عنوان مقاله:

A methodology for sizing and flight time estimation of a PEM fuel cell powered Multi-rotor UAV

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خلاصه مقاله:

Unmanned aerial vehicles (UAVs), as remote-controlled or autonomous flying devices characterized by high flexibility and mobility, were usually employed to conduct remote sensing and surveillance missions. Recent developments in fuel cell (FC) technologies show great potential to increase flight duration of UAVs with satisfactory fuel economy. For UAVs powered by FC propulsion systems, the maneuverability and the power performance may be considerably affected, since the FC has drawbacks such as the long start-up time, delayed response and weak power performance. The integration of FCs with other power sources can significantly improve the dynamic load-response, the power performance, and the energy storage capacity of UAV propulsion systems. FC hybrid with the battery is a well-known and wonderful scheme. In this paper, a flowchart for sizing different components of a UAV with PEMFC as main power source is presented. The flight time estimated by this flowchart showed a good agreement with actual flight time.UAVs have been widely applied in practice as one of the best applicable candidates to conduct remote sensing and surveillance missions. UAVs can achieve higher fuel economy, more reliability, and much safer than conventional piloted helicopters [i,ii]. Because the power density and energy density of power sources determine the propulsive force and the flight endurance, respectively, propulsion systems are particularly important for UAVs [iii,iv]. Typically, UAVs are powered by conventional internal combustion engines (ICEs) and electric motors [v]. Compared with pure ICE-based UAVs, the UAVs powered by electric motors are more lightweight, reliable, and efficient [vi]. Furthermore, the responsiveness to the dynamic load from the electric motors is faster than that of ICE. In recent years, using fuel cells (FCs) as the major power source has become very popular for electric propulsion systems in aircrafts or UAVs, [vii]. Three typical categories of FCs are used in UAVs: ۱) proton exchange membrane FC (PEMFC); ۲) solid oxide FC (SOFC); and ۳) direct methanol FC (DMFC)As a summary, the PEMFC is the preferred choice for small commercial UAVs due to its small size, high operating efficiency, and suitable operating temperature range. The critical issues faced by PEMFCs are the expensive PEM, high-cost noble metal catalyst, and relatively low energy density of the hydrogen fuel under normal circumstances [۲].Although FCs used as power sources in UAVs have many advantages, ... they have certain common defects: excluding the relatively low power density, their ope

کلمات کلیدی:

UAV, Multi-rotor, PEMFC, Hybrid construction