

Robotics for Smart Farming

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Advanced decision support systems, smart analysis, and planning are just a few of the ways that smart farming is evolving toward digitalized and data-driven operations. A new line of creative research for smart agriculture has been opened up by technologies like artificial intelligence (AI), cloud computing, and the Internet of Things (IoT) (Ahmed et al., 2016). Agriculture has entered a new phase of robotics as a result of agricultural mechanization and automation technology. Robotic technologies offer a significant potential to further minimize the need for labor and improve the accuracy and efficiency of production inputs.



Fruit picking robots

Agricultural robot

A robot used for agriculture is referred to as an agricultural robot. Robotics are primarily used in agriculture today during the harvesting process. Weed control, cloud seeding, seed planting, harvesting, environmental monitoring, and soil analysis are examples of new robotic or drone applications in agriculture (Dokin et al., 2017).

Robots used in agriculture

- ✓ Fruit-picking robots,
- ✓ Driverless tractor / sprayers
- ✓ Sheep shearing robots
- ✓ Robots can be used for other horticultural tasks such as pruning, weeding, spraying and monitoring
- ✓ Livestock robotics (such as automatic milking, washing and castrating)
- ✓ Autonomous precision seeding
- ✓ Robotic automation process (RPA) (nursery planting)
- ✓ LiDAR-powered robots to collect data
- ✓ Drones
- ✓ Sorting and packing robots

Classification of agricultural robot systems (Jin et al., 2021)

Aspect	Type
Type of industry	Crop farming, livestock and poultry farming, aquaculture
Function	Phenotyping, monitoring, mapping, health protection, etc.
Intelligent level	Remote control, man-robot collaboration, full autonomous
Working mode	Selective, non-selective
Mobility	Stationary, mobile
Space	Aerial, ground, aquiclude

Applications

The world population is projected to grow to 9 billion by 2025. With a dramatic increase imminent, it's time for countries to start thinking about new ways to feed their populations. Fortunately, the agriculture sector is next in line to adopt technology for a major transition. The United States, Australia, Japan, and European countries are already turning to robotics to solve their manufacturing



challenges. The future of robotics in agriculture is expected to increase dramatically over the next few years. Robots have many fields of application in agriculture. An example of the largescale use of robots in agriculture is milk bots widely used on dairy farms in the UK as it is efficient and does not require relocation. Robots can complete complex tasks if they are repetitive and robots are allowed to sit in one place. In addition, robots that perform repetitive tasks (such as milking) perform their roles uniformly.

Another field of application is horticulture. One of his horticultural applications is RV100 development by Harvest Automation Inc. The RV 100 is designed for transporting potted plants in greenhouses or outdoors. Benefits of using the RV100 for this task include high placement accuracy autonomous outdoor and indoor capabilities, and reduced production costs (Khatoon et al.). The fast moving world of production has greatly increased the need for human labor in packaging. That's why many agricultural companies use sorting and packing robots to streamline operations at high speed without interruption. Coordination capabilities and line following technology enable these robots to speed up the packaging process.

Benefits of agricultural robotics

- ✓ Robotics ease the non-availability of laborer in peak time of season
- ✓ Along with committing fewer errors and working at higher speeds, top quality products can also be expected by robots
- ✓ Robots are designed to expedite the farming process with nominal human interferences, they happen to ensure the sustainability of the agricultural method
- ✓ Robots play a key role in protecting human workers from harm that can be caused by sniffing or picking up pesticides with their hands
- ✓ Robots consistently produce error-free results in less time than human workers.



Conclusion

The robot revolution is clearly happening before our very eyes. From self-driving cars to automated service bots, robots are playing an increasingly important role in our daily lives. Agriculture is the world's largest manufacturing sector and requires enormous skill. With population growth, climate change, political pressure to migrate, rural-to-urban population decline, and demographic aging putting pressure on the global food chain, now is the time to apply robots to agriculture. It's the right time. Robotics and autonomous systems are seen as an escape from intrusive reality. It also provides a backup solution for critical transformations in the food chain. Fortunately, governments, recognizing the food crisis situation, have also jumped on board and jumped on the agrorobotics bandwagon.

References

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