

Pedestrian and Cyclist Detection and Counting Products

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Migma Systems, Inc.

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Agenda

- Update on pedestrian detection products
- Remote support using cellular communication (*live demo*)
- MigmaBicycle™ for cyclist detection and counting
- MigmaPedCount™ for pedestrian counting
- Status of MigmaSolar™
- Discussions

MigmaIntersectionTM

MigmaIntersection™



MigmaIntersection™ is an outdoor passive pedestrian detector with interface to APS pushbuttons for automated locator tone triggering and pushbutton actuation. Using this detector, APS locator tone is silent unless pedestrians are within 12 ft from the signal pole. Based on the presence of pedestrians, APS or mechanical pushbuttons can also be automatically actuated.

- ▲ High resolution IR LED stereo camera for day and night detection
- ▲ Industrial single board computer (SBC) running Windows XPe
- ▲ Remote view, configuration and diagnosis over Ethernet (option)
- ▲ Robust pedestrian detection using stereo vision analysis
- ▲ Two-zone support for APS pushbutton locator tone triggering and pushbutton actuation

MigmaIntersection™ utilizes the field-proven technologies for pedestrian detections at street crossings and intersections.

- ▲ Analytical video cueing and 3D pattern recognition
- ▲ Pedestrian detection both day and night, even in total darkness
- ▲ Operational under any weather conditions
- ▲ Two configurable pedestrian detection zones
- ▲ Support of APS buttons made by Campbell, Novax and Polara
- ▲ Simple wiring and connection using CAT5e Ethernet cables
- ▲ Over 98% detection rate and negligible false calls per day



SPECIFICATIONS

- ▲ Image Sensor: 1/3" Sony CCD Chip
- ▲ Camera Resolution: 600 TV lines
- ▲ Camera Mounting Height: 10 ~ 18 ft
- ▲ Camera Power: Power over Ethernet (application dependable)
- ▲ IR Range: 100 ft (~30 m) in total darkness
- ▲ S/N Ratio: ≥ 48 dB
- ▲ Cable: CAT5e Ethernet cable
- ▲ Operating Temperature: -22 °F ~ 158 °F (-30 °C ~ 70 °C)
- ▲ Operating Humidity: 0% ~ 96%
- ▲ Operating Environment: All weather, day and night
- ▲ Chassis Dimension (one crosswalk): 8(L)×6.5(W)×2(H) (inch)
- ▲ Chassis Dimension (one intersection): 11.5(L)×5(W)×9(H) (inch)
- ▲ Stereo Camera Dimension: 5(L)×7.5(W)×3.5(H) (inch)
- ▲ Fail-safe and watchdog timer support



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This product detects pedestrians waiting to cross the street.

Upon the detection of pedestrians, it can place a ped call automatically.

Working with APS pushbuttons, it can also actuate the locator tone when pedestrians are within 12 ft to the signal pole. Otherwise locator tone is muted.

It can be used at intersections without any pushbuttons.

MigmaIntersection™

It has two major features:

- Mute locator (allowed by MUTCD)
- Place ped call automatically



Locator
is muted
if nobody
is nearby



Ped call will
be placed
automatically

MigmaIntersection™

Installation at Kansas City, MO



MigmaMidblock™

MigmaMidblock™



MigmaMidblock™ is an outdoor passive pedestrian detector at the midblock crossings for automated beacon flasher actuation (flashing beacon) to alert the approaching vehicle drivers about the pedestrians who are about to enter the crosswalks.

- △ High resolution IR LED stereo camera for day and night detection
- △ Industrial single board computer (SBC) running Windows XPe
- △ Remote view, configuration and diagnosis over Ethernet (option)
- △ Robust pedestrian detection using stereo vision analysis
- △ Directional detection to avoid unnecessary detections
- △ Instantaneous detection and fast response

MigmaMidblock™ utilizes the field-proven technologies for pedestrian detection and offers advanced features.

- △ Analytical video cueing and 3D pattern recognition
- △ Pedestrian detection both day and night, even in total darkness
- △ Operational under any weather conditions
- △ Configurable pedestrian detection zone
- △ Interface with beacon flasher through relay contact
- △ Small size suitable for pole-mount cabinet
- △ Simple wiring and connection using CAT5e Ethernet cables
- △ Over 98% detection rate and negligible false calls per day



SPECIFICATIONS

- △ Image Sensor: 1/3" Sony CCD Chip
- △ Camera Resolution: 600 TV lines
- △ Camera Mounting Height: 10 ~ 15 ft
- △ Activation Time: ~1 second (configurable)
- △ IR Range: 100 ft (~30m) in total darkness
- △ S/N Ratio: ≥ 48 dB
- △ Cable: CAT5e Ethernet cables
- △ Camera Power: Power over Ethernet
- △ Operating Temperature: -22 °F ~ 158 °F (-30 °C ~ 70 °C)
- △ Operating Humidity: 0% ~ 96%
- △ Operating Environment: All weather, day and night
- △ Chassis Dimension: 8(L)×6.5(W)×2(H) (inch)
- △ Stereo Camera Dimension: 5(L)×7.5(W)×3.5(H) (inch)
- △ Failsafe and watchdog timer support

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This product detects pedestrians waiting to cross the street.

Upon the detection of pedestrians, it can actuate the flashing beacons.

This product can be installed near the school area to alert the incoming vehicle drivers about the students ready to cross the streets.

