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ROBOTIC TECHNOLOGY IN AGRICULTURE

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Agriculture is quickly becoming an exciting high-tech industry. The technology is developing rapidly, not only advancing the production capabilities of farmers but also advancing robotics and automation technology.

At the heart of this phenomenon is the need for significantly increased production yields. 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, the technology is being deployed in creative and innovative applications.

Agricultural robots automate slow, repetitive and dull tasks for farmers, allowing them to focus more on improving overall production yields. Some of the most common robots in agriculture are used for: seeding, crop monitoring and analysis, fertilizing and irrigation, pruning and thinning, harvesting and picking, sorting and packing, milking and so on.

Many food plants begin life as seeds in a field. The traditional method for sowing seeds is to scatter them using a "broadcast spreader" attached to a tractor. This throws many seeds around the field while the tractor drives at a steady pace. It is not a very efficient method of planting as it can waste seeds.

Autonomous precision seeding combines robotics with geomapping. A map is generated which shows the soil properties at every point in the field. The tractor, with robotic seeding attachment, then places the seeds at precise locations and depths so that each has the best chance of growing [1].

Monitoring huge fields of crop is a big job. New sensor and geomapping technologies are allowing farmers to get a much higher level of

data about their crops than they have in the past. Ground robots and drones provide a way to collect this data autonomously.

Drone companies like Precision Hawk offer farmers combined packages which include robotic hardware and analysis software. The farmer can then move the drone to the field, initiate the software via a tablet or smartphone, and view the collected crop data in real time [1].

Ground based robots, like BoniRob, provide even more detailed monitoring as they are able to get closer to the crops. Some can also be used for other tasks like weeding and fertilizing.

Irrigating and fertilizing crops has traditionally used a lot of water is quite inefficient. Robot-Assisted Precision Irrigation can reduce wasted water by targeting specific plants. Ground robots autonomously navigate between rows of crop and pour water directly at the base of each plant. Robots also have an advantage as they are able to access areas where other machines cannot.

Thinning involves reducing the density of plants so that each has a better chance of growing. Pruning involves cutting back parts of plants to improve their growth.

The LettuceBot thinning robot received an award for "outstanding product innovation in agriculture." It uses computer vision to detect lettuce plants as it drives over them and decides in that moment which plants to keep and which to remove [1].

Harvesting and picking is one of the most popular robotic applications in agriculture due to the accuracy and speed that robots can achieve to improve the size of yields and reduce waste from crops being left in the field.

These applications can be difficult to automate, however. For example, a robotic system designed to pick sweet peppers encounters many obstacles. Vision systems have to determine the location and ripeness of the pepper in harsh conditions, including the presence of dust, varying light intensity, temperature swings and movement created by the wind. A robotic arm has to navigate environments with just as many obstacles to delicately grasp and place a pepper. This process is very different from picking and placing a metal part on an assembly line. The agricultural robotic arm must be flexible in a dynamic environment and accurate enough not to damage the peppers as they're being picked [2].

Harvesting and picking robots are becoming very popular among farmers, but there are dozens of other innovative ways the agricultural in-

dustry is deploying robotic automation to improve their production yields. The demand for food is outpacing available farmland and it's up to farmers to close this gap. Agricultural robots are helping them do just that.

It seems certain that robotics will continue to revolutionize agriculture and change the way we think about producing food. The market for agricultural robots is developing at a rapid pace, with a large number of established and startup technology companies developing, piloting, and launching an innovative range of robotic systems.

1. Top 10 robotic applications in agricultural industry [Electronic resource]. – Mode of access: https://blog.robotiq.com/top-10-robotic-applications-in-the-agricultural-industry/ – Date of access: 11.04.2018.

2. Robotics in agriculture: types and applications [Electronic resource]. – Mode of access: https://www.robotics.org/blog-article.cfm/Robotics-in-Agriculture-Types-and-Applications/–Date of access: 11.04.2018.

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MARKETING COMMUNICATION TOOLS AT AGRIBUSINESS ENTERPRISES

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In recent years the role of marketing communication at agribusiness enterprises has increased. Nowadays it is not enough to have good agricultural products and services. To ensure the successful sale of goods, agribusiness enterprises need marketing communication to do more than just produce high quality goods but sell them at the best prices and in the best way to maximize the profit of the agribusiness enterprises.

Marketing is the process of planning and executing the conception, pricing, promotion and distribution of ideas, goods and services to create and exchange value, and satisfy individual and organisational objectives.