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Robotics in Agriculture

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In the management and production of agriculture, robotics is becoming increasingly important. In order to run farms effectively, agriculture needs time-saving and autonomous technologies. Although traditional farm machinery is crop and topographical dependant, researchers are currently concentrating on many farming operational aspects to build autonomous agricultural vehicles. The primary purposes for which agricultural robots have been studied and created to date include harvesting, chemical spraying, picking fruit, and crop monitoring. Due to their use of unmanned sensing and machinery systems, robots like these can replace human labour in many situations.

The robots are capable of multitasking, have keen sensory perception, are reliable in their operations, and are adaptable to unusual operating circumstances. Several precision farming tools were combined with a model structure design for the study on agricultural robotic systems. A few prototypes with the names CROPS, ISAAC2 and Michigan Hortibot, Australia's AgBot, Finland's Demeter, India's Agribot, and many others were created by the European Union. Several localization methods, including vision, GPS, laser, and sensor-based navigation control systems, are used in the construction of agricultural robots. The current trend in agriculture is towards automation in order to increase production through the use of equipment and technology.

The majority of research on agricultural autonomous robotics has been done in controlled settings, such as when cherry tomatoes, cucumbers, mushrooms, and other fruits are picked by robots. Robots have been used in horticulture to harvest apples and citrus. Moreover, milking robots have received a lot of attention, especially in the Netherlands. However, there are two difficulties with the development of these platforms: developing an electronic architecture to integrate the numerous electronic components and creating a physical structure suitable for the agricultural environment. An electronic architecture needs

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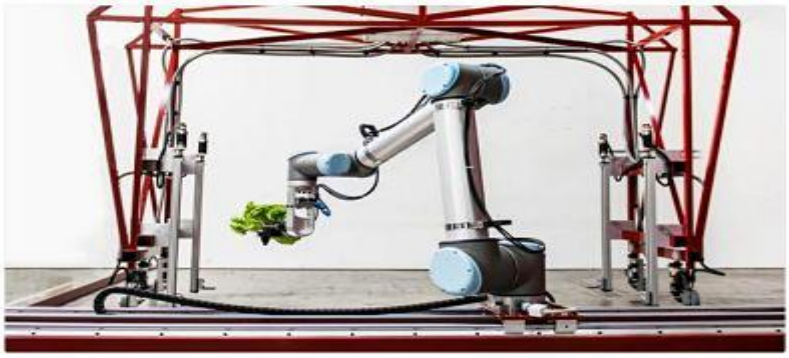
to be strong and dependable, quick and simple to maintain, modular and adaptable to allow for future expansions and the connection of new equipment.

In the realm of agriculture, there are many different kinds of robots in use, and new technologies are always being created. Out of all of those, the following types of agricultural robots have gained popularity:

Iron Ox Lettuce Robot

The robot employs a rectangular frame to travel from one side to the other and is constructed to operate in greenhouses. Each plant is represented in three dimensions by the robot using a stereo camera that is installed on its arm. The gripper on the arm is made specifically to fit the pods.



MIT Robot Gardener

The Massachusetts Institute of Technology students create a mobile robot that can regulate the soil's moisture level and select ripe fruit. Each plant has a network of sensors that monitor the soil's humidity and signal the robot to bring water. Wireless communication exists between the robot and the plant sensor.

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Hortibot

The equipment that assists farmers with weeds is called HortiBot. The robot can recognise and get rid of up to 25 different types of weeds with an environmentally friendly wee-removing attachment.

AgBot II

AgBot II is a robot created to assist farmers in making decisions on the application of fertilisers, insecticides, herbicides, and watering systems.

Hamster Bot

The autonomous robot known as the Hamster Bot rolls over croplands without endangering them. A variety of sensors that measure soil temperature, composition, moisture, and plant health are mounted inside the ball.

