Designing and Building a Continuously Spinning but Controllable Flying Object

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Classic rotorcrafts, such as helicopters, work due to complex mechanics and especially the interaction between the main and the tail rotor. Small and light microcontrollers are widely available today. Using them, concepts for rotorcrafts normally uncontrollable by human pilots alone can finally be mastered. This can be achieved by combining aerodynamics and modern hard- and software. In my project I evaluated how to design and build such a not yet documented and unconventional flying object from scratch. The roflCopter is a rotorcraft working like a helicopter's main rotor taken as a single flying object on its own. This leads to a continuously spinning flying disk and therefore several challenges in designing, building and especially controlling the copter and its electronics. To spin, two motors with propellers installed at the end of a rod mounted perpendicular to two rotorblades drive the rotor up to 850rpm in average. Two servo motors tilt the rotorblades to change the angle of attack during flight and thereby altering the lift respectively. Aileron-like flaps at each rotorblade tip are pulled down by actuators in 2-3ms. They alter the lift force of each rotorblade to tilt the whole copter and make it steerable in any direction. The final goal is to build a copter which has the agility of a model helicopter but is still mechanically simple. It could be used in various applications in which great agility is needed but other drones would fail. Examples are indoor 3D mapping, cave exploring, factory inspection or SAR applications.

Awards Won:

Intel ISEF Best of Category Award of $5,000

First Award of $5,000

American Institute of Aeronautics &amp Astronautics: First Award of $2500.00