Artificial Intelligence Robotics in Agriculture: See & Spray

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Abstract

AI-driven technologies address different challenges faced by the agriculture industry, such as soil health, crop yield, and herbicide resistance. These technologies are emerging to improve the efficiency of agriculture. In this study, we will discuss the role of artificial intelligence in agriculture. These days agricultural robots are a highly valued application of Artificial Intelligence. It is predicted that agricultural robots will be designed and developed to complete different tasks such as spraying herbicides and harvesting crops in the next three to five years. Farmers nowadays are equipped with up-to-date machinery and technology. This will ensure more productivity and profitability. It will help to prove the value of these tools over the long haul. As compared to other industries, the risk is easier to model and predict. The case is different in agriculture as it is impacted by environmental factors. Due to this, the extensive testing and validation of emerging AI applications in agriculture are critical. The agriculture industry will continue to adopt emerging AI in future.

Keywords*: Artificial Intelligence; Smart Agriculture; Robotics;*

1. Introduction

Artificial Intelligence (AI) has played a significant role in various domains such as healthcare, banking, agriculture, education, transportation, and security [1]. Computer vision is the subbranch of AI [2]. Computer vision is used for object detection, object recognition, and facial recognition [3]. It is also used for number plate recognition of vehicles. In the healthcare industry, AI is used for the diagnosis of various diseases at an early stage. AI can be used to detect diseases in the lungs, liver, kidneys, and in different human body parts [4]. Different algorithms are used in the healthcare industry for the detection of diseases. With the combination of IoT and AI algorithms, doctors are able to detect disease and treat their patients [5,6]. Different healthcare monitoring systems are developed by engineers and researchers in order to help doctors [7,8].

Agriculture is one of the oldest and yet most fundamental industries [9]. Agribusiness plays a vital role in the food chain and also supplies a tremendous amount of food to meet the needs of the growing population. The productivity and efficiency of agriculture have not been given too much importance and are still being practised by using decades-old heavy machines and chemicals. Even though there has been a significant improvement to the yields by using biochemicals, the food safety of those technologies is still a big concern. One big challenge in the agriculture sector is the adoption of new technology and machine [10].

The human population has grown significantly over the past years and is currently growing at an average rate of 1% per year. According to a new report launched by United Nations, the current global population statistics are expected to increase by 2 billion people in the next 30 years, from 7.7 billion to 9.7 billion in 2050. Modern agriculture has many complex challenges. Growth in population will bring inevitable problems to us, such as how the growing population will be fed and how will this be sustainable for farmers around the globe and producers of food [11]. Agriculture in the current era faces multiple issues and challenges, such as food production should increase in order to feed the growing population, more feedstocks for a potentially huge bioenergy market, adapt to climate change, and adopt more efficient and sustainable production methods. The growing population demands more food. One of the problems faced by the farmers is to grow more food with less available land. The global food demand increases by 50%. To combat the growing population, farmers and innovators alike will have to come together to put in place strategies to help farmers meet increasing production demands [12]. Organizations are using automation and robotics to help farmers find more effective ways to protect their crops from weeds. With the use of Artificial intelligence (AI) in agriculture, the farmers are capable of getting more crops from the fields while using resources more sustainably. The emerging technologies are continuously evolving over the last few decades. Smart agriculture is an emerging concept that relies on the use of technologies like robotics, the Internet of Things (IoT), drones, and AI to manage and improve agriculture practices [13]. It will increase the quantity and quality of products and optimize the human labour required by production by decreasing the need for intense manual labour as previously required. By incorporating the use of emerging technology, insights can be formed effectively from data collected with the use of analytics, allowing farming practices to be revolutionized.

Smart agriculture is well known for its precision practices. It is defined as utilizing different modern technologies or a combination of these technologies. Following are some of the modern technologies used in agriculture.

- Soil Scanning
- Internet of Things (IoT)
- Global Positioning System (GPS)
- Artificial Intelligence

All the above-mentioned technologies enhance the quantity and quality of agricultural products. Real-time data enables the farmers to access the state of their crops, and they can monitor the health status of their fields. The effectiveness of other resources such as herbicides, pesticides, water, and fertilizers can also be maximized. For example, instead of using pesticides on the entire field or farm, they can be used in specific spots in a smart agriculture-regulated field.

2. See & Spray (AI robot)

There are different AI robots used in various domains, such as in banks, hospitals, and restaurants [14]. AI robots are used to reduce human effort and human errors [15]. There are plants in particular that are harder to distinguish than any other plants. Figure 1 shows how 'See & Spray' works. See & Spray is an AI robot that works in 3 stages [16]. Pigweed is the most common one. Pigweeds are harmful to the crops. Pigweeds are herbicide resistant, and if they grow, it becomes extremely hard to kill. The pigweeds can have up to a million seeds in the seed bank, so it is necessary to identify pigweeds and kill them.

Herbicides are expensive and wasted when spraying manually on the crops. The chemicals in herbicides are also harmful to the crops. A farmer spends approximately a quarter-million dollars a year on herbicides. This expense can be reduced up to by 80%. 'See & Spray' is a modern technology robot that is capable of replacing conventional or aerial spraying methods. It has huge environmental benefits. The goal of the 'See & Spray' robot is to reduce the usage of herbicide to increase crop production. It helps to protect groundwater and rivers. The ultimate goal is to continue to advance ways to feed the world's burgeoning population [17].

Fig. 1. How See & Spray work?

3. Conclusion

Nowadays, smart agriculture is developing increasingly at a rapid speed. It belongs to the part of a movement referred to as the Third Green Revolution. The most interesting aspect of smart farming right now is the use of agriculture drones. The farmers can easily analyze the condition of their crops by aerial imaging and near-infrared viewing. There are many drones in the market, such as DGI AGRAS MG-1, that are capable of applying fertilizers and pesticides on a small scale. Recently, smart livestock has also emerged. Smart livestock is similar to the system found in smart agriculture. Smart livestock is generally defined as the welfare of farm animals and their environmental impact through automation. Smart agriculture has benefited farmers and is also beneficial for the environment. It greatly increases efficiency and profitability. It has helped farmers in both developing countries and developed countries as well. Emerging technologies are continuously evolving and taking new directions, and we cannot predict what the future holds for agriculture.

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