CROPS "Clever Robots for Crops"

Sensor Fusion and Learning Workshop

Abstracts Booklet

Wednesday 15th, May 2013

Technische Universität München,
Fakultät für Maschinenwesen

Program

	Workshop Sensor fusion and learning
9.30	Hyperspectral and Multispectral Imaging (CSIC)
10.15	Ripeness (KULEUVEN, INIA and FORCE-A)
11.00	Break
11.15	Learning algorithms (BGU, UMU)
12.00	Sensor fusion (BGU)
12.45	End

Hyperspectral and Multispectral Imaging

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Abstract

Spectral imaging combines the strength of conventional imaging with that of spectroscopy to accomplish tasks that each cannot perform separately. The product of a spectral imaging system is a stack of images of the same object or scene, each at a different spectral narrow band. However, the field of spectral imaging is divided into three techniques called multispectral, hyperspectral and ultraspectral. Multispectral deals with several images at discrete and fairly narrow bands (usually fewer than 10). The simplest method to obtain images at a discrete wavelength region is by using band-pass filters (or interference filter) in front of a monochrome camera lens. Hyperspectral deals with imaging at narrow spectral bands (usually about 100-250 spectra bands) over a contiguous wavelength range, and produces the "spectra" of all pixels in the scene. Ultraspectral is typically reserved for interferometer-type imaging sensors with a very fine spectral resolution and deals with more than 100 bands. These systems often have a low spatial resolution of several pixels only, a restriction imposed by the high data rate.

This presentation will focus on a survey of the state of the art on hyperspectral and multispectral imagery, introducing the main concepts involved in each of these techniques and reviewing the main results achieved in the agricultural field.

Learning Algorithms

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Abstract

Learning is about changing behavior as result of experience. In this talk I will describe how learning can be applied in various parts of a robot, both on-line and off-line. One important application is learning in sensing, and in particular object localization and classification based on sensor data. Bayesian decision theory will be described and exemplified with typical classifiers that estimate class-conditional or posterior probabilities. Ways of improving performance by combining classifiers will be further explained, followed by a discussion on the fundamental problems in classification, and why there indeed is no free lunch, neither on CROPS meetings nor in classification in general.

Sensor Fusion

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Abstract

Sensor fusion deals with integration of information from different sensors and algorithms in order to achieve a better understanding about the environment for improved decision making.

This presentation reviews motivation for sensor fusion, sensor fusion representation models/architectures, update methods and algorithms.

Examples of sensor fusion are supplied including in-depth discussion of cRops adaptive sensor fusion framework.