MigmaMidblock™



This product can be installed at midblocks near schools to alert vehicle drivers about students going across the streets.

Migma Walktime™

MigmaWalktime™

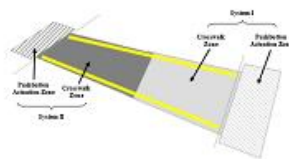


MigmaWalktime™ is an outdoor passive pedestrian detector for the pedestrian walktime extension and ped call canceling. As long as slow-walking pedestrians such as senior citizens, visually impaired or wheel-chair pedestrians are still in the crosswalk, it can automatically extend the walktime for them.

- △ High resolution IR LED stereo camera for day and night detection
- △ Industrial single board computer (SBC) running Windows XPe
- △ Remote view, configuration and diagnosis over Ethernet (option)
- △ Robust pedestrian detection using stereo vision analysis
- △ Two-zone support for reliable detection of pedestrians
- △ Coordination of two systems for very long crosswalks

MigmaWalktime™ utilizes the field-proven technologies to extend the walktime for slow-walking pedestrians.

- △ Analytical video cueing and 3D pattern recognition
- △ Operational under any weather conditions
- △ Simple wiring and connection using CAT5e Ethernet cables
- △ Support of both walktime extension and ped call canceling
- △ Support of APS buttons made by Campbell, Novax and Polara
- △ Over 98% detection rate and negligible false calls per day



SPECIFICATIONS

- △ Image Sensor: 1/3" Sony CCD Chip
- △ Camera Resolution: 600 TV lines
- △ Camera Mounting Height: 18 ~ 20 ft
- △ Camera Power: Power over Ethernet (application dependable)
- △ IR Range: 100 ft (~30m) in total darkness
- △ S/N Ratio: ≥ 48 dB
- △ Cable: CAT5e Ethernet cable
- △ Operating Temperature: -22 °F ~ 158 °F (-30 °C ~ 70 °C)
- △ Operating Humidity: 0% ~ 96%
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- △ Chassis Dimension (one crosswalk): 8(L)×6.5(W)×2(H) (inch)
- △ Chassis Dimension (one intersection): 11.5(L)×5(W)×9(H) (inch)
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It is an outdoor passive pedestrian detector for the pedestrian walktime extension and ped call canceling.

As long as slow-walking pedestrians such as senior citizens, visually impaired or wheel-chair pedestrians are still in the crosswalk, it can automatically extend the walktime for them until they leave crosswalk.

Remote Support

Remote Support

We have developed a remote support mechanism using cellular communication, i.e., AT&T aircard.



Every SBC has cellular communication drivers pre-installed and aircard is ready to use during field installation and troubleshooting.

In addition, TeamViewer™ client application is also pre-installed.

We can remotely log into SBC from our office and do everything as if we were standing at the front of cabinet.

MigmaBicycle™

MigmaBicycle™

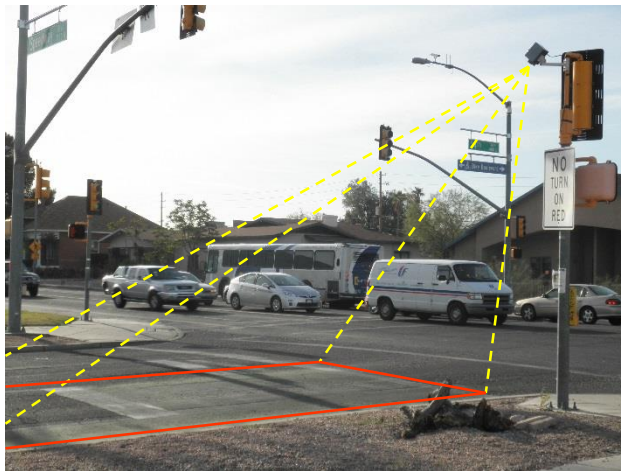
Our product, MigmaBicycle™, represents one of the most advanced bicycle detectors and counters. One system has two stereo cameras and one single board computer (SBC).



**One Cat5 cable
for video and power**

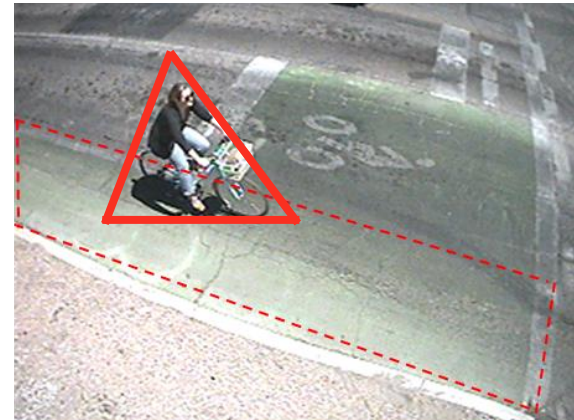
**It can detect bikes
in total darkness**

MigmaBicycle™ (cont'd)



Instead of being mounted on the mast arm as the mono and IR cameras do, our stereo camera is mounted on the signal pole and has a side view of the bicycle.

In addition to human body 3D curvature, this deployment approach can also extract the triangle bicycle signature, which is not available for the cameras on the mast arms.



