Counting Bicycles and Pedestrians at Signalized Intersections

PROJECT:

Investigation of Bicycle and Pedestrian Continuous and Short Duration Count Technologies in Oregon

Contributors:

Sirisha Kothuri, Krista Nordback, Miguel Figliozzi, Taylor Phillips, Andrew Schrope, and Carson Gorecki

TREC and Department of Civil and Environmental Engineering, Portland State University

NATMEC, May 3rd, 2016

Portland State
UNIVERSITY

Outline

- Goals
- Technologies
- Site
- Results by technology
  - Controlled Environment
  - Mixed Traffic
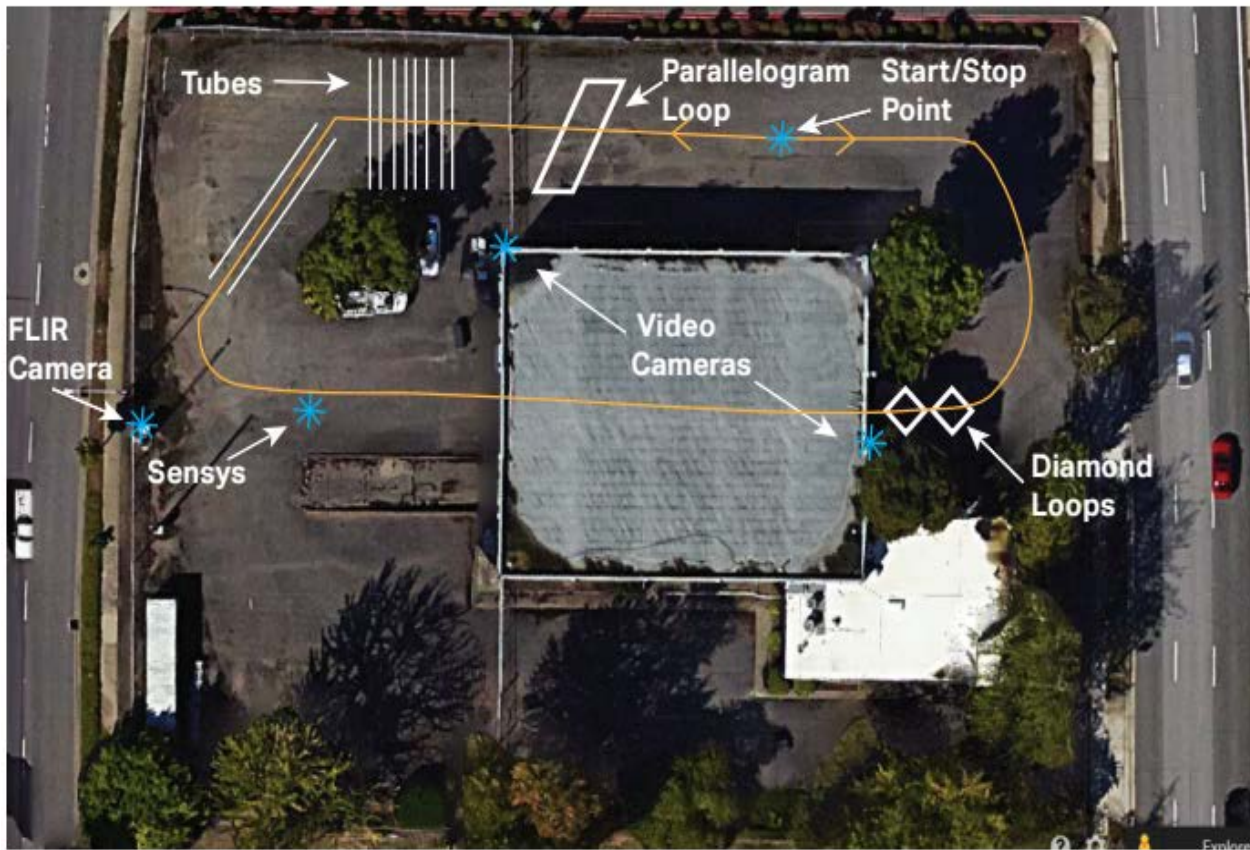- Conclusions and Recommendations

