Group 02 - Autonomous Drone for Wind Turbine Maintenance Inspection

In Europe, there are currently over 5000 offshore wind turbines, and this number is only expected to grow in line with the sustainability goals of the European Union. Not only is this a crucial step towards green energy, it also provides a substantial business opportunity as all these turbines have to be inspected to ensure safe operation and maximize their lifespan.

Mission Objective

Our project focuses on designing an autonomous drone specifically tailored for offshore wind turbine maintenance inspections. The goal is to develop a drone capable of performing visual inspection, thermal inspection, and 3D modeling. The aim is to enhance the efficiency and accuracy of wind turbine blade inspections while reducing costs and minimizing operational downtime.

Work Performed

Throughout the project, our team has conducted extensive research on wind turbine blade inspection methods and technologies. We have analysed the market and identified the main drawbacks, being the lack of endurance and high cost per inspection. By utilizing advancements in fuel cells technologies, we propose an innovative solution to tackle these challenges.

Throughout the project we have created a GNC system, operating an accurate model of the drone from scratch in MATLAB®, a CAD model has been constructed, higher fidelity structural analyses were performed using FEM analysis to ensure the structural integrity of the drone, and a propulsion system sizing was performed. Additionally, our design involves the development of a machine learning algorithm that can detect faults on the wind turbine blade autonomously based on the data collected by the advanced sensors onboard.

Future Outlook

In the final stages of our project, we plan to focus on the integration of all the sections that have been worked on up until now. A virtual environment in Unity is also being worked on to visualize the complete inspection of a wind turbine. Additionally, a prototype of the drone will be flown to test the control system created and the CAD model is being printed to display. We anticipate that the successful completion of this project will lead to a highly efficient and cost-effective solution for offshore wind turbine blade inspections.

We are excited about the potential opportunities of our project and look forward to presenting our final results.