

Robotics for Sustainable Farming of High-Value Crops in Norway: A Case Study on Sugar Pea Harvesting

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Flexible and low-cost robotic technologies hold promise for overcoming high labour costs in horticulture. There is a growing market for fresh sugar peas in Norway, one that is filled either by imports, or production by help of imported labour. This project was a case study on partially automated sugar pea harvesting. This included an analysis of the needs and requirements, approaches to identify and track harvest-ready sugar peas under field conditions, and the design and construction of an early proof-of-concept robot platform. The platform was extended and tested in the following collaboration.



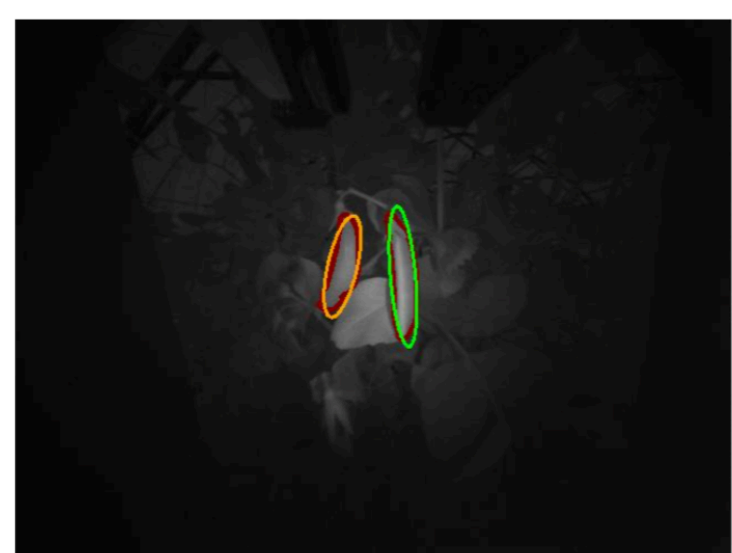
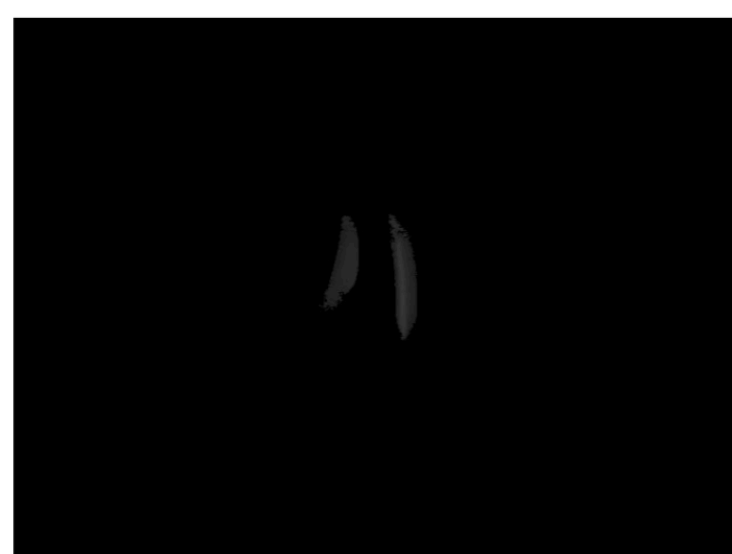
- Sugar peas - popular and high-value
 - Import increased 10x since 2000
- National production 10x smaller
 - Manual harvest is costly in Norway
 - No current automated alternatives



- Worked with a large Gartnerhallen producer
- Requirements/feedback
- Continuous in-house testing at NIBIO

