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CONCEPT OF MORPHOLOGY USED IN UAVS FOR EXTRA-TERRESTRIAL APPLICATIONS

Abstract

With the space race growing fast, the talks of human colonization on Mars, construction of Moon villages, deep space exploration have been going circles. Here, UAVs shall play a very critical role in the development process since they along with rovers and a few other robotic vehicles can be used for study, research, transportation and exploration of the planetary surface. This paper aims to study and develop the concept of morphology in UAVs that overcomes any compromise needed in its conventional design, decreasing flight limitations and is capable of performing a wide variety of missions. A more reliable UAV with modular structure has been designed that can change its shape during its flight. Study on an adaptive morphology that modifies the shape of the vehicle during flight environment is found to be very effective to suit the missions in comparison to the standard quadcopter design. A simpler and effective morphing technique for quadrotors consisting of a frame with independently movable servo-assisted arms that fold around the mainframe to develop different configurations have been proposed here. This flexibility in arms design changes the geometry of the quadcopter, which in turn modifies its exposed area. To achieve stable flight at all times, onboard computers are implemented to handle the control of the quad served along with optimal programs coded to deal with different flight situations during morph. The proposed adaptive morphology quadcopter with appropriate onboard sensors helps the UAVs to fly through narrow gaps, have a closer inspection and mapping of the planetary surface. UAVs developed with morphing innovation guarantees the benefits of superior endurance and performance, having the option to fly numerous sorts of missions, to perform fundamentally new maneuvers thus helping thoroughly in the exploration process. Existing strategies for different flight tests, various techniques for organization and development, materials used for building and different navigation and control methods have been studied and talked about intricately. These UAVs developed, are to be utilized for various extra-terrestrial applications betters the chance for the study-research process and will help in the growth and development of various space programs. Limitations of the proposed idea have also been discussed here. In future, this concept can be extended to Manned Aerial Vehicles in which the aircraft wing can be modified to obtain enhanced flight characteristics.