

Method of controlling a helicopter with six or more rotors

(This is a translation of the patent application LT2012007)

Abstract

The invention makes it possible to increase the load capacity and improve the manageability of light helicopters with six or more carrying rotors. The effect is achieved by using different rotors to create a thrust and to carry out maneuvers. The average speed of the rotors' rotation, providing maneuverability, does not decrease during flight. The diameter and mass of the rotors providing maneuverability is restricted in order to decrease the inertia. The invention is applicable for light flying devices where it makes economic sense to use rotors with a fixed pitch angle. The invention's implementation requires a flying device whose frame allows for a separate installation of the sustainer and shunting rotors, as well as a microprocessor controller that controls the rotors according to the described algorithm.

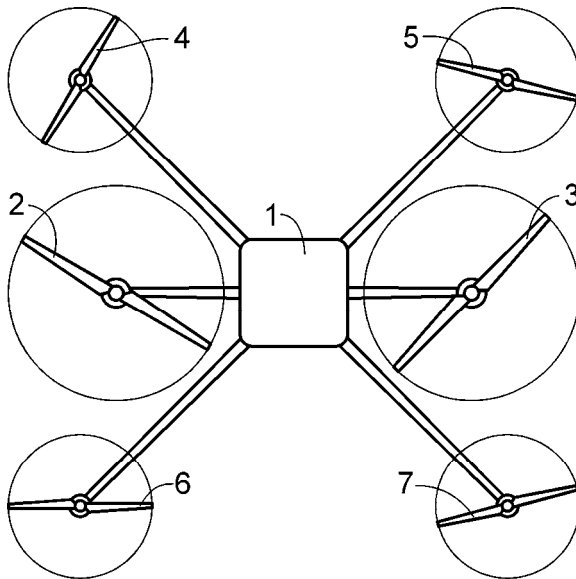


Fig. 1

Method of controlling a helicopter with six or more rotors

The invention relates to rotary-wing aerial vehicles with several rotors.

Patent GB2455374 describes an aerial vehicle with several rotors with a fixed pitch angle. The vehicle is controlled by changing the speed of rotor rotation. Rotors must be lightweight and compact to allow quick adjustment of their rotation speed. This requirement puts a restriction on the weight-lift ability of the vehicle. Another shortcoming of such vehicles is that their controllability is considerably worse during descent than it is during ascent due to a lower rotor speed in the former case.

The goal of this invention is to increase the weight-lift ability of lightweight aerial vehicles with several rotors, as well as to enhance their controllability during descent.

The goal is achieved via retaining the high rotation speed of some rotors in all flight modes. These rotors will be called “maneuvering rotors” further in the text. Maneuvering rotors have a relatively small diameter and weight, which makes it possible to quickly adjust their rotation speed for maneuvering. The total thrust of maneuvering rotors is insufficient for keeping the vehicle aloft. Additional rotors are intended for creating extra thrust and are called “cruise rotors“. They can be larger and heavier than maneuvering rotors, so it is recommended to place them closer to the center of the vehicle, while maneuvering rotors can be placed on the perimeter. Prior to take-off, maneuvering rotors are started first and then followed by cruise rotors. For maximum thrust, all rotors work at their maximum speeds.

Figure 1 shows an aerial vehicle with six rotors. Meaning of labels: 1 – hull; 2, 3, – cruise rotors; 4, 5, 6, 7 – maneuvering rotors.

The invention can be used in lightweight aerial vehicles and situations where the use of rotors with a fixed pitch angle is economically viable. The practical application of the invention will require an aerial vehicle with a chassis capable of accommodating both cruise and maneuvering rotors, as well as a computerized controller that adjusts the speed of rotors according to a predefined algorithm.

Climes

1. A means to control a helicopter with six or more carrying rotors, **characterized in that** part of the rotors change the thrust according to the helicopter tilt command, but do not change the thrust according to the change in total thrust command.

2. A means to control a helicopter with six or more carrying rotors according to clime 1, **characterized in that** all rotors change the thrust according to the change in total thrust command if the total thrust command is close to the minimum or maximum value.

3. A means to control a helicopter with six or more carrying rotors according to clime 1, **characterized in that** the rotors that do not change the thrust according to the total thrust change command are located farther from the helicopter’s center than other rotors.

4. A means to control a helicopter with six or more carrying rotors according to clime 1, **characterized in that** the rotors that do not change the thrust according to the total thrust change command have a smaller diameter than other rotors.