ЗАКЛЮЧЕНИЕ

Рассмотрен физический аспект автоматического управления положением центра давления трактора, оборудованного резинотросовыми обводами гусеничных тележек, в зависимости от крюковой нагрузки для повышения показателей его эксплуатационных свойств.

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ИСПОЛЬЗОВАНИЕ ДРОНОВ В СЕЛЬСКОМ ХОЗЯЙСТВЕ

THE USE OF DRONES IN AGRICULTURE

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Данная статья посвящена обзору применения беспилотных летательных аппаратов, в сфере сельского хозяйства. Использование беспилотных летательных аппаратов (дроны) в сельском хозяйстве помогают решать такие задачи как создание и обновление

электронных карт обрабатываемых территорий, учёт сельскохозяйственных земель, планирование посевных работ, мониторинг за объемами и качеством выполняемых работ, прогноз урожайности посевных культур, контроль сбора урожая.

This article is devoted to the review of the use of unmanned aerial vehicles in the field of agriculture. The use of unmanned aerial vehicles in agriculture (drones) helps to solve such tasks as the creation and updating of electronic maps of cultivated areas, accounting of agricultural land, planning of sowing operations, monitoring of the volume and quality of work performed, crop yield forecast, harvest control.

INTRODUCTION

Drones and smartphones have become everyday tools for farmers. It is today, in the era of smartphones, that drones are gaining in popularity in agriculture. Drones in agriculture are not just about mapping, collecting information on crop use, and monitoring crop development. Today, drones are also used to spray plants and apply fertilizer.

These days, forward-thinking farmers are using industrial drones for everything from pest control to plant monitoring. Rapid software development makes drones less expensive and more autonomous, eliminating the need for professional pilots.

The history of drone use in agriculture is about 20 years old, but few farmers are actively using drones. The main obstacle to the adoption of drone technology is poor awareness of the benefits of drones and the seemingly high cost of the equipment. But when an instructor demonstrates the benefits and savings of using drones in agriculture, construction, surveying, and industry, many begin to think about buying one (figure 1).

THE MAIN PART

Modern smartphone apps make drones semi-autonomous, which makes them much easier to use. The farmer marks on his smartphone the land he needs, and the drone handles all other tasks on its own.

Figure 1 – Work performed by drones

A brief overview of the advantages and disadvantages of using drones in agriculture.

1. Pros:
– effectiveness;
– saving time;
– saving money;
– accuracy of crop treatment;
– due to the low height there is no risk of spraying someone else's territory;
– can be used at night;
– multiple uses;
– remote mapping;
– use in agricultural work.

2. Minuses:
– difficulties in operation for some farmers;
– frequent software updates;
– relatively small working area coverage;
– you can't fly everywhere (also applies to agricultural aviation).

The use of drones in agriculture is extremely important for farmers. Drones help farmers get a visual overview of the condition of their crops, as well as eliminate any factors that could lead to crop failure. Typically, farmers see an increase in their income after deploying drones. Aerial observation of agricultural operations brings good results for farmers. Drones offer an alternative way to monitor crops. Without drones, farmers have to work without days off to monitor the condition of their crops (figure 2). Drones help identify potential problems ahead of time, saving time and preserving the crop. Farmers are grateful for the use of drones

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to prevent potential losses caused by disease or bad weather. They know that we take into account all the challenges that can arise when using drones. Technical analysts are aware of the nature of the problems associated with drone use. Experts conduct various studies to avoid similar problems recurring in the future.

Figure 2 – Drone control

Ease of use.

The use of drones in agriculture requires little effort. It takes very little time to deploy and launch the drone (figure 3). It is easy to operate using buttons or icons on a smartphone. A user guide is offered to help poppy berry farmers understand how to operate the drone. For example, you can launch the drone into flight with a single tap of the "Unlock" icon.

Reducing the farmer's production costs.

The regular use of drones helps reduce the cost of labor in agriculture. Drones improve the quality of crops before they reach the market. Drones are able to detect crop infestations. They also act as an alternative labor force. They help keep an eye on the farmland. By using drones to regularly report on crop quality, farmers reduce production costs and prevent rejected goods from reaching the consumer. In this way, farmers can recoup the cost of purchasing drones fairly quickly and avoid losses caused by infestation or plant diseases.

