Automatic Monitoring of Insect Populations

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Team Members

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- Henry Medeiros
- Anderson Nascimento
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Current Trapping System

- Relatively cheap traps & lures
  - ≈20% monitoring costs
- 80% cost is in labor and travel
  - Finding traps is not easy!
- Checked once a week
- Have 1 trap per pest monitored
Technology benefits

• Labor costs drop dramatically
  ▪ Only need to check 1-2 times

• Data available in real time

• Data can be displayed spatially and temporally

• Combine with a DSS to help interpret the data
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Technology Benefits

- Electronics, trap design, lure specificity, and insect behavior can all be used to trap multiple species in the same trap.
- Can be used to monitor both pests and natural enemies to help trigger or delay management as needed.
$20B/yr crop loss due to insect damage in U.S.

$4.5B/yr spent on insecticide in U.S.

Decisions driven by insect populations in the field

Labor intensive Mundane

Error-prone Unreliable

Weekly Bi-weekly

The Problem
Electronic trap for automated, real-time monitoring of insect populations in the high-value specialty crops
Our Solution: Automated Insect Monitoring Using Z-Traps

AUTOMATIC

ACCURATE

TIMELY
Evolution of Z-Trap

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August 2008

Initial concept in the SCRI proposal
LDR (Light Dependent Resistor)

LED (Light Emitting Diode)

LDR (Light Dependent Resistor)
February 2009

- Funnel with sensors
- Moths
- Wind tunnel experiment setup at WSU
IR bucket traps at PSU-FREC

June 2009
February 2010

First zapper-based trap prototype
April 2010

Wind tunnel experiment at WSU
Field experiment at Purdue

May 2010
Field experiments at WSU and PSU
July 2010

Modified zapper bucket trap at WSU

Modified zapper delta trap at PSU
May 2012
Field tested over 50 Z-Traps in WA, PA and IN
Z-Trap Components

- Antenna for wireless communication
- Weather-proof enclosure
- Electric grid
- Lure
- Bottom cap for removing collected insects
Z-Trap System

Z-Trap

Z-Node

Base station
Field Experiment Protocols

• In each location, deploy 5-10 Z-Traps for monitoring CM and OFM.

• For each Z-Trap, also deploy a conventional stick trap nearby for comparison study.

• Regularly inspect all the traps (both Z-Traps and sticky traps) for ground truth.

• Rotate positions of the traps to eliminate any locational effects on capture rate.
Field Test Setup at PSU-FREC
2012 Field Trials in WA

- 4 units of 2011 version Z-Traps
- 4 units of 2012 version Z-Traps
- 8 conventional LPDs
- 6 units of Z-Nodes
2012 Field Trial at WSU

- Cumulative CM capture
- LPD total
- Z11 Count
- Z12 Count
Remaining Issues

Cost

• The current custom battery accounts for about half of the Z-Trap cost
• Currently Z-Traps last 2 months when operating 24/7
• Goal: Achieve 6-month operation time with off-the-shelf batteries

Usability

• Current system not easy to use
• Goal: Improve user friendliness of the set-up and monitoring process
Value Proposition

• Independent evaluation by Dr. James Julian at Oregon State University

• **Cost savings from reduced labor, insecticide use, and insect damage**
  - $275/acre/year in Washington fresh apple
  - $687/year savings from each Z-Trap

ROI < 1 year
... as a Visualization Tool for Insect Population Data Collected by Z-Traps
...as a General Tool for Insect Monitoring Activities

Manual traps

Z-Traps

Base station

Internet
Commercialization of Z-Traps

In an effort to commercialize Z-Traps, Johnny Park founded Spensa Technologies in 2009

Housed in the Purdue Research Park
Innovation Showcase in Indianapolis
July 12, 2011
Ag Innovation Showcase in St. Louis
September 11, 2012
Timeline

2013
• Carry out pilot tests in commercial orchards
• Raise capital

2014
• Small-scale sales to US apple market

2015 -
• Other high-value specialty crops
Thank You