MigmaBicycle™ (cont'd)

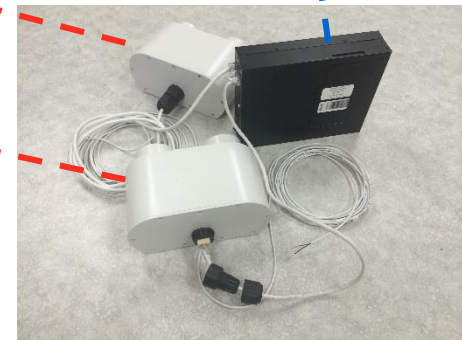
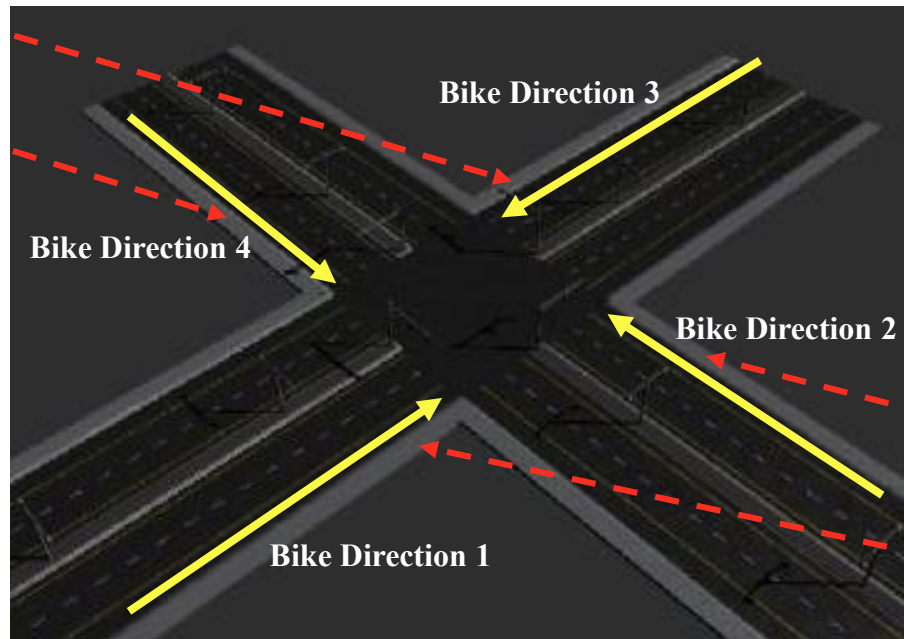
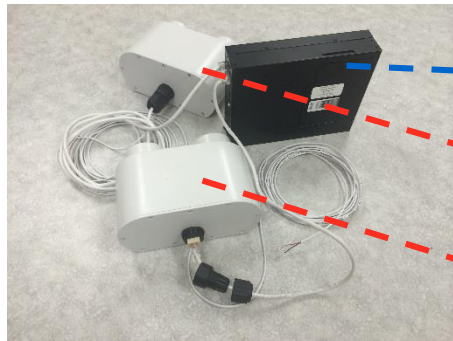


We can separate bicyclists from pedestrians by using their speed. Pedestrians walk much slowly than bicyclists do.

Vehicles can come into the bike lanes. We can separate vehicles from bikes using the 3D and triangle signatures.



Low Cost Ownership



**Two units for
one intersection**

Bicycle Detection and Counting

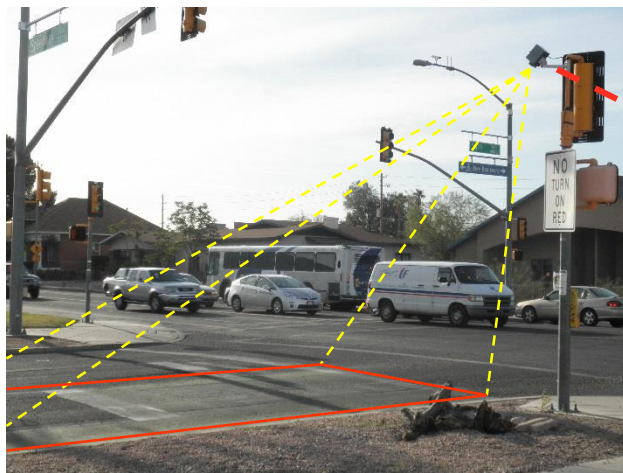
Once bicycles are detected, our system will do:

- (1) Place a bike call to the traffic controller
- (2) Count bicycles
- (3) Stream data to a remote server



Networking of MigmaBicycle™

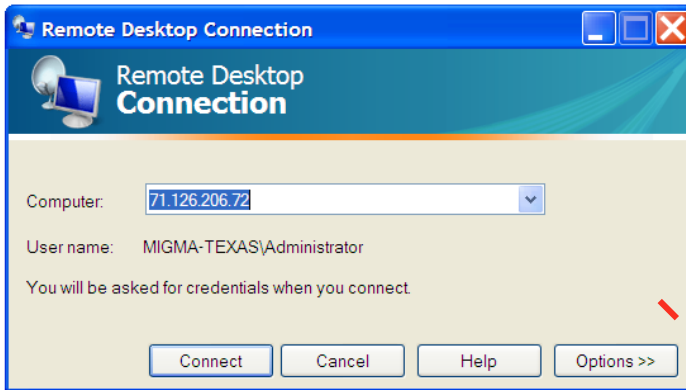
MigmaBicycle™ supports Ethernet communication through city network.



