Disease and Pest Detection Using Low-altitude Remote Sensing and UAS

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**Objective:**

To develop a network of aerial- and ground-based sensing system for disease and stress detection in two test crops, strawberry and citrus, in Florida.

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### Disease and Stress Detection in Strawberry and Citrus

- **Botrytis Fruit Rot/Gray Mold**
- **Rice Blast**
- **Citrus Greening**

**Diseases such as the botrytis fruit rot in strawberries and the citrus greening (HLB) can cause significant crop loss.**

**Monitoring and early detection is the key in the disease control.**

**Low-altitude remote sensing using UAV can be a great tool for early disease detection and control.**

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### Early Detection of Laurel Wilt Disease in Commercial Avocado Production Area

- **Laurel wilt (Lw) is a lethal disease of avocado (Persea americana) and other tree species in the Laurel family.**
- **Lw has spread rapidly in Florida since it was first detected on avocado in 2006.**
- **Lw has the potential to destroy avocado production.**

**Financial losses could range from $27 to 54 million in the absence of a control strategy.**

**Detection and Removal of infected trees has been the primary mitigation tool to battle the disease.**

**Lw trees are identified and destroyed.**

**Detection is first and most important step in managing this disease.**

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### Pest Pressure Mapping for Site-specific Spraying

- **Huanglongbing (HLB; citrus greening) is caused by a phloem-limited plant pathogenic bacterium, Candidatus Liberibacter asiaticus.**
- **Asian Citrus Psyllids transmit the greening bacterium by feeding on a healthy tree and injecting the bacterium into the phloem.**
- **If the existence and amount of the Asian Citrus Psyllids within an orchard is known, the disease infected areas are also known.**
- **The current method of manual pest scout is time- and labor-consuming.**

**Objective:**

To develop a novel way of in-field pest population/density monitoring using the UAV platform.

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**Platforms:**

- **Autonomous ground robots** (for strawberry in the figure on the right) conduct close proximity sensing to confirm the suspected disease detected by the aerial system.

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**Images:**

- **Sticky Card on a Pole**
- **Images:**
  - **RGB Image**
  - **Binary Image after Segmentation**

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**Sampling locations in the orchard**

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**Sensors:**

- **Canon SX260 HDVI**
- **Tretracam MCA 6**

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**Platforms:**

- **Small UAV**

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**Sensing Platform – small UAV**

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**Indoor Test (manually put psyllids on the card)**

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**Outdoor Test (card on poles in the orchard)**

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**Pest Traps – Yellow Sticky Card**

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