

Recent advances in automation and robotics in horticulture

Hemming J.

jochen.hemming@wur.nl (www.wur.nl/agrofoodrobotics)

Wageningen University & Research, Wageningen Campus, Droevendaalsesteeg 1, 6708 PB Wageningen, The Netherlands

Labour, productivity and sustainability are the most significant global issues in the agri-food sector today. The growing world population and the limited natural resources result in an increased demand in food and a need to produce more with less. Crop production has become a large scale industrial process with an increasing number of sensors and registration systems for climate conditions, plant status, crop development, fertigation and pests and diseases. To extract useful information from this big amount of data is challenging. Artificial intelligence (AI) and machine learning methods have recently shown their large potential for data processing and reasoning. Moreover, it can be observed that fewer people are willing to do the often monotonous and heavy work in warm, humid greenhouses or cooled processing facilities. With COVID-19 resulting in closed borders, this has escalated the need for a quick implementation of automated production with robots and automated quality assessment systems. Due to the natural variation of the target products and of the environment the implementation of robotics in horticulture is more demanding than in traditional robotic industries. In these applications sensors, especially imaging sensors, play a key role and machine learning and more specifically deep-learning techniques have been proven to greatly outperform classical machine learning in a multitude of very challenging problems. Example applications are scouting robots in the greenhouse that autonomously monitor the status of the crop and spot pests and diseases as well as gathering detailed climate and environmental information and robots for phenotyping (e.g. monitoring and predicting fruit setting). Results from projects on robots for harvesting for example sweet-pepper in the greenhouse and apples in orchards confirm that innovations from fundamental scientific concepts have led to robust solutions. Research is currently focusing on bringing even more advanced technology that has proven to work under defined laboratory conditions into the greenhouse and into the field and on robots that can learn from and work alongside employees (Cobots).

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