Advanced perception strategies for agricultural mobile vehicles

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In the last twenty years, there has been increasing use of automatic systems in the agricultural supply chain, particularly in post-harvest operations. Today, the research aims to adopt automatic systems increasingly and, particularly, robotic systems directly in the field. The aim is to automate processes such as harvesting, sowing, fertilization, distribution of pesticides, just to name a few. Introducing these systems would lead to several advantages, leading toward the, so called, precision agriculture. However, besides these advantages, the researchers are facing different issues, especially to make agricultural vehicles suitable for such harsh environments. This talk focuses on the development of advanced multisensory perception systems and methodologies for agricultural robotics. These algorithms, integrated onboard robotic vehicles, allow: on the one hand, to improve the autonomous navigation capabilities of vehicles in environments with variable characteristics and not known a priori; on the other hand, to characterize the operating environment by automatically or semi-automatically generating a coherent multi-modal map useful for precision farming applications. Different vehicles, ranging from standard agricultural tractors and off-road vehicles to real high-mobility robotic platforms, have been used for on-field experiments. These platforms are equipped with multi-sensor systems that include 2D and 3D vision sensors, lidar, radar, or proprioceptive sensors (such as encoders and inertial systems).