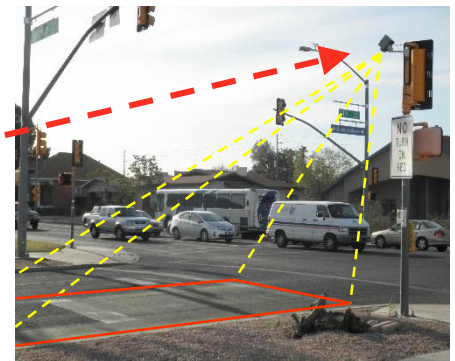
**Bike Counts
& Images**



Remote Access to SBC in Cabinet



Microsoft Remote Desktop Connection software can be used for the remote access



Remote Configuration

Once you log into the SBC in the cabinet, you can see the live images.



Remote Configuration (cont'd)

You can configure the zones for the bicycle detection.

There are three zones:

- Forward
- Left Turn
- Avoid

System supports two bike flow directions:

- left to right
- right to left



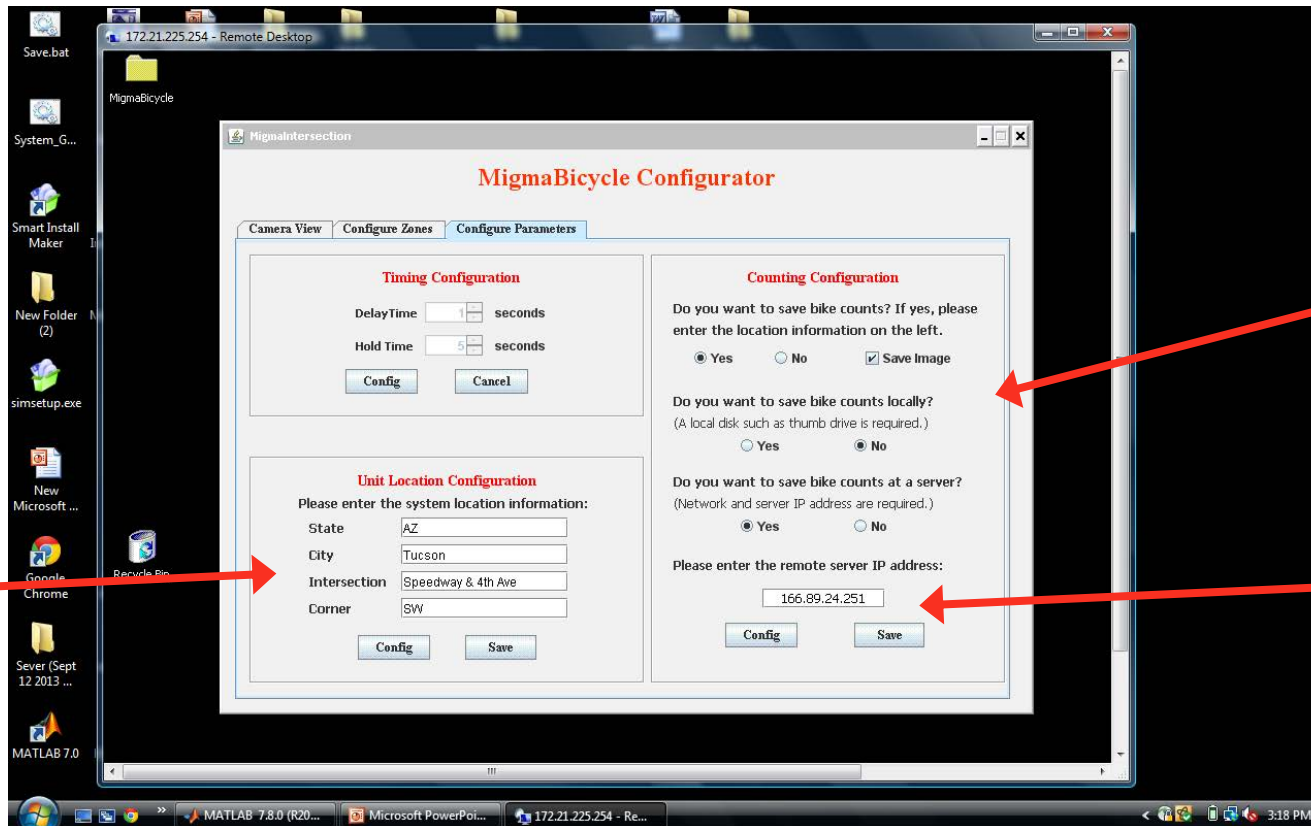
Forward

Left Turn

Avoid

Remote Configuration (cont'd)

Network communication can be easily configured as well.



Bike Counts and Images

Server Computer



Bike counts and images are streamed to and stored at the server computer located in the traffic control center.