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Rowbot

The robot Rowbot is made to function in a range of settings. The removal of height restrictions caused by a crop that is expanding quickly is one activity that involves moving between the rows of corn. In order to apply fertiliser and gather information regarding the maize, the robot can potentially work in groups.

Autonomous Robot Tractor

This self-steering tractor can perform a variety of moves with excellent precision. In an uneven and unpredictable terrain, a huge challenge is caused by the change of tractor direction. To get over the issues, neither sophisticated computers nor just sensors are sufficient. This robot makes use of a programme that may adjust its direction in accordance with the terrain.

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Spray Robot

Another greenhouse device designed for autonomous spraying is the Spray robot. The robot moves through the greenhouse on a pipe rail system that is 30 cm wide. It is intended for usage in rose, gerbera, anthurium, alstroemeria, and orchid as well as tomato, cucumber, pepper, and eggplant.

Trakur

A robot called Trakur (fog) is used to spray insecticides in greenhouses. The robot employs a cable that produces an electromagnetic signal, algorithms, and GPS data for navigation.

VINBOT

This robot contains several sensors that might collect data and help winemakers determine the vineyard yield. The robot, known as VINBOT, uses a cloud network to gather and evaluate 3D data and vineyard pictures.

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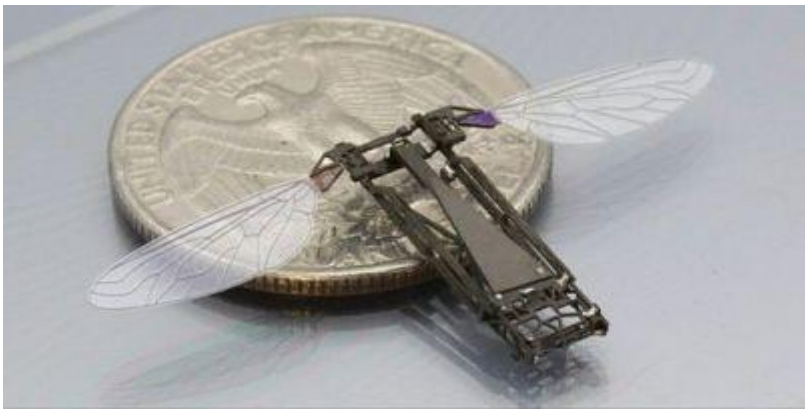
Bee Bot

This little flying robot is used for pollination and is modelled after bees.



Nursery Bot

The Nursery Bot is the answer to moving potted plants automatically. The robot moves the plants to the desired area using wheels, gripper arms, trays, and sensors.

Ladybird

Ladybird has methods and tools that enable it to carry out tasks on its own. The robot is employed for monitoring, mapping, categorization, and detection of various veggies.

Vine robot

The robot, which is just a prototype, controls the vines using cutting-edge sensors and artificial intelligence. Data on water quality, productivity, vegetable growth, or grape content are provided by the robot.

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Insect Control Robot for Controlled Agriculture

This is an autonomous insect control system able to move on a rail in greenhouses.

Gripper Inspired by Octopus

This robot arm is moving the vegetables on a party tray back and forth somewhere in a lab. Each piece of broccoli can be wrapped in its blue fingers, which then lift it to a nearby chamber.

PRO Packing Robot

The fruit or vegetable cartons will be filled by this robot. A camera that has been configured to distinguish between the sorted items is part of the machinery.

Future food security will be greatly maintained by robotics and automation in agriculture. Due to the advanced technology provided by the established system, farmers are now able to complete agricultural tasks quickly thanks to the use of robotics equipment. Because the development of robotic systems in agriculture is generally focused on mimicking the behaviour of human labour in the completion of agricultural operations, operations like planting, inspection, spraying, and harvesting will be carried out efficiently with the least

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amount of operational costs and human labour. The creation of a reliable and effective agricultural robotic system with the primary goal of producing a high level of agricultural output in order to preserve food security in the future may be accomplished in the future by designing a systematic autonomous agricultural robotic system.