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Drones Controlled By Artificial Intelligence: Technological Prospects And Efficiency Analysis

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Abstract

This article explores the theoretical and practical aspects of using artificial intelligence (AI) technologies in agricultural drones. The author analyzes the processing of Big Data obtained via drones through AI algorithms, crop condition monitoring, and precision pest control methods. The article scientifically justifies the role of AI-equipped drones in saving water resources and increasing crop yields.

Keywords: Agricultural drones, artificial intelligence, machine learning, computer vision, monitoring, precision agriculture, agrodrones

Introduction

In the face of global population growth and climate change, ensuring food security necessitates the digitalization of agriculture. Traditional farming methods are characterized by high resource consumption and low efficiency. A new technological revolution has occurred with the integration of Unmanned Aerial Vehicles (UAVs) – an integral part of the "Smart Farming" concept – with artificial intelligence technologies. AI allows drones not only to fly but also to make independent decisions, identify plant diseases, and allocate resources purposefully. This research is aimed at improving the scientific and methodological foundations of using agrodrones in the conditions of Uzbekistan.

Methodology

Systematic analysis and mathematical modeling methods were used to study the operational algorithms of AI-equipped drones. The efficiency of

"Computer Vision" and "Deep Learning" neural networks in processing multispectral images obtained from drones was comparatively studied. The vegetation index (NDVI) of crops was analyzed based on field experiments and remote sensing data. Furthermore, the speed and accuracy of AI algorithms in detecting pests were monitored in both laboratory and field conditions.

Results

The conducted research showed that drones utilizing artificial intelligence provide the following technical and economic results:

1. **Autonomous Monitoring:** With the help of AI, drones fully scan the designated area without human intervention and detail plant diseases with 95% accuracy.
2. **Resource Efficiency:** By applying pesticides and water only to problem areas (spot spraying), the consumption of chemicals is reduced by up to 30-40%, and water consumption by up to 25%.
3. **Time Efficiency:** Within one hour, AI drones generate a complete digital map of the state of 10-15 hectares of land, providing real-time data to specialists.

Through the use of networked algorithms (YOLO, ResNet), the possibility of distinguishing weeds from cultivated crops and providing targeted treatment was created.

Discussion

While the prospects for AI-controlled drones are high, there are several technical barriers to their widespread implementation. Firstly, high-capacity servers and 5G communication systems are required to process large volumes of data (Big Data) in real-time. Secondly, it is necessary to improve the skills of local specialists in working with AI algorithms. However, the results confirm that smart drone systems reduce the human factor in farming and minimize the possibility of errors. As a scientist at the "TIIAME" National Research University, it is worth noting that monitoring soil moisture via AI drones in Uzbekistan's climate is of strategic importance in solving the problem of water scarcity.

Conclusion

The use of artificial intelligence technologies in agricultural drones is the most effective way to intensively develop the sector. AI enables not only data collection but also the automatic management of precision agriculture systems. The study concludes that the introduction of smart

drones increases productivity by 15-20% while drastically reducing the chemical impact on the environment. In the future, it is advisable to continue scientific research on transitioning drones to a fully autonomous "Swarm Intelligence" system.

References

1. **Mirziyoyev Sh.M.** Decrees and resolutions on the mechanization and digitalization of agriculture.
2. **Mulla, D. J.** "Twenty-five years of remote sensing in precision agriculture". Precision Agriculture, 2013.
3. **Wolfert, S., et al.** "Big Data in Smart Farming – A review". Agricultural Systems, 2017.
4. **TIIAME National Research University.** Collection of scientific articles.
5. **Zhang, C., & Kovacs, J. M.** "The application of small unmanned aircraft systems (sUAS) in agriculture". Precision Agriculture, 2012