Internship Proposal

Intelligent video acquisition and processing system from a wireless video camera network in a greenhouse: application to early pest detection

Context and Objectives

This internship is part of a Collaborative Research Initiative of INRIA for early bioagressor detection in greenhouse crops without pesticide (detection of pests on plant organs as rose leaves). Currently, vision systems as experimented in greenhouses (static imagery) are limited by their spatial and temporal sampling abilities. The goal of this project is to define new methods for *in situ* early pest detection based on video analysis and scene interpretation from multi camera data.

Considering temperature and hydrometric conditions inside a greenhouse, attacks (from insects or mushrooms) are fast and frequent. This implies almost immediate decision-taking to irreversible proliferations. Our first objective is to be able to continuously survey a greenhouse by setting up a network of Wifi video sensors. The positions, the number and the nature of the video cameras to use are critical elements to obtain an optimized video sampling in terms of cost/accuracy. The second objective, in the long term, is to develop new algorithms for detection and tracking of complex objects in their natural environment. The major issue is to reach a sufficient level of robustness for a continuous surveillance, i.e. to be able to adapt algorithms to illumination changes during daytime. Our *in situ* approach is non-destructive and non-invasive. Among other things, this implies to use tracking methods able to adapt to plant movements.

This project gathers the expertise of two INRIA project-teams: VISTA (Rennes) and PULSAR (Sophia Antipolis), of the Unity of Vegetal Pathology (INRA-UPV) at INRA Avignon and of the ``chambre d'agriculture'' of Nice (CREAT). We will also collaborate with the Keeneo Company at Sophia Antipolis, especially to use its image processing platform.

This internship has two main objectives. The first one is to implement a wireless network of video cameras (five to ten at first) inside a greenhouse crop to watch apparition of bio-aggressors. The second objective is to develop an intelligent tool to acquire and to process the video flows from the camera network. This tool should be able to detect interesting video sequences to be stored in order to achieve offline more elaborated processing. The student can rely on our team skills and tools (network server, web server, image processing library), which should be extended and adapted to the specificities of the application.

Work to be done

The student will:

1. In collaboration with agronomy experts, study the optimal positioning of the video cameras,
2. Set up a wireless network of video cameras (5 to 10 video cameras) inside the test greenhouse of the CREAT,
3. Develop and/or adapt pre-processing or intelligent storing algorithms of the system
4. Validate the prototype on experimental data

Prerequisites

C++ programming, image processing, network, French language

Practical Information

Internship location:

- Project-team PULSAR, INRIA Sophia Antipolis with some trips to CREAT Nice (place of the greenhouse) at 10 km

Duration: 5 to 6 months

Take-home pay: 907€ net per month.

Supervision

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