# **Counting Bicycling** and Walking in Oregon

## **Project Purpose**

Recommend technologies to increase bicycle and pedestrian count accuracy while integrating bicycle and pedestrian counting with existing ODOT traffic counting.



**Bicycle counting** technologies: Inductive loops Pneumatic tubes Thermal cameras



## Methods

**Ground Truth:** Manual counts from video

**Error Calculation:** Overall Error =  $\frac{c-m}{m}$ 

Mean Percent Error (MPE) =  $\frac{1}{h} \sum_{i=1}^{h} \frac{c_i - m_i}{m_i}$ 

where

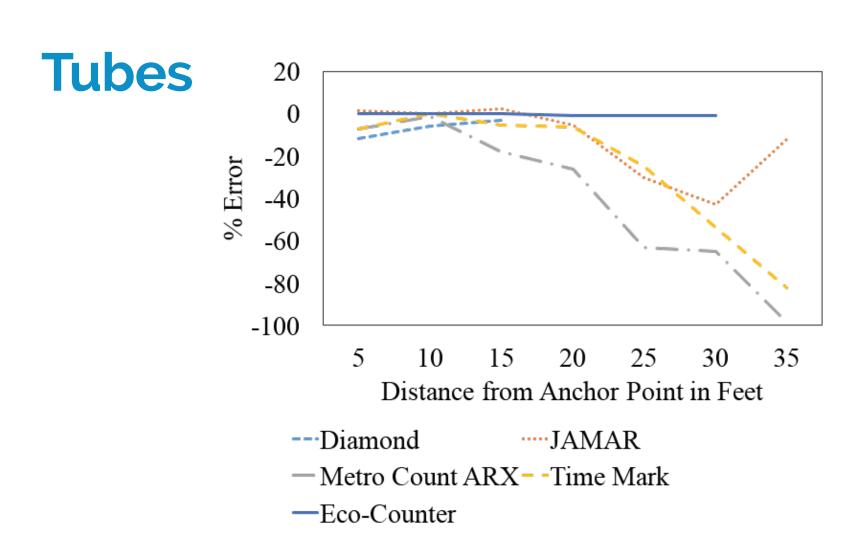
- *m* = ground truth count for study period *c* = tube count for study period
- h = total number of bins (hours)

## **Controlled Environment**



#### Parallelogram Loop

EDI card > 50% error in center of loop Reno A&E 1101B card - Low error in center of loop < 5% error



#### **Thermal Camera**

Thermal Camera: < 1% error for standard bikes approaching camera

#### **Oregon DOT Report SPR 772**

## **Pedestrian counting**

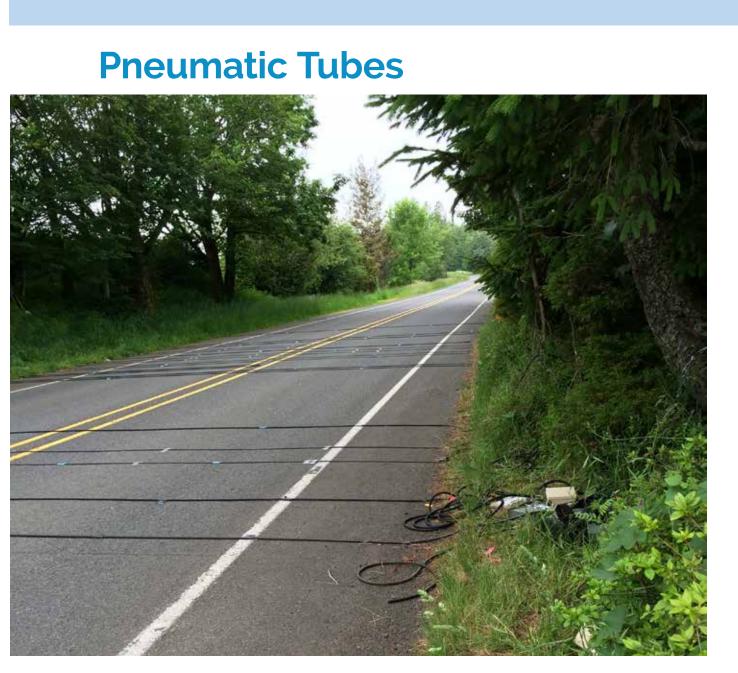
Pedestrian phase actuations





### **Mixed Traffic**

**Rural Highway** 



#### **Suburban Intersection**









#### Inductive Loops

		$\diamond$	
	Ground	% Error	
	Truth	Diamond	Par
NB	108	550%	
SB	105	540%	

#### **Pneumatic Tubes**

Thermal Camera				
Zone	Facility	Modes Counted		
1	Sidewalk	Pedestria and Bicyo		
2	Right Turn Lane	Bicycle		
3	Bike Lane	Bicycle		
4	Left Turn Lane	Bicycle		

#### Pedestrians

0 1 2 3 4 5 6 7 8 910

Ground Truth...

North

217

190

1.14

South

145

1.19

East West Total

278

230

1.21

0.95

818

723

1.13



**Pedestrian Phase Actuations** Parameter Pedestrian Volume (Video Counts)

> Pedestrian Phases (2070 Data)

Ratio (Pedestrians/Phase)

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#### Facility **Bicycles** Pedestrian Only Facilities Eco-Counter N (sidewalks, Eco-Counter S trails) JAMAR N JAMAR S JAMAR S half-road TimeMark 10ft N TimeMark 16ft N TimeMark 10ft S Bicycle Only Facilities (cycle TimeMark 16ft S MetroCount ARX N MetroCount ARX S tracks, separated MetroCount BOCO N MetroCount BOCO bike lanes) Diamond TT6 Bike-Ped Paths & Sidewalks **Bicycles** Shoulders and % Error Bike Lanes allelograr 420% 160% ₫ 10% 0% **ய** -10% ் **b** -20% Roadways (mixed traffic) -30% low volume ound Thermal Error (% Truth Camera Camera Roadways (mixed traffic) medium to high 112 20 volume 57 207 113 104 59 63 22 14 Intersections $R^2 = 0.9$ Conclusions

All 3 bicycle counting technologies are adequate to count bicycles under controlled, favorable conditions.

In mixed traffic conditions only the pneumatic tubes were able to count bicycles with less than 20% error.

Bicycle counts in mixed traffic conditions with pneumatic tubes are more accurate when bicycle-specific vehicle classification schemes are used and when counting bicycle traffic within 10 feet tube length of the counting device.

Both pedestrians counting technologies – passive infrared and pedestrian phase actuations – were tested and attained satisfactory results.



## **Recommendations For Short Duration Counts**

	Bicycles	Pedestrian
<image/>	N/A	Passive infrared (most accurate for low pedestrian traffic sites)
<image/>	Tubes – all types	N/A
	Tubes – bike specific and classification	Passive infrared (reference) Combine with tubes to distinguish bicycles.
	Tubes – bike specific and classification	N/A
	Tubes – classification counters low volume roads	N/A
	Manual counts	N/A
	Manual counts	Pushbutton for pedestrian activity