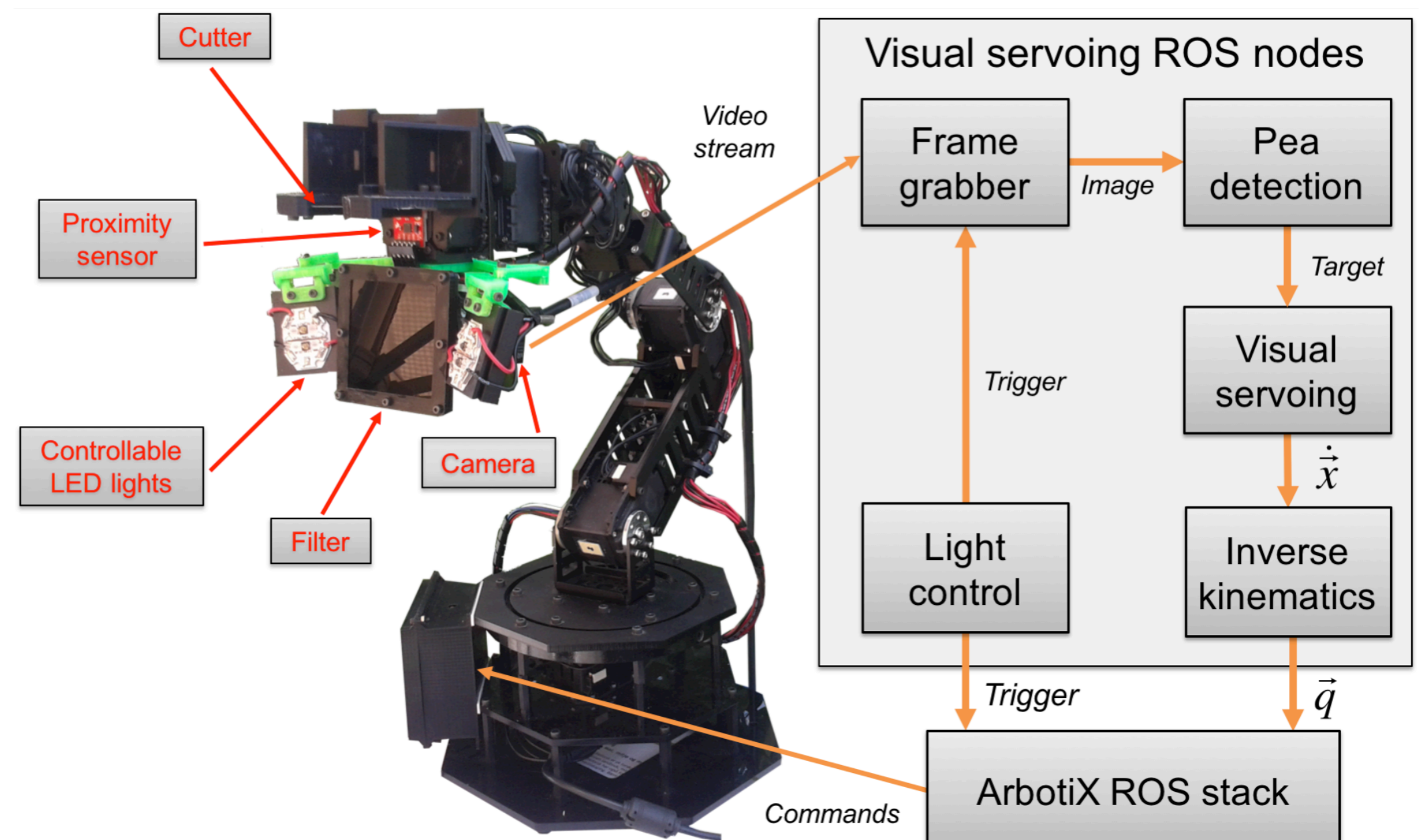


Torbjørnrød farm, Norway, summer 2014



- Visual identification challenging
 - Green pods and green leaves
 - Direct sunlight, shadows, occlusion
- Pods can be better distinguished in the Infrared (IR) part of spectrum
 - Water absorption band (940 nm)
 - Pods have higher water content
- Low-cost proof-of-concept developed
 - Active IR LEDs provide illumination
 - IR filter on off-the-shelf camera
 - €2000 robot arm and €1600 base
- **A scalable approach to harvesting**
 - Human scale – no soil compaction
 - Low initial investment if required
 - Scalable in number with farm size
 - Working with human pickers
 - E.g. 10 robots per supervisor

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Tejada, V. F., Stoelen, M. F., Kusnierek, K., Heiberg, N., & Korsæth, A. (2015). A Robot Platform for Exploring Automated Harvesting of Sugar Snap Peas. Submitted, *Precision Agriculture. An International Journal on Advances in Precision Agriculture*.



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