Chapter 5
The Role of AIoT-Based Automation Systems Using UAVs in Smart Agriculture

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ABSTRACT

Agriculture is not all about food and includes production, promotion, filtering, and sales of agricultural products and provides better employment opportunities to many people. Nowadays, precision agriculture is gaining more popularity, and its main goal is the availability to all common people at low cost with maximum crop productivity. It also helps in protecting the environment. IoT, internet of things, a technology that is developing in modern society, can be applied to agriculture. At present, IoT-enabled technology in agriculture has developed to a greater extent, particularly a drastic development of unmanned aerial vehicles (UAVs) and wireless sensor networks (WSN), and could lead to valuable but cost-effective applications for precision agriculture (PA), including crop monitoring with drones and intelligent spraying tests. In this chapter, the authors explore the various applications of artificial intelligence of things (AIoT) and provide detailed explanation on how AIoT may be implemented in agriculture effectively. Moreover, they highlight crucial future research and directions for AIoT.

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INTRODUCTION

Agriculture, the backbone of Indian economy, plays a dynamic role in the production of essential food crops and providing staple food for more than a century. Researchers are applying a various technique to improve agricultural practices such as crop management, automated vehicle, climate conditions etc. IoT technologies can offer high potential in smart agriculture and precision agriculture. The various IoT devices and technology used in precision agriculture are used for monitoring, analyzing and protecting the environment for increasing productivity and reducing crop damage. But change in climate poses various challenges that can affect many sectors, including agriculture. According to the Food and Agriculture Organization (FAO) of the UN and the International Telecommunication Union, the world's population must find new innovations to rise food production by 60% by 2040. There are too many advances in precise agriculture today to increase crop yields. Especially in developing countries such as India, more than 60% of the rural population rely on agricultural land (L. M. Gladence et al., 2020).

The solution for the important task is the proper implementation and use of information and communication technology services, which provide the opportunity to intensification of the use of agrochemical products such as pesticides and fertilizers while minimizing operating costs. For example, aerial crop monitoring and intelligent spraying. UAV is one of the aircrafts that can fly autonomously without a pilot. UAVs are much easier to operate and cost-effective than manned aircraft. They are also more effective than ground-based systems and have the capability to cover a wide area without any damage in a short time. Mini UAVs, also known as drones, are characterized by being more cost-effective and capable of spraying pesticides. With the evolution of information technology, low-altitude remote sensing technology, represented by the Internet of Things (IoT) and unmanned aerial vehicles (UAV), is being proactively used in the field of environmental monitoring. When modernizing agriculture, IoT and UAVs can track the incidence of crop diseases and pests in terms of ground-based micro and macro-economic indicators, respectively. IoT technology can be used to collect weather parameters of crop growth in real time using a variety of low-cost sensor nodes. Depending on the spectral camera technology, UAVs can take images of farmland, but these images can be used to analyze the presence of pests and diseases in crops. The agricultural sector suffers huge losses from diseases. The diseases are occurring by pests and insects that reduce crop yields. Pesticides and fertilizers are generally sprayed to eliminate insects and pests to improve crop quality. UAV - Airplanes are used to spray pesticides to prevent human health problems when manually spraying. UAVs can easily be used where human intervention is difficult. To reduce the cost and the labor shortage, Computer systems that are capable of doing activities that

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