Goals

- Investigate if and under what conditions existing continuous and short duration, <u>bicycle and pedestrian count technologies are most accurate</u>

- How to <u>cost effectively integrate</u> them into ODOT's current traffic monitoring and signal operations systems?
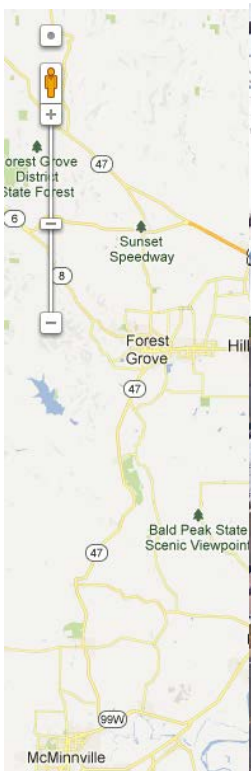
Technologies Tested

- Pneumatic tubes
- Inductive loops
  - Diamond
  - Parallelogram
- Thermal Camera
- Pedestrian pushbutton
- Passive infrared

Bicycle counts

Pedestrian counts
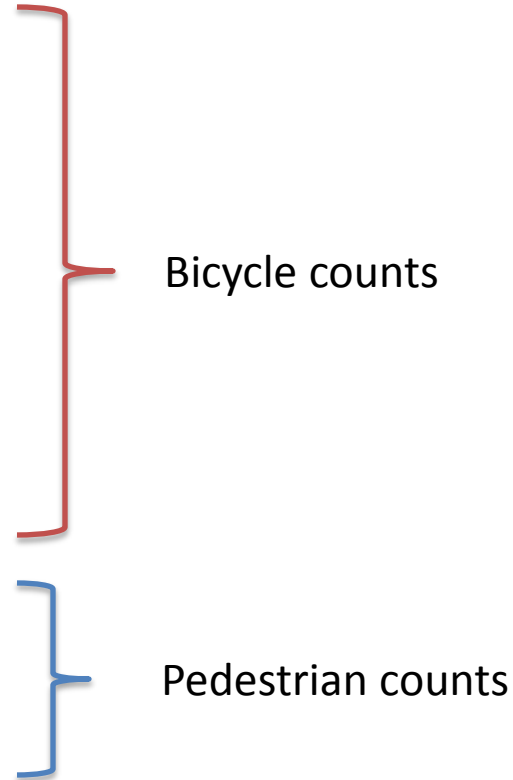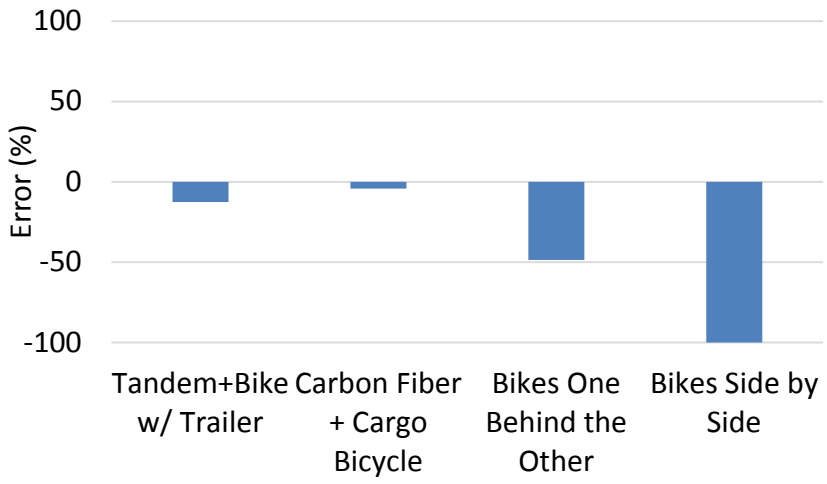
Site - Controlled Environment

