DESIGN AND FABRICATION OF MORPHING ARM DRONE FOR AGRICULTURE MAPPING USING GPS

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Introduction:

A quadrotors are distributing industries ranging from agricultural to transport, security, infrastructure, entertainment, search and rescue. Their maneuverability and hovering capabilities allow them to navigate through complex structures, inspected damaged buildings, even explore underground tunnels and caves, areas of irrigations, agricultural lands, fields, farms, cultivation, gardening and also for with horticulture. Yet current quadrotors still lack by ability to defend flight conditions and task, which is commonly observed in bird adaptive nature called as “Morphing”.

Researchers have long recognized that birds were able to change their body positions in flight in order to perform specific maneuvers or adjusted their aerodynamic profile to suit flight condition. This orientation adaptive body shape has been termed morphing. The words transform a morphing are actually forms of the word metamorphosis, which derives from the Greek meta means change and morpheme means form. That is the description of the capability to change the shape or goemetery of their bodies and wings for both heightened maneuverability and a stable flight with in multiple environmental conditions. The type of habitat are closely related to body size, wing shape, flight style and power of flight.

Objectives:

Drone technology has gotten most of the recognition in the industry because of its diversity and considered the future for the agrarian community. However, other sectors quickly embraced unmanned aerial vehicles (UAVs) when they learned about its widespread applications. Drones don't merely enhance overall performance but also encourage farmers to solve other assorted barriers and receive plenty of benefits through precision agriculture. With the market for agricultural drones. Fill the gap of human error and inefficiency by traditional farming methods. The purpose of adopting drone technology is to exclude any guesswork or ambiguity and instead focus on accurate and reliable information. External factors like weather, soil conditions, and temperature play a critical role in farming. Agricultural drone empowers the farmer to adapt to specific environments and make mindful choices accordingly. The gained data helps regulate crop size, crop treatment, crop scouting, irrigation, and carry out field soil analysis and crop damage assessments. The drone survey helps boost crop yields and minimize time and expenses along with the area for growing, cultivating, irrigation and all the other agricultural tasks. According to experts, the predicted world population will be 9 billion by 2050. Agricultural consumption is also said to increase simultaneously by nearly 70%. Drone technology, equipped with artificial intelligence (AI), machine learning (ML), and remote sensing features, are rising in demand because of its advantages. The central government has acknowledged the importance of unmanned aerial vehicles.

Methodology:

The Agriculture Drone System is designed by making use of GPS where the automatically controlled drone based on aerial mapping or navigation. Surveying of agricultural land area mainly consisting of two parts in the quadrotors with squeeze and fly mechanism. Initially quad rotor is assembled using necessary components such as arduino board, GPS, BLDC motor, ESC controller and battery, servo motor etc. Where the drone was behaved at required altitude, and then it is switch to altitude hold mode, which maintains the same altitude until it is switch back. Quadrotor with morpho functional morphimg capabilities. The drone can transition from the standard X configuration to task-specific morphologies:

(a) H configuration to fly through narrow vertical gaps;

(b) O configuration, where the drone is fully folded to fly through horizontal gaps;

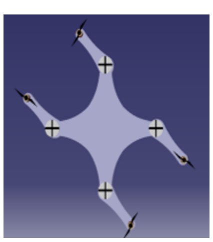
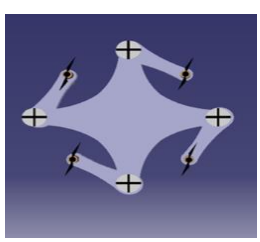
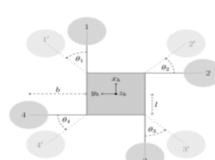
(c) T configuration for proximity inspection of vertical surfaces;

(d) Traverse of a gap narrower than the vehicle size using the H morphology. From right to left:

(e) the quadrotor approaches the gap with the X configuration;

(f) the vehicle initiates the folding maneuver to reach the H configuration;

(g) the gap is traversed using an elongated morphology to avoid collisions in complex scenarios.


Conclusion:

In this work, we presented a simple, yet effective folding system for quadrotors that consists of four arms that can fold around the main body. Our approach does not require symmetries in the morphology to guarantee stable flight. We showed that simple folding mechanisms combined with adaptive control strategies are a viable solution to broaden the spectrum of applications of quadrotors. This could lead to a formal shift in the research community towards novel folding aerial vehicles. However, there are still a number of unsolved research questions, such as automatic folding selection, exploitation of the morphology for improved flight at high-speed, and novel, bio-inspired mechanical designs

Scope for future work:

1. Flight through narrow gaps: Previous works addressing quadrotor flight through narrow gaps have shown at an aggressive maneuver is required to align the vehicle with the gaps orientation to avoid collisions. Flight through arbitrarily shaped gaps using monocular vision has also been shown. In all those works, the gap has be large enough to let the vehicle pass through

2. Close proximity surface Inspection: The supplementary images shows the results of an experiment highlighting the benefits of the T configuration against X morphology for surface inspection

3. Object Grasping and Transportation: The drone can close its arms around objects to grasp and transport them. Although this strategy cannot replace specialized and effector.

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