# Measure the strain of wind turbine blades

How can we monitor the structural health of wind turbine blades?
By performing optical measurementover a large area of a utility scale wind turbine blade,it would be possible to develop a new approach for structural health monitoring of wind turbine blades. This sensor information will be useful to understand and create prediction tools in determining when blades are either damaged or about to fail.

How to test the fatigue of wind turbine blades?
Fatigue test within the test facility is performed using a hydraulic shakerthat can excite the blade at multiple resonant frequencies. By performing optical measurement over a large area of a utility scale wind turbine blade,it would be possible to develop a new approach for structural health monitoring of wind turbine blades.

Why are wind turbine blades measured from different viewing positions?
However, due to a sensor's field of view limitation, spatial constraints of the testing facility and optical occlusion effects or complex curvature, large-scale wind turbine blades need to be measured from many different viewing positions or directions as seen in Fig. 1.

How do you calculate forces on a turbine blade?
Moments and forces on each of the blades are calculated in the local axes of the blade,represented in Fig. 4 by the three axes separated by 120°. The local axes of blades are labeled as x,y,z,while the global axes of turbine are denoted as X,Y,Z,each creating a right-handed coordinate system.

Can we inspect the entire surface of a wind turbine blade?
Further studies are neededto evaluate the accuracy of the proposed method to inspect an entire surface of a utility-scale wind turbine blade with more than two camera pairs. In principle,since the stitching approach has been shown to be effective for two camera pairs,it should be able to be extended to three or more sensor pairs.

Can tangential strain be ignored in wind turbine blade fatigue testing?
This paper is mainly based on the blade fatigue testing only considering the longitudinal strain,ignoring the transverse and tangential strain; firstly,a 52.5-m wind turbine blade fatigue testing was carried out and the strain data were counted,proved that the transverse and tangential strain cannot be ignored.

Assessment of the strain gauge technique for measurement of wind turbine blade loads. Blade load measurement errors are assessed by numerical simulation and full-scale laboratory tests. ...

The analysis indicates that axial and shear forces may be neglected as sources of cross-talk in measuring the blade root bending moments. The cross-talks of the flap bending moment on ...

Wind turbine blade certification requires static and fatigue testing at a large-scale facility similar to the Wind

Technology Testing Center (WTTC) located in Charlestown, Massachusetts. Usually, ...

Because wind turbine blades are complex twisted structures and the deflections are large, there is often significant cross-talk coupling in the sensitivity of strain gauges placed on the structure. ...

In this chapter, four main topics in composite blades of wind turbines including design, stress analysis, aeroelasticity, and fatigue are studied. For static analysis, finite element method (FEM) is applied and the critical ...

field displacement and strain over a ~12-meter long portion of a ~60meter utility- -scale wind turbine blade. The proposed system has the potential to streamline the certification process by ...

A new method of calibrating and processing strain gauge data on wind turbine blades has been described. It is currently being used to monitor a full scale bi-axial fatigue test. Early results ...

This paper introduces a vision-based displacement measurement method for wind turbine blades in biaxial fatigue testing. Instead of relying on existing strain data, this ...

During the strain measurement process of wind turbine blades, fiber optic grating strain sensors often operate in complex strain environments with high vibration frequencies and large strain ...

Present day research divides methods for the full-scale static testing of wind turbine blades into two types. The first one is contact-based, such as measuring tapes [], pull ...

Wind turbine blades, blade testing, composite materials, non-destructive testing Summary The application of thermoelastic stress measurement techniques and acoustic emission monitoring ...

Utilization of strain measurements to compute these forces and moments requires design details on the WT. This paper introduces a method to analyze root reaction forces and moments on ...

One of the essential parts of a wind power generator that captures wind energy is the wind turbine blade. The safety of the blades rapidly declines as a wind turbine"s operating ...

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