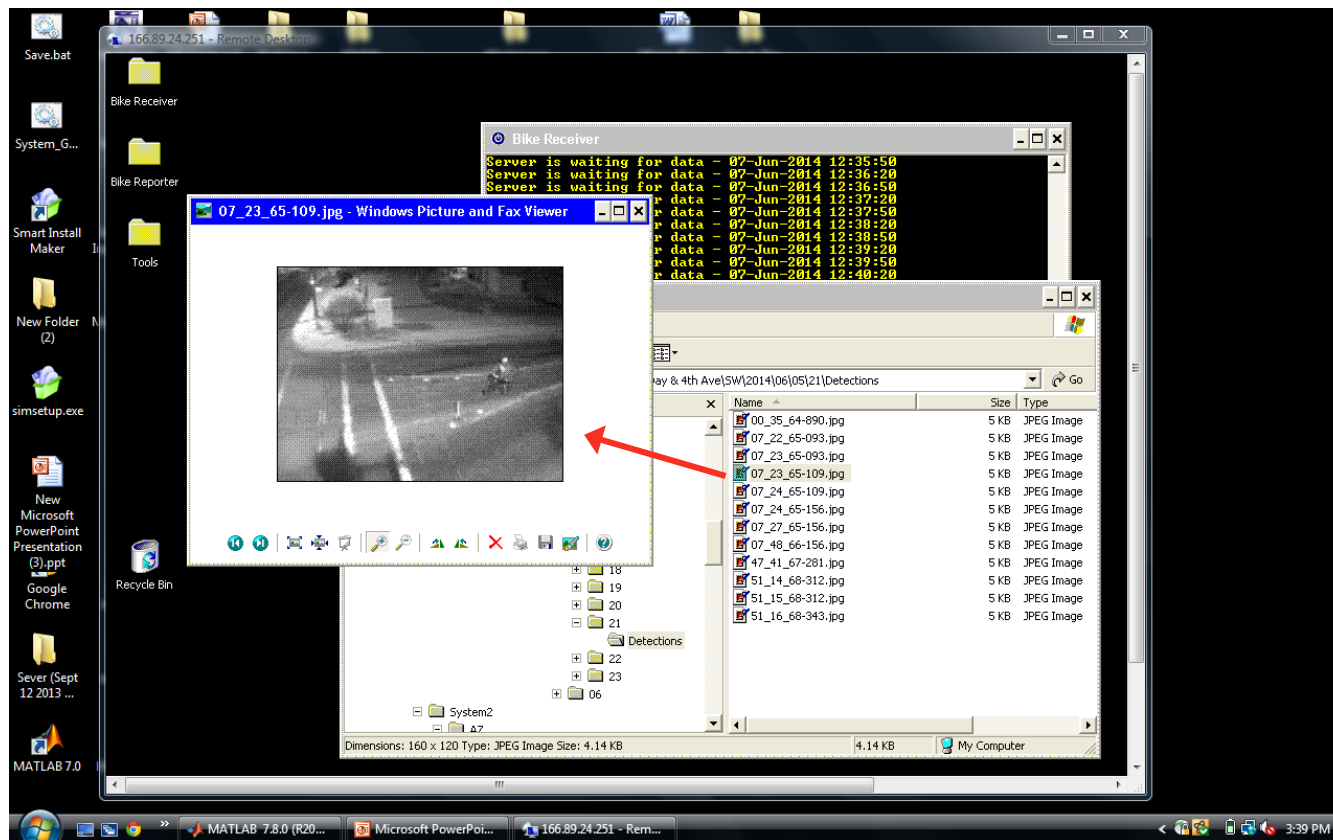
The server can process the data from multiple clients. For example, data from five intersections can all be stored in one server.

Data and images are organized based on

- location**
- timestamp**

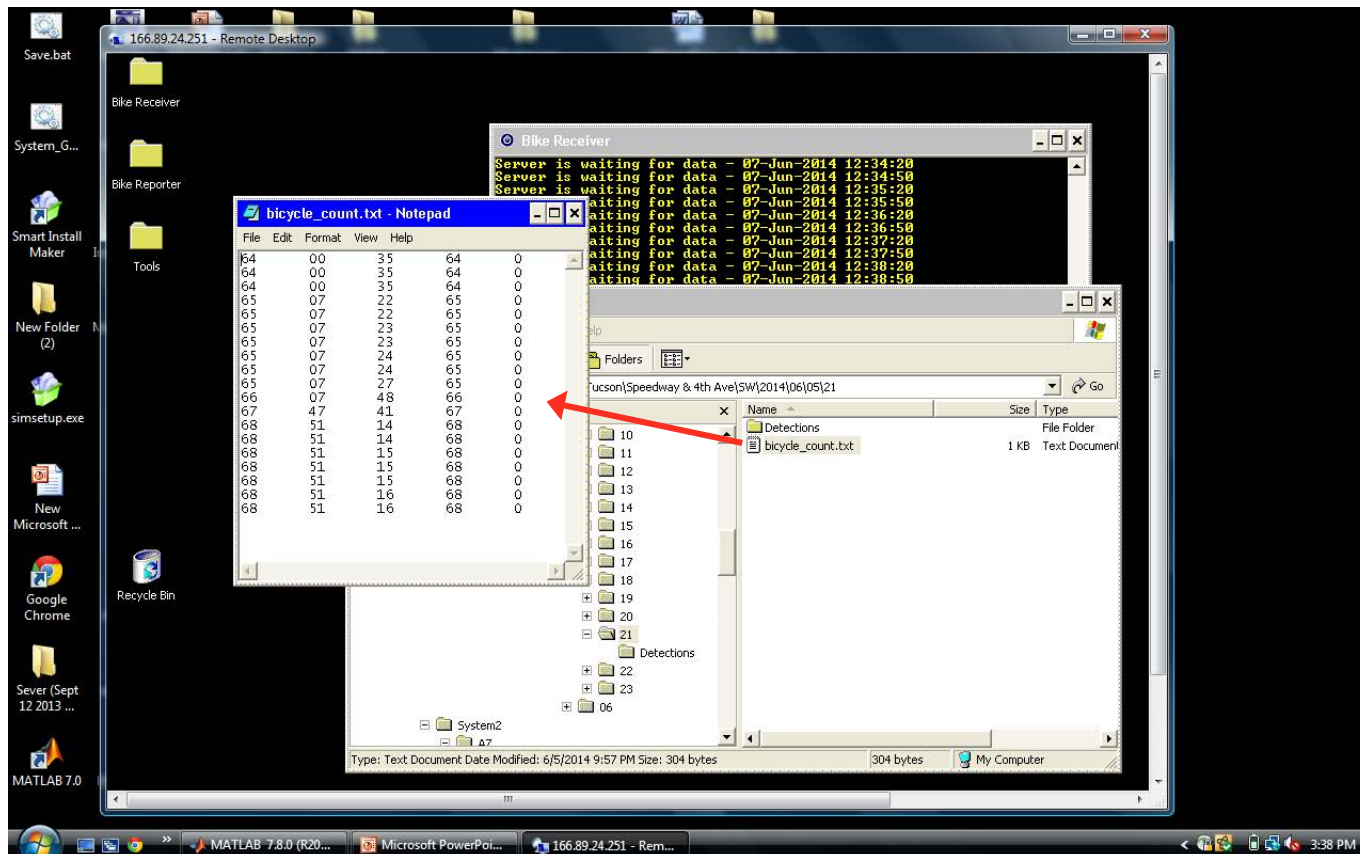
Bike Counts and Images (cont'd)

