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Use of Robotics in Agricultural Field and Its Applications: Short Commentary

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Robotics in Agricultural field

In this interesting paper entitled "use of robotics in agriculture field and its applications" performed a review about robotics in agriculture field in order to identify the main contributory factors involved. Given the heterogeneity of the studies they considered, they did not statistically pool the data, but qualitatively analyzed according to the type of robotics in agriculture field, dividing them in Mechatronics and electronics, Locomotion, Manipulators, Robotic vision.

Agriculture is quickly becoming an exciting high-tech industry, drawing new professionals, new companies and new investors. The technology is developing rapidly, not only advancing the production capabilities of farmers but also advancing robotics and automation technology as we know it. At the heart of this phenomenon is the need for significantly increased production yields [1]. The UN estimates the world population will rise from 7.3 billion today to 9.7 billion in 2050. The world will need a lot more food, and farmers will face serious pressure to keep up with demand. Agricultural robots are increasing production yields for farmers in various ways. From drones to autonomous tractors to robotic arms, the technology is being deployed in creative and innovative applications. Robots have many fields of application in agriculture. Some examples and prototypes of robots include the Merlin Robot Milker, Rosphere, Harvest Automation, Orange Harvester, lettuce bot, and weeder. One case of a large scale use of robots in farming is the milk bot. It is widespread among British dairy farms because of its efficiency and non-requirement to move. According to David Gardner (chief executive of the Royal Agricultural Society of England), a robot can complete a complicated task if its repetitive and the robot is allowed to sit in a single place. Furthermore, robots that work on repetitive tasks (e.g. milking) fulfill their role to a consistent and particular standard. Another field of application is horticulture. One horticultural application is the development of RV100 by Harvest Automation Inc. RV 100 is designed to transport potted plants in a greenhouse or outdoor setting. The functions of RV100 in handling and organizing potted plants include spacing capabilities, collection, and consolidation. The benefits of using RV100 for this task include high placement accuracy, autonomous outdoor and indoor function, and reduced production costs. New robotics is already quietly transforming many aspects of agriculture, and the agrochemicals business is no exception. Here, intelligent and autonomous robots can enable ultra-precision agriculture, potentially changing the nature of the agrochemicals business. In this process, bulk commodity chemical suppliers will be transformed into specialty chemical companies, whilst many will have to reinvent themselves, learning to view data and Artificial Intelligence (AI) as a strategic part of their overall crop protection offerings [2]. Agricultural platforms can be divided into domain- and task-specific robots designed to perform a specific task on a given crop in a pre-defined domain, and generic platforms designed to perform several tasks in different domains. Both are likely to play important roles. Since farms in general have very different infrastructure, early robots may be able to operate only on a given farm and only to a limited extent across different farms. Similarly to current farm vehicles, we may see therefore a combination of robots adapted to a specific task and the emergence of multi-purpose robots able to carry out a multitude of different tasks, analogous to the myriad use cases of the modern tractor. A common challenge is that most current robotic platforms are not robust to real-world conditions such as mud, rain, fog, low and high temperatures. For example, most current manipulators are not equipped to deal with humidity in glasshouses. In this type of Mechatronics and electronics, the development of rapid prototyping techniques and low cost processors have led to an explosion in the use of 3D printing and "maker" technology, raising the potential of low cost robotic platforms for a variety of applications. The use of embedded software enables highly configurable and application-specific platforms that can use common hardware modules and be adapted to a variety of roles. While such approaches have been used extensively in UAVs (Unmanned Aerial Vehicle) and smaller-scale robots, there is much scope for the expansion of robotics in Agri-food on a much wider scale. Issues that need to be addressed to migrate from prototypes to robust commercial platforms include robustness and reliability, power management (the platforms need to be able to operate all day, in some cases 24/7, for extended periods), usability (the platforms must be able to be used effectively by non-specialists), maintenance (e.g. self-diagnosis) and integration with mobile communications. In this type of Locomotion, agricultural robots need to move in challenging dynamic and semi-structured environments. Ground robots needs to travel on uneven, inhomogeneous, muddy soil, while aerial vehicles need to operate for long periods of time, in different weather conditions. Current agri-robots are mainly designed by borrowing technology from other sectors (e.g. drones) or as an add-on to existing platforms (e.g. autonomous tractors). As such, they may be not fully optimized for their tasks, or may retain some of the limitations of existing platforms. In this type of Manipulators, Manipulators will be needed for a range of tasks in future agriculture, replacing dexterous human labour, reducing costs and increasing quality, or performing operations more selectively than current larger machinery like slaughter harvesters. Work in this direction is ongoing, with soft grippers used for experimental work on selectively harvesting mushrooms, sweet peppers, tomatoes, raspberries and strawberries. Other applications such as broccoli harvesting can be performed with cutting tools, but will also require gentle handling and storage of the picked crop. In the open field, and for protected crops,

