft final report for review during the second week of October, 2009. We anticipate to receive the reviews back and incorporate requested changes / comments in our final report. Then, we will finalize the report.

2. Proposed activities for next quarter by task:

Finalize and submit the final report.

3. List of deliverables provided in this quarter by task (product date):

1. Draft final report.

[1] This report is being prepared in November 2009 and some of the tasks are in anticipation of what is expected to happen in December 2009.

4. Progress on Implementation and Training Activities:

1. None this quarter.
2. An on-site training for the installation and the calibration of the thermal camera scheduled with the manufacturer of the thermal pedestrian counter" was conducted on March 5th, 2009.

5. Problems/Proposed Solutions:

We did not have any new problems during the 4th quarter.

Past problems that are successfully resolved: We encountered a problem with finding a suitable power source for the thermal counter. This was a problem because the current power source needed to be altered to be compatible with the voltage required by the thermal counter and this had a cost of $2000. Thus, we decided to use batteries as an alternative that is less expensive and more portable. A steel box that can accommodate both these batteries were ordered. The original New Brunswick location also required permission from the owner of the traffic light and that might cause further delays. We decided to first test the equipment at a less problematic more accessible location namely at the same Busch campus location where we tested the EcoCounter. This location has several advantages 1) the permit for installation the equipment on the pole has already been obtained 2) it has quite a high volume of pedestrian traffic 3) it has been used for the testing of the EcoCounter, thus we will have a chance to compare both sensors under similar pedestrian traffic conditions 4) it is easily accessible by allowing the team to test if the battery based power solution works adequately or not.

Year 1 Budget	$ 97,455
Years 1 & 2 Cumulative Budget	$165,876
Years 1, 2 & 3 Cumulative Budget	
Total Project Budget	$165,876
Modified Contract Amount:	
Total Project Expenditure to date	$165,876
% of Total Project Budget Expended	100 %

NJDOT Research Project Manager Concurrence: _____ Date: _____