Bicycle images are stored in folders based on location and timestamp.



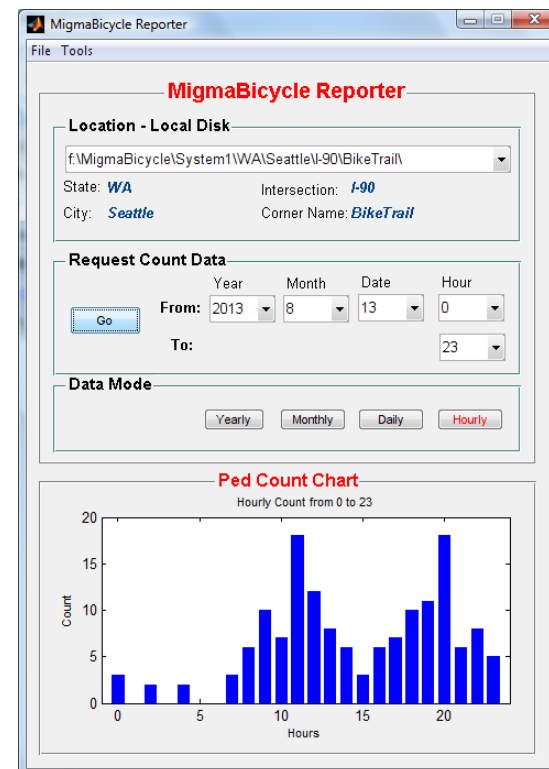
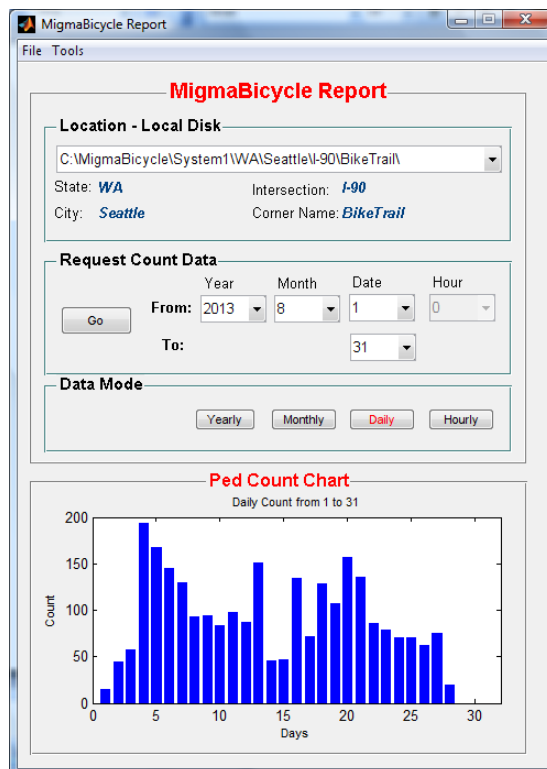
Bike Counts and Images (cont'd)

Bicycle counts are stored in folders based on location and timestamp.



Desktop Application for Data Summary

MigmaBicycle™ comes with a desktop application that can remotely access the server computer and retrieve data based on request. Bike counts can be summarized in different time periods and saved in Excel.