Site - Intersection

Legend:
- 🟡 Video Camera
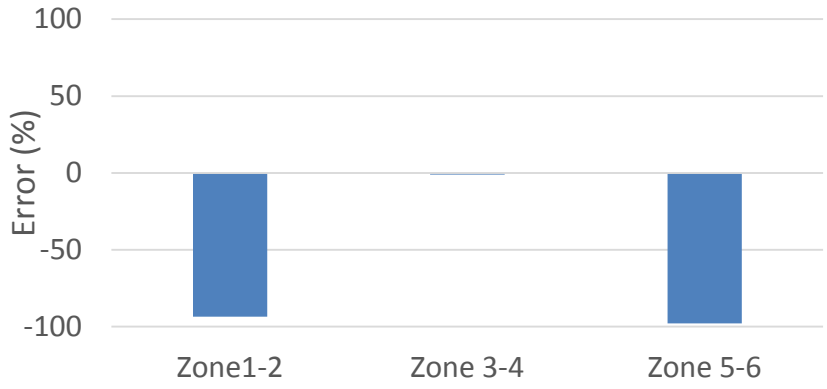- 🟦 Passive Infrared
- 🟩 Thermal Camera
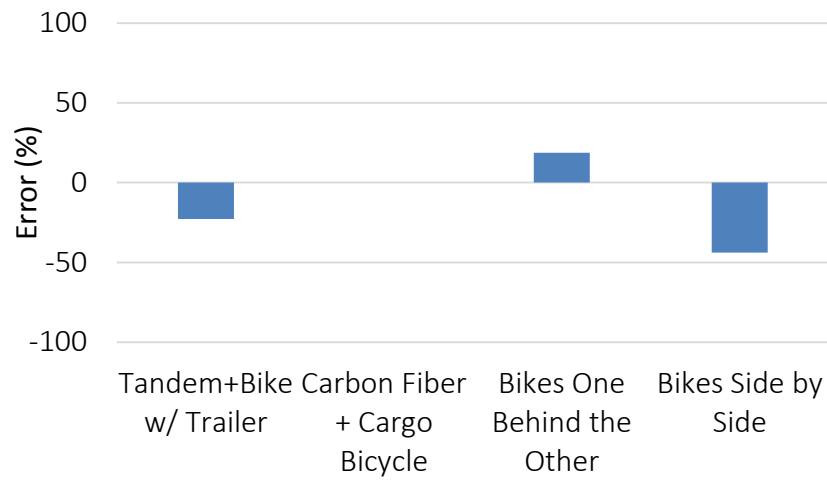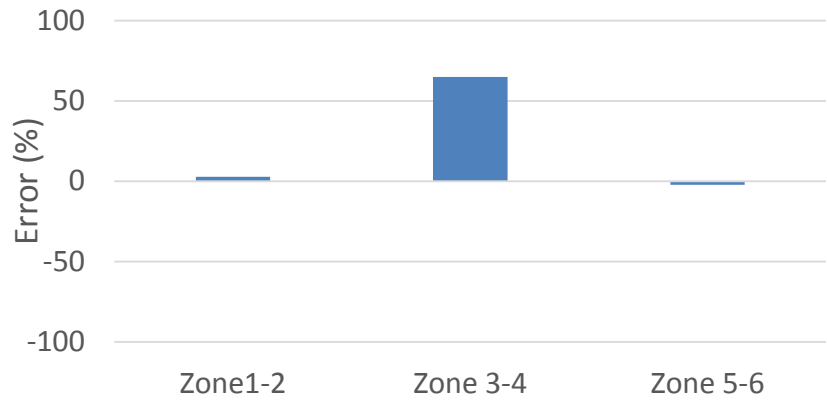- 🟧 Inductive Loops
- 🟥 Pneumatic Tubes

Inductive Loops – Controlled Environment

Inductive Loops – Controlled Environment

Inductive Loops – Bike Lane With Mixed Traffic

	Bikes in Video	% Error Diamond	% Error Parallelogram
NB	108	550%	420%
SB	105	540%	160%