Fertilizer and insecticide spraying.

The drone sprays chemical fertilizer on the plant leaves. Fertilizers are applied immediately after sowing. Insecticides prevent animals or insects from invading farmland. And while people are at risk of various diseases as a result of contact with insecticides, drones are not affected by them.

Figure 3– Remote control of drones

Mapping

Agriculture is a labor-intensive industry. Drones are needed to carry out the tasks faced by farmers who grow poppy berries in difficult weather conditions. Farmers get tired quickly when doing mapping work. Drones make it easier for farmers to survey and measure large areas of land. Drones provide significant assistance in mapping agricultural products. They provide high-quality images, through which conclusions can be drawn about the current state of the farm. For example, it can be a question of topographical changes, construction of a new structure or damage caused by bad weather conditions. Modern drones, equipped with numerous functions, fly over the farm, taking pictures or spraying fertilizer. Such drones contribute to the agrarian revolution by greatly facilitating the mapping process.

Farmers often face drought or heavy rainfall. Some areas of land are more susceptible to drought or flooding than others, and drones help find those areas. With this help, farmers are able to save most of their crops.

Drones move over fertile land, identifying any potential threats to crops, and relaying that information to users (figure 4).
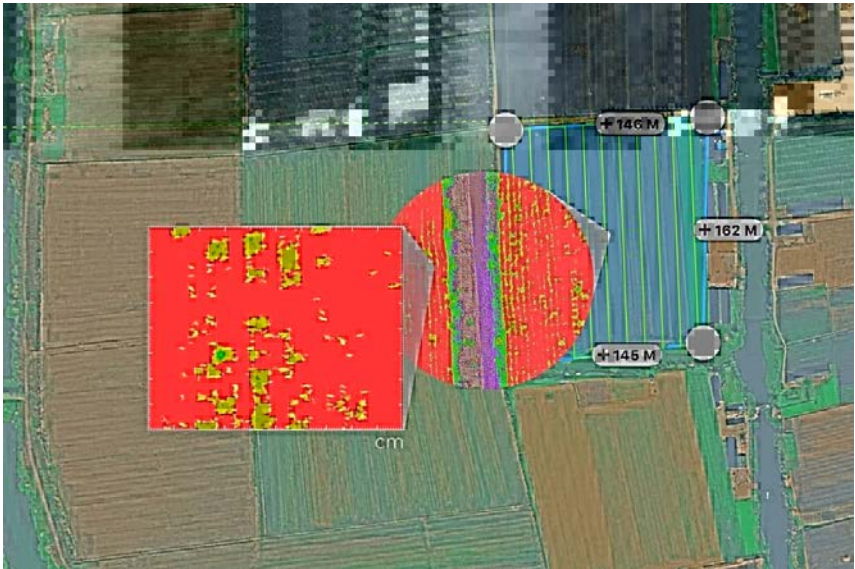

Figure 4 – Display of the terrain map

Prevention of animal and insect infestations.

Drones move over fields looking for potential animal or insect infestation threats. Drones are sent into flight to monitor the farm around the clock. Pest sightings alert farmers to the threat of an animal or insect infestation.

Diseases affect all crops. Animals or insects only need a few days to kill a crop. In the case of animals or insects, farmers suffer from a lack of objective information. Drones scare animals by using ultrasonic waves that irritate small animals and drive them away from the fields. Ultrasonic waves prevent the reappearance of insects.

Forecast and evaluation of crop quality.

The data collected during monitoring can be used to build various analytical reports. High quality products are needed to meet growing demand. Drones help farmers improve the quality of their future crops. They are equipped with light processing devices that allow them to visualize crops. The resulting images give farmers an idea of the condition of

the crop. Drones detect poor quality seeds to prevent the production of products that do not meet the required standards. Drones analyze crop quality after spraying plants with insecticides or medicines. This is necessary to track the effects of chemicals on crops because farmers must destroy crops damaged by insecticides.

CONCLUSION

Thus, automation is the next step in the evolution of drones. Due to the availability and fast payback period of drones, the main limiting factor is the small number of professional operators. But the situation can be remedied by increasing the level of automation.

In the last few years, there have been many experiments with drones in the fields. And many theoretical predictions have been statistically substantiated. The growing number of farms introducing UAVs into their work process is a confirmation of the positive research results.

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