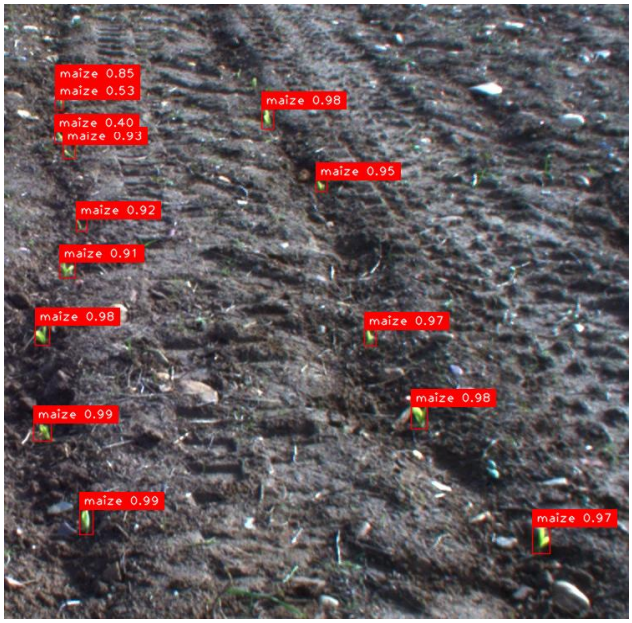
WeLASER
Eco-innovative weeding with laser

Practice Abstract N. 23

Deep learning helps autonomous navigation in early-stage growth crops

The problem

Weeding treatments with laser technology have to be applied when crops are in their early stages of growth. Autonomous navigation for weeding in agriculture is based on crop row guidance systems, but they solve the problem when the crop is in a mature growth stage or in crop types with an appropriate morphology for LIDAR-based methods, such as vineyards. The early growth stage of plants, together with the unevenness in-ground height and the presence of weeds make conventional perception systems unable to identify the crop properly, and thus preventing its further use for autonomous row guidance. GNSS still suffer from severe drawbacks to be an effective tool for following crop rows: (i) sudden degradation of the GNSS signal might occur; (ii) fields are subject to frequent changes, making recurrent map updates mandatory, and (iii) an accurate map may not be available in all situations.



The solution

Using Smart Perception Systems to enable autonomous robots to safely navigate in fields in an early stage of crop growth without relying on GNSS is a prospective solution.

Practical conclusion

A model based on deep learning techniques, that is able to detect early-stage crops, has been tested. The experiments were carried out using a manually operated mobile platform, equipped with RGB and ToF (time of flight) cameras. Image acquisition was done on experimental fields with corn and sugar beet crops during different time periods. These experiments also demonstrated the capabilities of integrating crop detection into already trained models that are capable of detecting other types of objects, such as mobile and fixed obstacles. The results enable the future development of a navigation system in early-stage growth crops.

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