

## **DRONE'S CONTROL SYSTEM RESEARCH**

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A multicopter is an aircraft with an arbitrary number of rotor screws arranged in one plane and rotating diagonally in opposite directions. Due to the simplicity of the design, a quadrocopter is often used in amateur aircraft modeling. Multicopter is considered as a convenient and inexpensive way of aerial and filming. In many countries, small standard or specially manufactured copter successfully use law enforcement, fire and environmental services, as well as military.

A medium-sized multicopter can lift a weight from 500 g to 2 – 3 kg. This is the weight of a small photo or video camera (usually an action camera in cheap models, or a SLR camera in a professional). There are also quite large models of copter, which have 6 – 8 rotors (hexa- and octokopters) and are able to lift cargo into the air with a mass of up to 20 – 30 kg. A multicopter can develop a flight speed to 100 – 110 km/h.

It is much easier to operate the copter than other aircraft models, although there is a problem of visual control over a small device during removal. In order for the pilot to better determine the position of the copter in the air, its sides are illuminated with colored LEDs or marked with bright ribbons. The release of new models of quadrocopters, as well as the training of operators, requires qualitative testing of their behavior characteristics on the relevant virtual models and the study of control features using special simulators.

The developed software application contains a virtual model of the quadrocopter, interaction with which occurs by a PC. This simulator allows displaying on the screen some features of the behavior of the virtual quadrocopter, as well as the impact on it of various external environmental factors. The obtained modeling takes into account the key features of the algorithm of the aircraft, which allows to get an initial idea of controlling the drone.

In this program, an algorithm is presented that makes possible to significantly simplify and automate the quadrocopter control process. As is known, such aircraft have a limited range of action. When the quadrocopter leaves the reach, the built-in algorithm allows the aircraft to be automatically returned to the initial launching point, and also to make a safe landing, avoiding various obstacles in the way of its flight.

The program is developed on the modern Unity cross-platform engine using scripts written in the popular high-level programming language C#. Also used is the integrated programming environment of Visual Studio and the software complex for creating 3D models of 3ds Max. To run the simulator a regular PC with Windows 7, 8 or 10 is required. To increase the realism of control, a game joystick is used as an essential tool for manipulating the quadrocopter.