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Study on Capability of the Octocopter Configurations in Finite Element Analysis Simulation Environment

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Abstract : Energy harvesting on board the Unmanned Ariel Vehicle (UAV) is one of the most rapidly growing emerging technologies and consists of the collection of small amounts of energy, for different applications, from unconventional sources that are incidental to the operation of the parent system or device. Different energy harvesting techniques have already been investigated in the multirotor drones, where the energy collected comes from the systems surrounding ambient environment and typically involves the conversion of solar, kinetic, or thermal energies into electrical energy. The energy harvesting from the vibrated propeller using the piezoelectric components inside the propeller has also been proven to be feasible. However, the impact on the UAV flight performance using this technology has not been investigated. In this contribution the impact on the multirotor drone operation has been investigated at different flight control configurations which support the efficient performance of the propeller vibration energy harvesting. The industrially made MANTIS X8-PRO octocopter frame kit was used to explore the octocopter operation which was modelled using SolidWorks 3D CAD package for simulation studies. The octocopter flight control strategy is developed through integration of the SolidWorks 3D CAD software and MATLAB/Simulink simulation environment for evaluation of the octocopter behaviour under different simulated flight modes and octocopter geometries. Analysis of the two modelled octocopter geometries and their flight performance is presented via graphical representation of simulated parameters. The possibility of not using the landing gear in octocopter geometry is demonstrated. The conducted study evaluates the octocopter's flight control technique and its impact on the energy harvesting mechanism developed on board the octocopter. Finite Element Analysis (FEA) simulation results of the modelled octocopter in operation are presented exploring the performance of the octocopter flight control and structural configurations. Applications of both octocopter structures and their flight control strategy are discussed.

Keywords : energy harvesting, flight control modelling, object modeling, unmanned aerial vehicle
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