

UNMANNED AERIAL VEHICLES

Kalinin T.A., student
Scientific supervisor – Matusevich O.A., senior lecturer
English language department № 1
Belarusian National University of Technology
Minsk, Republic of Belarus

There are many criteria by which unmanned aerial vehicles (UAVs) are distinguished. They are mainly classified according to their body structure.

The first, the most famous of all types, is an airplane-type vessel. From the name it is clear that this is a familiar aircraft for us, only on a smaller scale. The principle of operation of such a vessel is flight due to the lifting force created by its wings. As in the case of an airplane, such types of UAVs require special platforms to start their flight. Such vessels can be launched not only from the ground, but also from the water (jet skis are installed on them) and they are called hydroplanes. In the absence of a sufficient area for launching a vessel into the air, ejection devices are used. The acceleration of the aircraft over the entire duration of the take-off line is replaced by the transfer of high kinetic energy at launch using a catapult. Often, this is the main disadvantage of such a vessel: the need for a runway, a take-off device and other conditions to create the necessary lifting force to lift the structure into the air [1].

The next type of aircraft is a multicopter. The most popular at the moment, because of its design features. A multicopter or a multirotor with 4 engines is called a quadcopter (a quadrocopter or a quadrotor), a hexacopter drone with six engines, an octocopter with eight rotors, etc. The presence of several engines, directed vertically, and creating sufficient lift to launch the device into the air, almost instantly allows this type of aircraft to take off in almost any conditions and hover in one place in the air, as much as necessary to perform a particular task. Another key skill of the multicopter is its versatility [2]. They can be monitored online, record video, collect readings from sensors installed on it, use it as a manipulator, courier, etc.

To maximize the effectiveness of UAVs, they are used in combination with some advanced technologies such as machine vision

(not to be confused with artificial intelligence). Machine vision allows a computer to recognize familiar objects for the human eye and translate them into machine language in order to take further actions prescribed by the computer program. You can start working with machine vision by connecting the camera to any computer. Modern machine vision capabilities make it possible to recognize a much larger number of objects at the same time than the human brain is capable of.

Where are such technologies used? The most popular application of drones is in the energy sector. Suppose it turns out that at the moment there is a leak of natural gas, which flows in the water supply from China to the West. The length of such a pipeline is 12,000+/-100 kilometers.

This problem can be easily solved by installing a camera with machine vision and a thermal imager on a multicopter. It is necessary to set the correct task for machine vision, namely to identify the gas pipeline and follow it at a certain height until the thermal imager detects a gas leak. After flying several hundred kilometers through fields, forests, swamps, and rugged terrain, the drone will stop, hover over the leak site, and transmit its coordinates to the team responsible for repairing the problem.

Saving time, money and human resources in this task is undeniable. You can cite an infinite number of such examples in environmental monitoring (animal population control), industrial activity (overflying and re-accounting of warehouses, storages), control of border territories (overflying hard-to-reach territories in search of smuggling routes), etc.

UAVs have become widely known in the Republic of Belarus. In 2019, a new category appeared at the all-Belarusian robotics competition – “Autonomous aircraft. Drones”. This gave a significant impetus to the development of this branch in our country.

References

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