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Licensing Opportunity

TTO – Technology Transfer Office

Foldable and self-deployable aerial vehicle

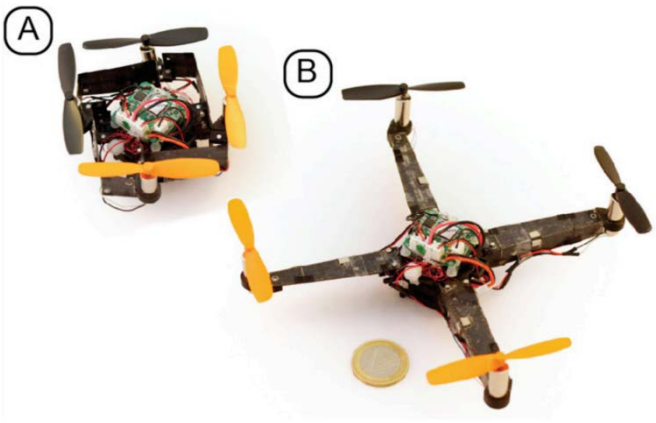

Figure 1. Miniature quadrotor equipped with foldable and self-deployable arms. (A) Stowed configuration with the arms wrapped around a central rigid frame. (B) As soon as the propellers are activated, the arms autonomously deploy and the quadrotor unfolds to a ready to fly configuration. The control board, battery, motors and propellers belong to the commercial quadrotor Walkera QR Ladybird.

Ref. Nr

6.1438

Keywords

Aerial robots, foldable robots, self-deployment

Intellectual Property

US 9446845 B2

Publications

"Foldable and Self-Deployable Pocket Sized Quadrotor", presented at the 2015 IEEE International Conference on Robotics and Automation (ICRA 2015), Seattle, Washington, USA

Date

16/10/2020

Description

There has been considerable increase in interest and research into aerial robots or drones in the last decade. Aside from the recent uptake in consumer drones, such robots support service personnel especially in high-risk scenarios due to their ability to fly into dangerous or inaccessible locations. In order to be fully effective, aerial robots need to be easy to transport and fast to deploy.

A straightforward way of easing transport of drones is reducing their size, however this reduces their payload capabilities. In response to this, foldable structures have been suggested to be able to be packaged for transportation yet deployed quickly for operation. Current designs utilize foldable beams or detachable appendages for storage. This means that an operator must manually configure the robot before deployment, which is in general not scalable to numerous units. Robots with self-unfolding structures have been designed in response to this, in order to have automatic deployment.

This technology leverages an emerging technique based on foldable origami in order to optimize both payload capability and deployment efficiency. The current prototype consists of a pocket sized foldable quadrator that can self-deploy before use and can be manually packaged for ease of transportation.

Advantages

Within the class of foldable aerial robots, there are two common approaches. Firstly, multi-joint mechanisms provide design flexibility, but the resulting structures are bulky, rendering them difficult to manufacture and miniaturize. Alternatively, continuous deformable systems are mechanically simpler, but are limited in their folding capabilities.

The present invention combines the best of both designs through an origami structure. This allows complex crease patterns to be manufactured simply. The stowed configuration occupies 82% less volume and is 57% shorter than he deployed configuration. Moreover, this invention offers a very fast, automatic deployment within 0.3 seconds.

Applications

- Military operations, especially high-risk situations
- Remote sensing
- Image acquisition or surveillance
- Transportation and delivery of goods