PURDUE INNOVATES | Office of Technology Commercialization

Electromagnetic Actuator for Flapping Wing Micro Air Vehicles (MAV)

An easily scalable, efficient electromagnetic actuator for flapping wing flight offers superior maneuverability, reduced complexity, and enhanced energy conservation for diverse air vehicle applications.

Traditionally, flapping wing micro air vehicles (MAV) have successfully utilized only a few forms of actuation. Piezoelectric actuators can generate enhanced stroke amplitudes and fast response, but they require high voltages, and therefore, complex circuitry, which add size and weight. Commercial DC motors paired with gear transmissions have demonstrated sustained hover abilities, but generally, offer only fixed wing kinematics and high mechanical wear.

Researchers at Purdue University have developed a novel technique for flapping wing flight using an electromagnetic actuator that produces harmonic oscillation of the wings, which can easily be scaled. Excess energy can be harvested from the system and stored or used to power additional systems, eliminating the need for large power units. Using fewer less costly components simplifies the fabrication and reduces the possible modes of failure. Air vehicles using this type of technology offer superior maneuverability and response over traditional vehicles, as well as efficient use of stored electrical energy, allowing its use in most applications, from general consumer to military.

Advantages:

-Fewer mechanical components and fewer points of failure

-Greater maneuverability and response

-Increased energy conservation and storage

-Scalability and large range of applications

Potential Applications:

-Materials

Technology ID

2013-DENG-66379

Category

Energy & Power Systems/Energy Storage

Aerospace & Defense/Autonomous Systems (UAVs & AVs)

Authors

Bo Cheng

Xinyan Deng

Jesse Roll

Further information

Parag Vasekar

psvasekar@prf.org

View online

-Manufacturing

-Air Vehicles

TRL: 3

Intellectual Property:

Provisional-Patent, 2013-03-08, United States | Utility Patent, 2014-03-10, United States | CON-Patent, 2018-07-13, United States

Keywords: Flapping wing micro air vehicle, MAV, electromagnetic actuator, harmonic oscillation, energy harvesting, simplified fabrication, superior maneuverability, increased energy conservation, scalability, biomimetic flight, Actuators, Air Vehicle, Electromagnetics, Mechanical Engineering, Motors