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Application of Robotics in Agriculture

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Introduction

Artificial intelligence is gaining traction in the agricultural industry and is steadily being integrated in robotics developed for this sector. As automated technologies penetrate the market, we aim to answer the important questions that business leaders are asking today:

- Which types of AI applications are currently available in the agricultural robotics market?
- How are agricultural companies using these technologies to stay ahead of the competition?
- What innovations have the potential to change the industry over the next decade?

In this article, we explore current and "near future" examples of agricultural robots (often called "agribots" or "ag. robots"). Based on our research, most current ag robotics applications fit into the following sub-categories:

- Drones (Primarily Surveillance) Precision Weed Control Crop Harvesting, Planting and Seeding

Current Agri-bot Applications

Blue River Technology – Weed Control

Herbicide resistance has become a primary concern for stakeholders in the agricultural industry. The increasing use of herbicides has contributed to herbicide resistance which has been documented in 250 species of weeds. The Weed Science Society of America recently concluded that herbicide resistant weeds have been responsible for approximately $43 billion worth of financial losses for American farmers.

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In response to the continued challenges that weeds are presenting to farmers, Blue River Technology has launched a weed spraying machine. The *See & Spray* robot has been marketed as a safer solution to herbicide resistance with claims that it significantly reduces the crops' exposure to chemicals.

Agribotix – Drones

Colorado-based Agribotix reportedly takes agricultural data captured by drones and conducts analyses using cloud-based software to help clients increase crop yields and profits. According to the Agribotix website, the company claims that it has experience with more than 44 crops and its clientele base spans over 45 countries. The one minute video below provides a demonstration of a drone in action

In one case study, Agri-botix claims its technology helped a soybean grower prevent damage to its crops from weeds and avoided a 13 percent crop loss. The reported ROI amounted to $7,222.00, which included savings from crop loss avoidance and a precise herbicide application.

In May 2017, Agri-botix announced its involvement in a partnership with The Climate Corporation to expand the Corporation's suite of digital tools by integrating the ability to capture high resolution aerial images.

For example, as depicted in the image below from the company's website, these aerial images provide a contrasting view of the terrain, highlighting which areas are healthy and which require attention. Theoretically, the information derived from these images would allow more efficient budgeting and planning of farming and harvesting procedures.

Vision Robotics – Planting and Seeding

Vision Robotics' technology reportedly integrates algorithms with sensor technology to bring automation to lettuce farming and vineyards. Specifically, computer vision allows robots to generate 3D maps and models of areas of interest and then to complete various tasks within those parameters. For example, "thinning" is a process in farming where seeds are adequately

spaced apart during planting to allow for optimal crop growth. It can also be a time-consuming process. Vision Robotics' automates the lettuce thinning and results are shown in the example image below:

Future initiatives appear to include the development of precision weed removal technology using herbicides and the company is actively seeking strategic partners. Vision Robotics has not published an anticipated timeline for this effort.

Concluding Thoughts on Agricultural Robots

Agricultural robots or agribots are changing the look, feel and pace of traditional farming practices. Crop harvesting is poised to significantly impact the agricultural sector over the next decade. Essentially, where consumer demand and labor requirements are the greatest, automation will prove most useful. For example, roughly 320,000 acres of apples are grown in the U.S. annually and each acre requires between 250 and 350 man-hours per acre. However, it is important to keep in mind that there will be a learning curve as these technologies improve in their sensitivity and operation capacity. The industry appears to be inching towards large-scale efforts, so robot developers will need to keep this growing trend in mind.

Drone technology has reportedly demonstrated some promising results as in the case of Agr-ibotix. In comparison to other robotic categories where ROI is scarce, the company's openness to publish hard figures may reflect the sustainability of the this technology (we regularly publish reputable case studies of successful AI implementations in business, and we've found such published case studies to be relatively rare in the nascent world of agricultural robots).

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Advances in drone research will be critical for maintaining safety considerations. Agriculture authorities and investors alike will require proof effectiveness and safety. We can anticipate more drone applications to attempt to come to market in the coming decade.

Barring adverse weather, drones seem to have the easiest chance of becoming a commonplace agricultural application because-unlike their grounded counterparts-they don't need to navigate the unpredictable and messy world of sold and product. Grounded machines require dexterity in interacting with plants safely, while drones can survey a domain and record image data without requiring the same kind of significant progress needed for other robotics applications (case in point: the dexterity and discernment needed to pick strawberries at human speed is a much harder problem than simply flying over crops). We suspect that drones will be among the first widely adopted agricultural robots in the near term.