

## Section Sciences et Ingénierie de l'environnement Design Project 2013 (semestre de printemps)

### Proposition n°26

#### Towards Intelligent Pest Monitoring using a Wireless Camera Network: A preliminary Study on the Codling Moth

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##### Descriptif du projet

Sensorscope Sarl, an EPFL-based startup that employs wireless sensor networks (WSNs) for environmental monitoring applications, has recently expanded into the agricultural market. Thanks to a strategic partnership with a leading company in the area of biological control measures for plant protection (Andermatt Biocontrol AG), innovative wireless technology can be combined with biologically-based solutions for pest monitoring and control. Pest attacks are responsible for a significant decrease in crop productivity, in severe cases causing billions of dollars in harvest losses worldwide. We are interested in extending sensor network technology to monitor and ultimately predict the movement of insect pests at local level. Currently we are studying the use of insect traps monitored by cameras to sense the

presence of the Codling Moth. However, such a sensor may consume a great amount of power, and its use may be limited by other factors as well, e.g., the trap itself may degrade after being exposed to air for a long period of time. This project begins a study in how information from traditional environmental sensors, specifically anemometry, temperature, and humidity already deployable in high spatial density through standard wireless Sensorscope technology, may be used to make selective use of these “smart traps” by predicting the presence and motion of an insect swarm.

### **Objectif**

The main goal of this project is to digest relevant information on the Codling Moth and to outline possible micro-scale correlations between the behavior of a swarm of such pests and environmental parameters such as temperature, humidity, and wind, all parameters measurable currently with wireless Sensorscope stations. A good starting point for macro-scale spatio-temporal predictions is the operational modeling tool SOPRA (<http://www.sopra.info/>) developed by Agroscope, a network of federal research stations for agriculture. Ultimately, the students should develop a simple probabilistic model for the spatiotemporal distribution of such pest at micro-scale as a function of the environmental parameters and leverage it to propose a strategy for deploying and sampling insect traps.

### **Descriptif tâches**

The project tasks can be summarized as follows:

- investigate and understand relevant literature regarding the Codling Moth
- investigate and understand available modeling and prediction tools (e.g., SOPRA)
- get a working understanding of the employed WSN technology
- build a simple probabilistic spatiotemporal model of insect swarm behavior
- use the model to propose a “smart trap” deploying and sampling strategy

### **Divers**

Work breakdown: 65% theory, 35% programming

Prerequisites: Matlab

Keywords: agricultural monitoring, pest distribution, wireless sensor networks

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