

Design, Fabrication, and Analysis of Low-Cost Smart Solar Powered Energy Harvesting Micro Air Vehicles using 3D Printing

Micro Aerial Vehicles (MAVs) are advanced aerial vehicles having reduced size of the order of 100 mm. The MAVs are primarily employed for advanced engineering applications including surveillance, wildfire detection, wildfire monitoring and search and rescue operations. Depending on the requirements, MAVs have different configurations such as wing-less design, tail-less design and so on. Designing a MAV is often a challenge considering the need for high performance, incorporating gust stability features and other control systems. Additionally, the fabrication of cost-effective MAV devices is critical in realizing its widespread applications. Using 3D printing instead of conventional assembly techniques could prove to be a game-changer. Recently, 3D printing has gained much interest around the world. Despite all its promises, 3D printing is still considered as evolving technology and is primarily used for fabricating non-functional prototypes in limited volumes. The primary goal of this study is to design, fabricate and analyze affordable and smart solar powered energy harvesting Micro Air Vehicles. The project involves the study of various energy harvesting solutions for applications in MAVs and to develop a thin-film based solar panel to power the proposed MAV. Other aspects of the project include performing aerodynamic analysis of the proposed smart MAVs followed by theoretical evaluation of drag coefficient, developing quantitative laboratory testing methods capable of testing and evaluating the performance of the proposed MAVs, and to integrate smart solutions to the proposed MAV prototype.