Thermal Camera - Controlled Environment

< 1% error for standard bikes approaching the camera
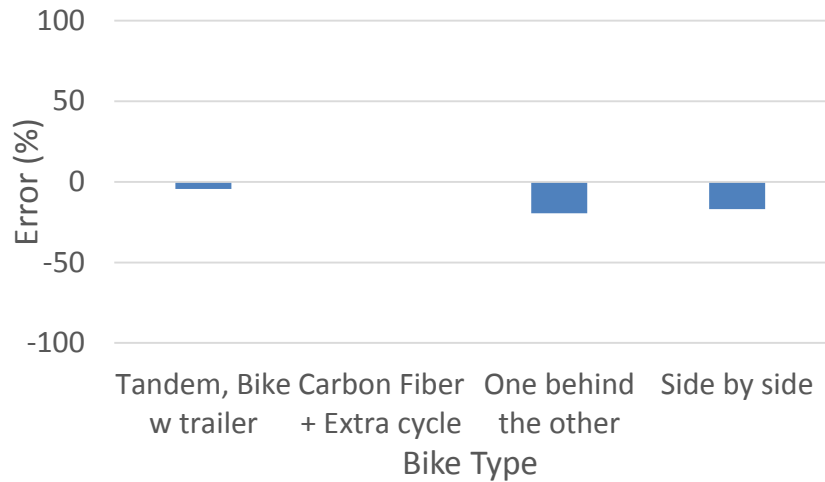
Thermal Camera – Mixed Traffic

Zone	Facility	Modes Counted	Ground Truth	Thermal Camera	Error (%)	Ground Truth	Thermal Camera	Error (%)
			NB			SB		
1	Sidewalk	Pedestrian and Bicycle	65	20	-69	112	34	-70
2	Right Turn Lane	Bicycles	5	207	4040	9	57	533
3	Bike Lane	Bicycles	104	63	-39	113	59	-48
4	Left Turn Lane	Bicycles	3	14	367	1	22	2100

Supplemental Thermal Camera Analysis

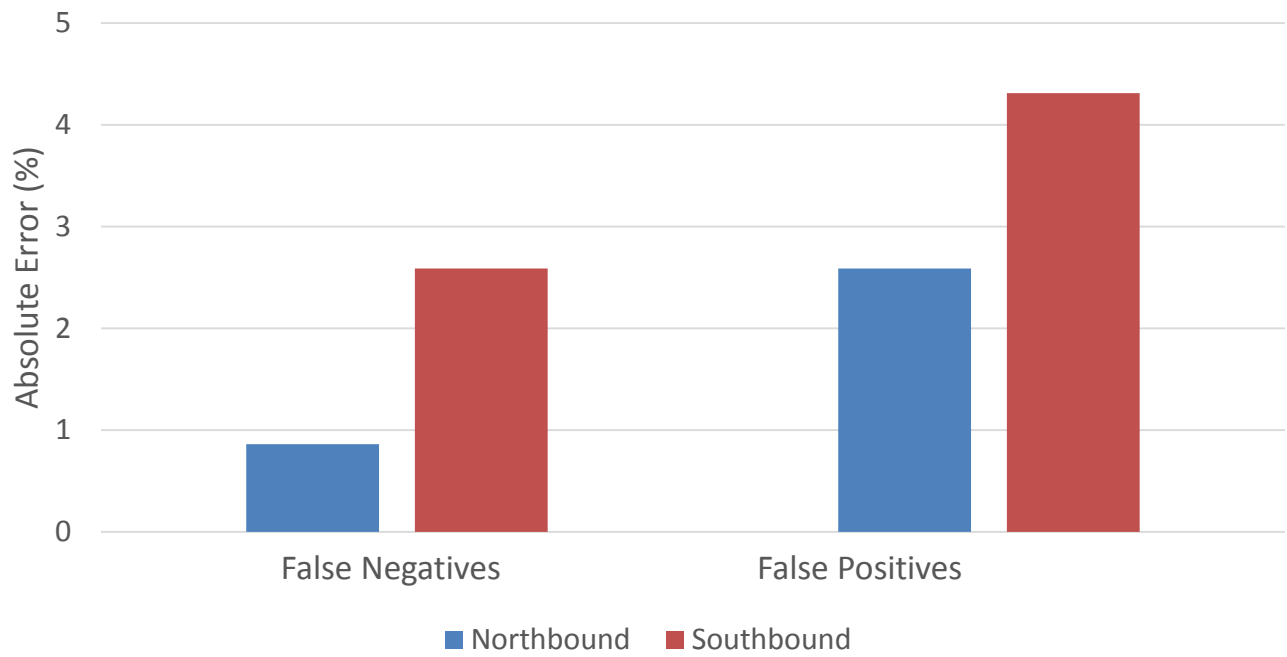|	NB		SB	
	Number	%	Number	%
False Positives	6	6	4	4
False Negatives	50	49	55	49

