INRIA Post-doctoral position:

Cognitive vision for early detection of bio aggressors in greenhouse crops

Research context

This post-doc position is part of a Collaborative Research Initiative of INRIA for early bio aggressor 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. We intend 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 post-doc objective 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. The target cognitive vision system should integrate different original techniques in addition to traditional computer vision ones. Such a system must be easy to use in greenhouses and easy to adapt to different categories of bio aggressors.

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).

Post-doctoral research work description

The post-doc will focus on two main research axes:

Bioaggressors detection and tracking

The objects of interest are small, complex, and they evolve in a dynamic environment. Vision methods should be made adaptive at each level (acquisition, detection, and tracking) to provide robust results by using, for instance, incremental learning techniques. Moreover, real-time constraints imply to combine different approaches (probabilistic, stochastic, and learning approaches) which should be evaluated and combined so as to provide robust results in real-time.

Interpretation and modelling of bio aggressor behaviours

Interpretation will be automated thanks to event recognition techniques developed in the PULSAR team that must be adapted to the application needs. We are also interested in data mining for knowledge discovery. Indeed, new knowledge is required by biologists to analyse the bioaggressor behaviours. A key step will be matching numerical features (based on the trajectory and density distributions for instance) with their biological interpretation (predation, center of infestation).

Required knowledge and background

PhD in video understanding, image and video processing, cognitive vision
C++ programming, Linux and Windows environment
French language

Additional information

BioSerre proposal, http://www-sop.inria.fr/orion/bioserre.pdf (in french)

Location : INRIA Sophia Antipolis (06) France, trips to INRIA Rennes (35), France and INRA Avignon (13), France
Duration : 24 months
Gross salary/month : 2339€
Application : By mail to : Sabine.Moisan@sophia.inria.fr