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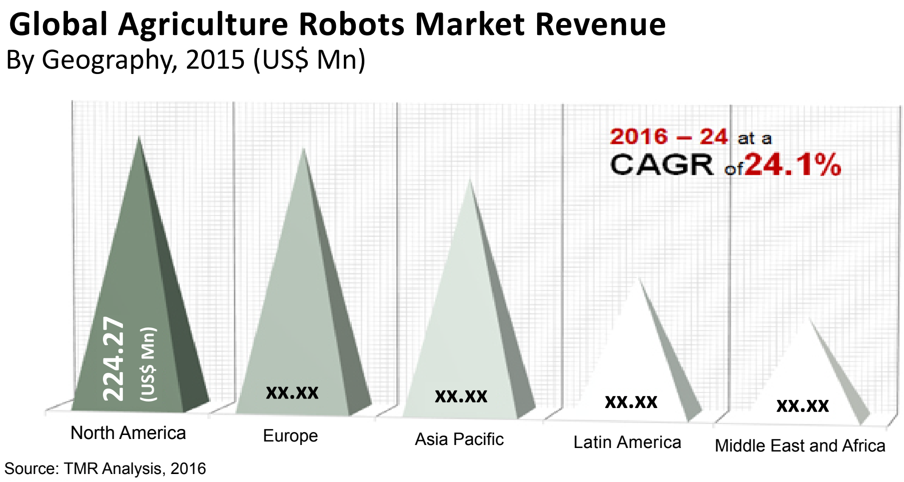

Figure 1: Agriculture robots market.

there are complementary tasks to harvesting where manipulators can also play an important role. This includes mechanical weeding, precision spraying, and other forms of inspection and treatment. Manipulators will also be needed for the increased automation seen in food handling applications, such as large automated warehouses. In this type of robotic vision, machine vision approaches offer significant opportunities for enabling autonomy of robotic systems in food production [3]. Vision-based tasks for crop monitoring include phenotyping, classifying when individual plants are ready for harvest, and quality analysis, e.g. detecting the onset of diseases, all with high throughput data. Vision systems are also required for detection, segmentation, classification and tracking of objects such as fruits, plants, livestock, people, etc., and semantic segmentation of crops versus weeds, etc. to enable scene analysis and safe operation of robotic systems in the field. Robotic vision in agriculture requires robustness to changes in illumination, weather conditions, image background and object appearance, e.g. as plants grow, while ensuring sufficient accuracy and real-time performance to support on-board decision making and vision-guided control of robotic systems (Figure 1). Active vision approaches, integrating next-best view planning, may be needed to ensure that all the relevant information is available for robotic decision-making and control, e.g. where the fruit or harvestable part of a crop is occluded by leaves or weeds. Approaches based on analysis of 3D point clouds, e.g. derived from stereo imagery or RGB-D (Red Green Blue-Depth) cameras, offer significant promise to achieve robust perception in challenging agricultural environments .Robotic vision often depends closely on machine learning from real-world datasets, with approaches such as deep neural networks gaining traction and further raising the possibility for robots to share their knowledge by learning from Big Data. An open challenge in robotic vision and machine perception for robotic agriculture is to enable open-ended learning, facilitating adaptation to seasonal changes, new emerging diseases and pests, new crop varieties, etc. Most existing work considers only the initial training phase prior to deployment of a robot vision system, but not the ongoing adaptation of the learned models during long-term operation.

References

1. Gajendran E, Vignesh J, Boselin Prabhu SR (2017) Real time Application of Robots for Smart Crop Cultivation in Rural Community Environments. Int J Sci Res 7: 83-88.
2. Mohiuddin SM (2015) Agrigultural Robotics and Its Scope in India. International Journal of Engineering Research and Technology (IJERT) 4: 1215-1218.
3. Payne J (2013) Transformational robotics and its application to agriculture.