- False positives – counts recorded by camera but not ground truth

- False negatives – counts recorded by ground truth but not camera

- More false negatives (missed calls) during late afternoon/early evening hours
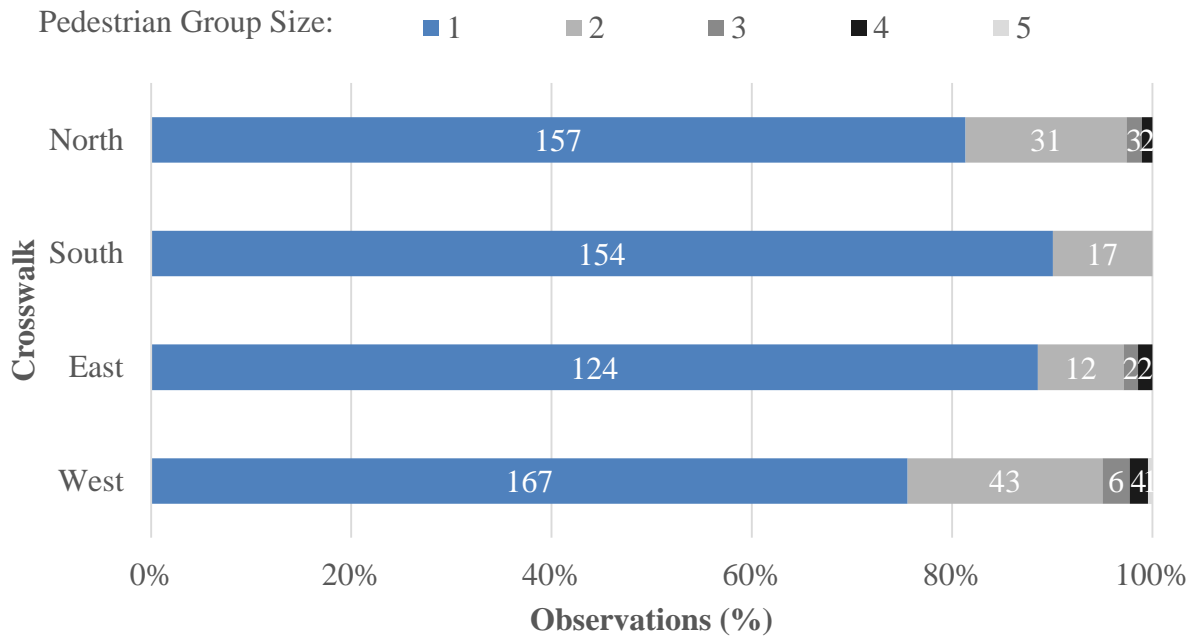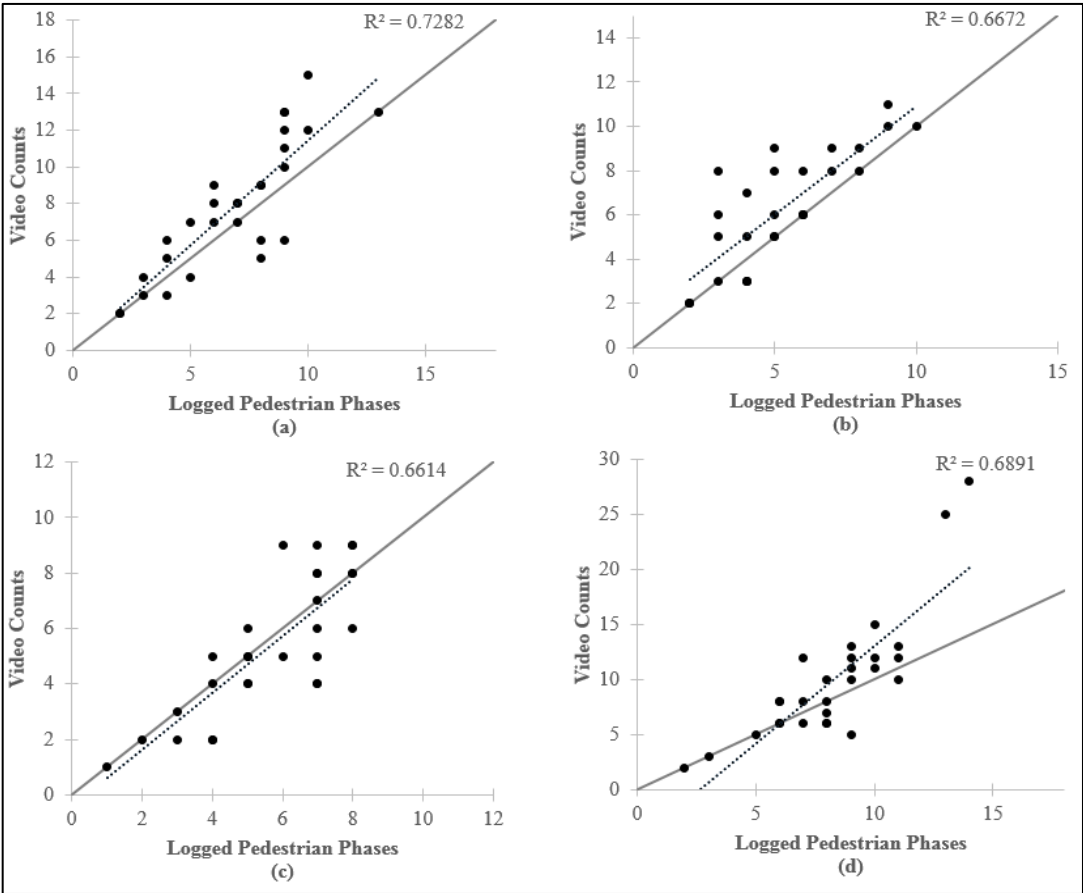
Passive Infrared
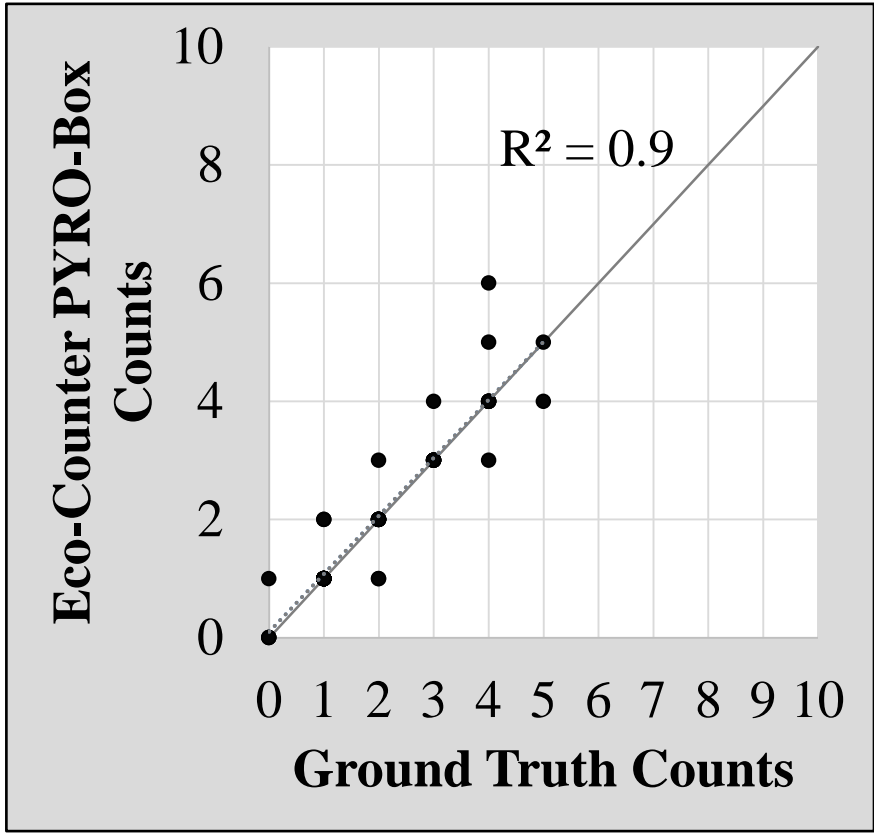
Passive Infrared