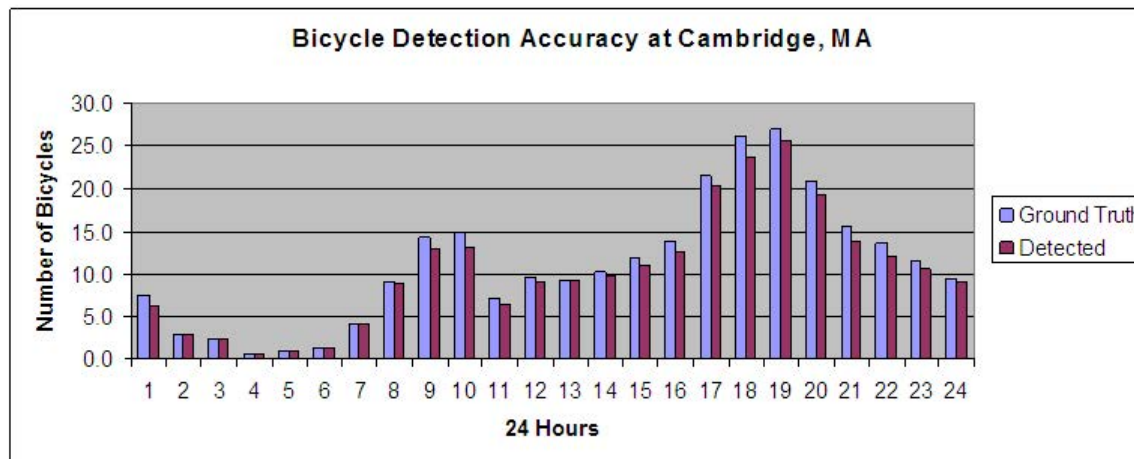
Performance Evaluation

Bicycle Detection Accuracy at Cambridge, MA



Description of Test Site: It is located at a busy intersection. The bicycle lane is separated by a vehicle parking lane and vehicle traveling lane. It is difficult to reliably discriminate bicycles from vehicles at this kind of street environment. Both FLIR thermal IR camera and our stereo camera are used at this difficult site to achieve the high detection rate and low false calls.

Number of Test Days: 14 days in August 2012
Positive Detection Rate: **93%**
False Call Rate: 1.3 per hour



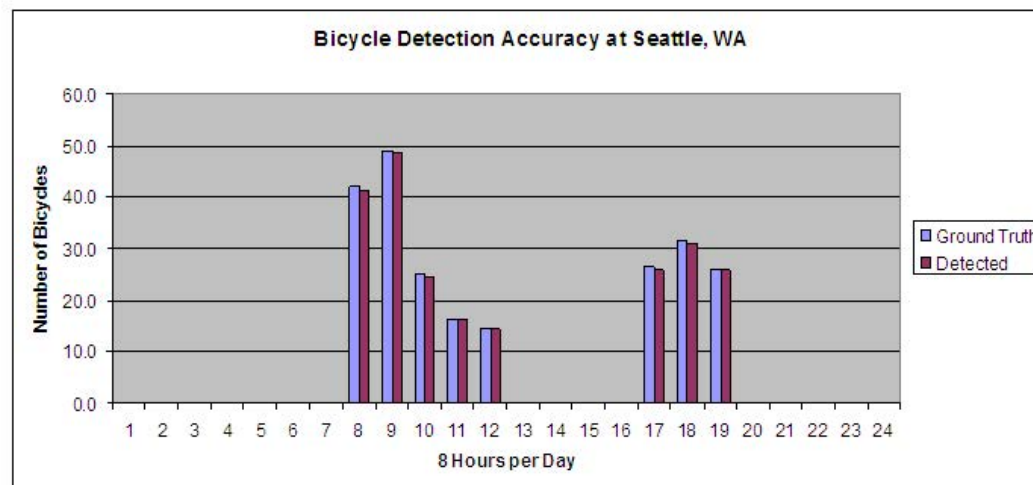
Performance Evaluation (cont'd)

Bicycle Detection Accuracy at Seattle, WA



Description of Test Site: *It is located at I-90 bike trail that is not shared with any vehicles. Both bicycles and pedestrians use this site often. Directional detection is essential at this site. Solar panel was installed to provide power for the entire system. System ran 8 hours a day, 7:00 am to noon, 4:00 – 7:00 pm.*

Number of Test Days: 15 days in October 2012
Positive Detection Rate: **98.5%**
False Call Rate: 1.4 per hour



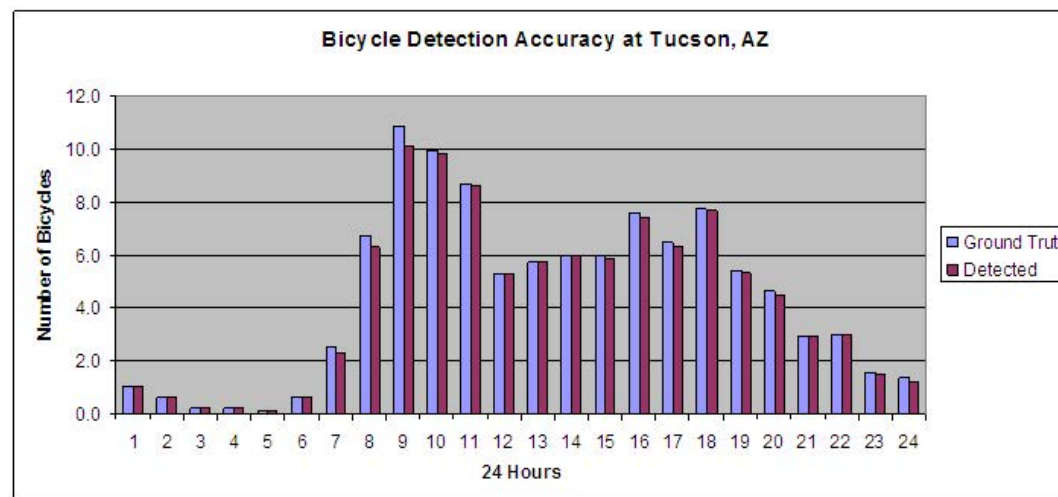
Performance Evaluation (cont'd)

Bicycle Detection Accuracy at Tucson, AZ



Description of Test Site: *It is located at a busy intersection that is near the campus of University of Arizona. The bicycle lane is located next to the side walk. Only stereo camera is used at this site.*

Number of Test Days: 15 days in April 2012
Positive Detection Rate: **97.6%**
False Call Rate: 0.6 per hour



MigmaPedCount™

MigmaPedCount™

MigmaPedCount™ can automatically count the pedestrians walking across the crosswalks. It can count pedestrians walking in a large group (e.g., 10 or 20 together), which is difficult to do visually.



