Structural Health Monitoring of Wind Turbine Blades using Unmanned Aerial Vehicles

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Structural Health Monitoring (SHM) is a key technique to ensure the health and safety of civil and mechanical structures. The most commonly used monitoring methods make use of a combination of techniques such as vibration-based methods, acoustic emission, thermal imaging and ultrasonic reflection in order to detect deformation or failure. The use of active image processing concepts in Structural Health Monitoring of static and moving civil structures is largely unexplored and presents an interesting area of research. The aim of this dissertation is to evaluate the use of visual imaging from unmanned aerial vehicles to autonomously monitor Wind Turbine blades in order to create a real time model which can be used to assess its structural health. Initial experiments and simulations provide promising results, and the use of powerful drones in combination with specialist software can be used to identify small-scale deformities. This opens up various areas of potential future research such as 3D reconstruction of scenes and objects from Unmanned Aerial Vehicles, remote unobtrusive monitoring of moving mechanical structures using visual imaging and servoing etc.