Pedestrian pushbutton

Pedestrian pushbutton

Parameter	North	South	East	West	Total
Pedestrian Volume (Video Counts)	217	173	150	278	818
Pedestrian Phases (2070 Data)	190	145	158	230	723
Ratio (Pedestrians/ Phase)	1.14	1.19	0.95	1.21	1.13

Conclusions and Recommendations

- Thermal camera and inductive loops (diamond & parallelogram) tested are not appropriate for continuous <u>mixed traffic</u> at intersections <u>at this time</u>.

- Pedestrian pushbutton data can be used to show locations of pedestrian activity.

- In pedestrian only environments with low pedestrian volume, passive infrared counters can be accurate.

Acknowledgements

- Technical Advisory Committee
    - Lyn Cornell, former Chair, ODOT
    - Mark Joerger, current Chair, ODOT
    - Sheila Lyons, ODOT
    - Gary Obery, ODOT
    - Jessica Horning, ODOT
    - Dave Hirsch, ODOT
    - Don Crownover, ODOT
    - Bruce Moody, ODOT

- TSSU Test
    - Bill Link, ODOT
    - Fraser Groves, ODOT
    - Roger Boettcher, ODOT
    - Amanda Owings, City of Lake Oswego

- Hall & 99W Test
    - Tiffany Slaughter, ODOT
    - Mike Casper
    - Tim Damm

Questions?

