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ROBOTS IN AGRICULTURE

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Summary. *The article deals with the new technological advancements in agriculture.*

Key words: *agriculture drone, spraying drone, agriculture robot, precision agriculture, unmanned aerial vehicle, remote sensing technology, agriculture mapping drones, harvesting and picking robots, weeding robots, milking robot.*

Formulation of the problem. For many years, farmers and scientists have found new ways to address the problems they encounter with innovative technologies. Agricultural robots are the next level in this process. They can be used to accomplish anything from precision agriculture to enhancing field management. The results comprise minimized business expenses, improved crop quality, and increased yields.

Basic research materials. Agricultural robots pick apples, gather strawberries, harvest lettuce and hoe out weeds. Drones gather aerial images that help farmers quickly evaluate crop health. And robotic greenhouses are sprouting up thousands of miles away from traditional farmland regions, growing vegetables in the backyards of high-consumption urban markets.

It all comes at a time when growers face a costly, long-term labor shortage and – with the global population expected to rise from 7.7 billion to 9.7 billion by 2050 – food demand is about to rise significantly.

On its face, crop harvesting seems ripe for automation. It’s physically taxing and highly repetitive – the kind of labor that’s often most effectively targeted in the robot revolution. But that’s not necessarily the case.

Picking crops also requires manual dexterity and a delicate touch. Many fruits bruise easily in the heat, and leafy vegetables are easily torn. And most robots just aren’t advanced enough to handle that level of precision. But agtech companies are working to clear that hurdle.

Founded by former employees of Roomba inventor iRobot, Harvest Automation made its first product with the fast-growing gardening market in mind. The behavior-based HV-100 robot handles the important, but highly repetitive and strenuous, work of spacing container crops and plants. Greenhouse plants need space between them so they grow thick and bushy and resilient, but too much space means square footage isn’t being optimized. The HV-100 is built to keep running even in the scorching temperatures and less-than-pristine environments of nurseries that grow ornamental plants and specialty fruits and veggies [1].

Lettuce harvesting has remained mainly robot-resistant thanks to the plant’s fragile nature and close proximity to the ground. But researchers at

Cambridge University made a breakthrough with “Vegebot,” another computer vision-powered prototype.

Here’s how it works: one camera scans the lettuce and gives a thumbs up or down for harvesting. A second camera (positioned near a blade) then guides the pick without crushing the plant. Meanwhile, a machine-learning algorithm “teaches” the robot to avoid unripe or diseased lettuce [1].

If you’ve ever tended a personal garden, you know that chores like mowing and weed control are both important and difficult. Commercial agriculturists know it too, but on a massive scale. Even when crop rotation is possible, many large outfits rely at least somewhat on the use of herbicides. But given the facts that plants can become resistant to weed killers and consumers are increasingly averse to chemically treated food, it’s hardly a perfect solution. And mowing is a time-consuming responsibility for large properties. That’s why weed-management and mowing robots – including ones that incorporate advanced AI – are an attractive option [2].

Instead of bringing agricultural robots to the field, one of the next great advances in farming automation will bring the field to robots.

There are several startups helping to plant the seed for a robotic-greenhouse future. Not everything is can be grown in this way, but for certain crops the improvements are striking. These companies promise a dramatic decrease in the amount of water used – between 90 and 95 percent less – for an equivalent crop yield, and boast controlled indoor environments that eliminate the need for pesticides.

Inside what Iron Ox describes as “the world’s first autonomous farm” – an 8,000-square-foot space that more closely resembles a research lab than a farm field – two cloud-connected robots oversee the growth of leafy greens like romaine and butterhead lettuce, bok choy, kale and arugula as well as a variety of herbs. All the produce is grown inside heavy hydroponic pods. Using computer vision and sensors as its “eyes,” one robot does the heavy lifting, transporting the pods across the facility; the second analyzes and picks the individual plants. It all happens beneath high-efficiency LED lights and under the watchful eyes of some dozen on-site robot and plant scientists [2]. High-tech farming is no oxymoron. A contemporary agricultural operation is more likely to resemble Silicon Valley than American Gothic, with apps that control irrigation, GPS systems that steer tractors and RFID-chipped ear tags that monitor livestock. And agricultural robots play a key part of that technological stable.

References

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