Tucson, AZ



Miami, FL



Long Island, NY

Introducing Ped Counting Product



It can simultaneously count pedestrians walking in two different directions (e.g., North and South).

Counts are available in realtime.

Data can be streamed to a remote server and stored.

Over 95% Accuracy

Stereo Camera + Laser Scanner

Stereo Camera

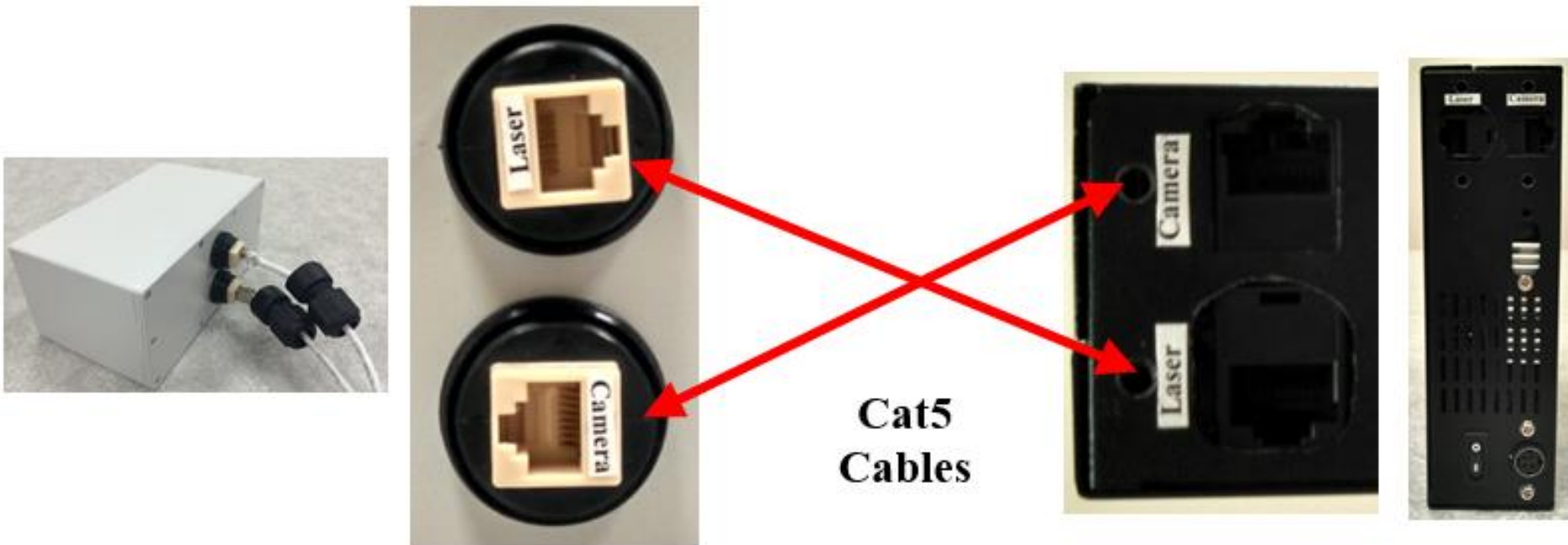


Laser Scanner



The stereo camera can provide 3D information about pedestrian's body and laser scanner can separate pedestrians walking in group.

Sensor Wiring



Two Ethernet cables (e.g., CAT5e) are used for wiring, one for camera and one for laser scanner.

Sensor Installation

Mounting Bracket

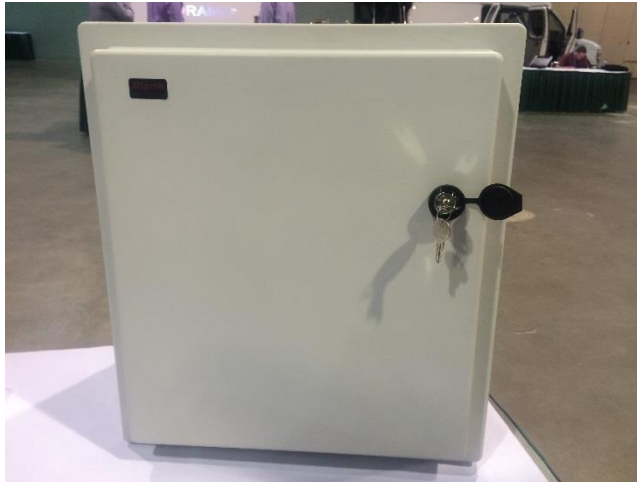


Sensor is mounted to the signal pole and computer is placed inside a cabinet.



MigmaSolar™

MigmaSolar™



We are working on solar systems for both pedestrian and cyclist products.

We have made our own fiberglass cabinet which allows the cellular communication using aircard.

A low-power SBC will be used, which runs under Linux.

Total power consumption of system is about 6W, or 500mA @ 12V.



**Dimension: 18" (L) x 13" (W) x 22" (H)
Supported Weight: 150 lb.**

Thank You

Company Location

**Migma Systems, Inc.
1600 Providence Highway
Walpole, MA 02081**

Product Web Site

<http://www.MigmaPd.com>

Contact

**Email: bling@migmasys.com
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