Sirisha Kothuri, skothuri@pdx.edu

Krista Nordback, Nordback@pdx.edu

Miguel Figliozzi, Figliozzi@pdx.edu,

Taylor Phillips, tphill2@pdx.edu

Extra Slides

Parallelogram Loop - TSSU

Special Cases

Tandem Bike

Cargo Bicycle

Carbon Fiber Bike
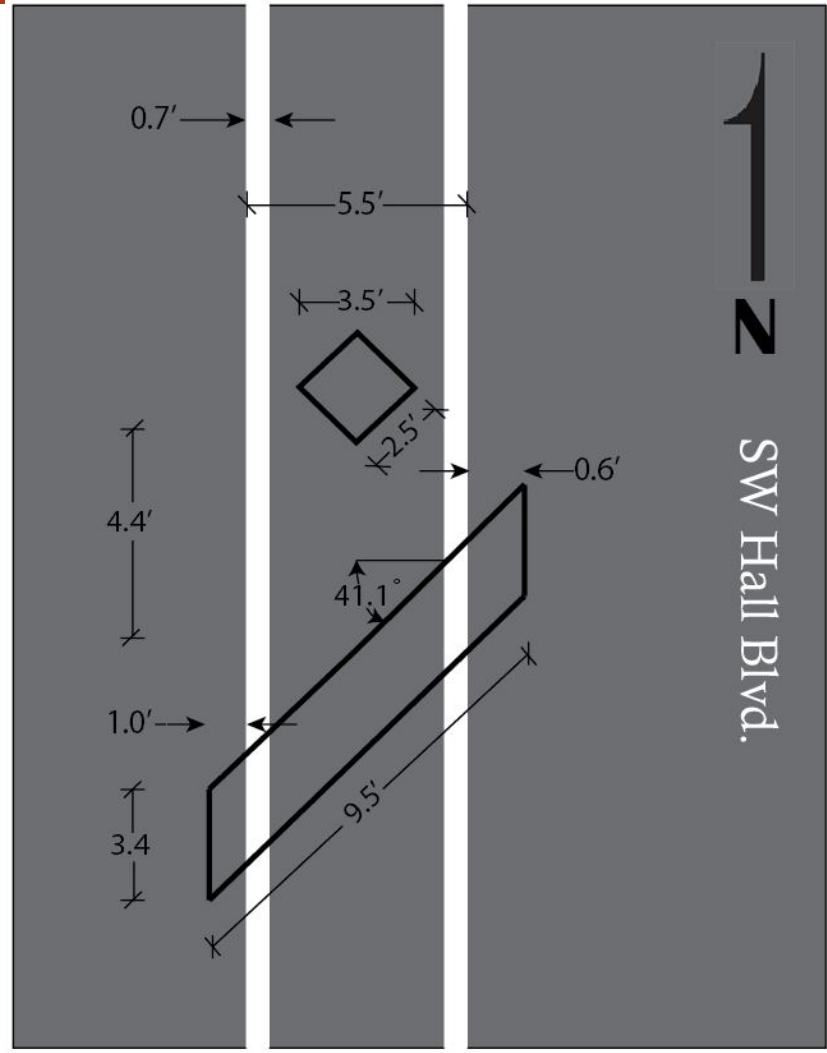

Bike with Trailer
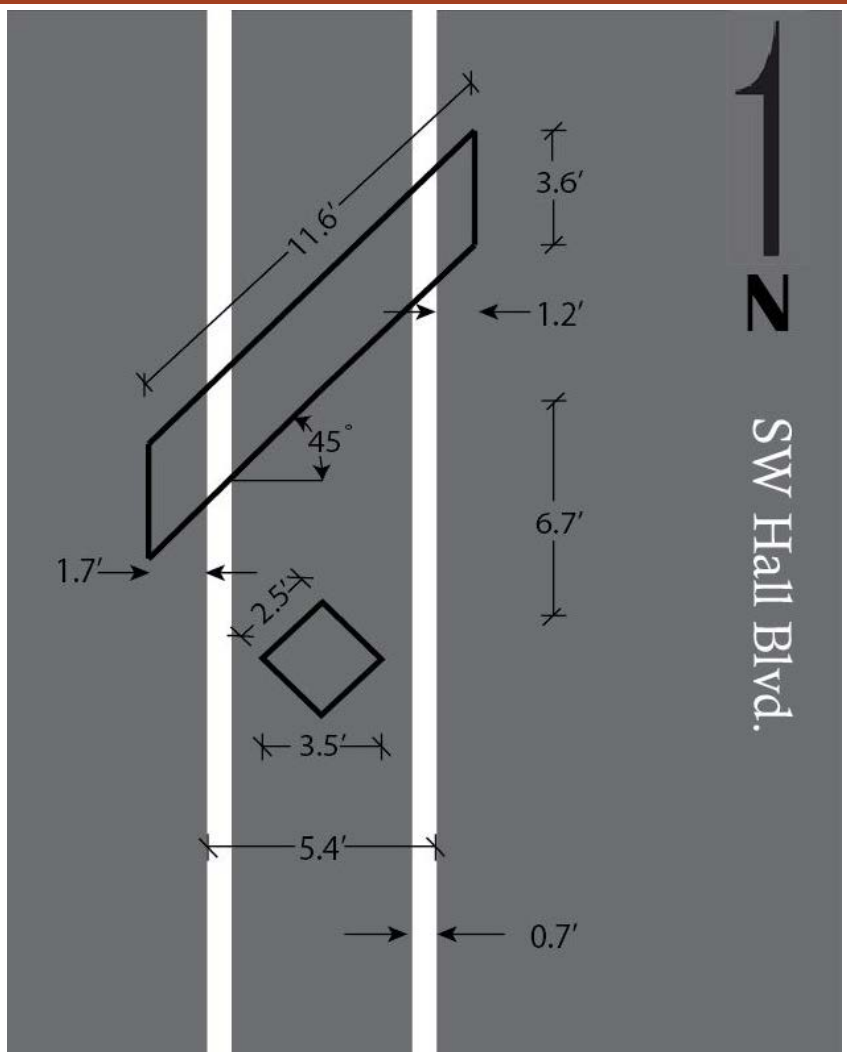
Thermal Camera False Calls

Thermal Camera Missed Call

Parallelogram and Diamond Loops

FLIR Thermal Camera

Eco-Counter PYRO