An agricultural mobile robot guided by sonar and vision for crops and yield estimation (Ramot)

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Technology

Using bio-inspired sensing methods (from bats) for crop estimation, plant examination and plant classification. The system is based on a mobile robotic platform with vision and sonar sensing that is doing the agricultural tests.

The Need

An agricultural manager‘s success depends on his ability to estimate accurately the status of the crops. Although it is assumed that a small sample is good enough to evaluate the whole field or green-house the in-homogeneity of the crop may cause miss-estimations up to 15-25 %.

Potential Application

In Israel there are 6,000 ha of specialty crops, 3,000 ha of dates and 15,000 ha of deciduous trees (Chief Scientist, Ministry of Agriculture) that require yield estimation. For example fruit-thinning task in Israel in deciduous and dates requires about 375,000 working days, which cost about $23,000,000 day wage of about $62. Accurate yield estimation could reduce the fruit thinning work by 20% which equals to $4,4000,000 per year, reduction of 10 to 20% in logistics and different resources and increase in productivity by 10 to 25%.

Stage of Development

- We tested the sonar’s ability to detect pepper fruits on a plant. We found characteristic features in the sonar spectrograms that enable the detection of fruits.
- We are capable of integrating the camera image, sonar data and LADAR data on the same computational platform.
- Another finding from the initial sonar test is the ability of the sonar to penetrate through the nearest crop row and detect additional rows that are obscured. This is a key ability for autonomous navigation in the greenhouse.
- Currently we are working on the integration of the sensing system on a mobile robot.

Patents

Agricultural Robot US Provisional Application was submitted Jan 2015.

Supporting Publications

R. Finkelstein, G. Kosa, Y. Yovel and A. Bechar, “Navigation in a green-house using sonar,” Israeli Society for Agricultural Engineering, Tel Aviv, Israel, May 29, 2014

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