



Industrial Consultancy & Sponsored Research (IC&SR)

SYSTEM AND METHOD FOR GENERATING PRECURSORS FOR EARLY DETECTION OF IMPENDING AEROELASTIC INSTABILITIES

IITM Technology Available for Licensing

Problem Statement

- The problems associated with aeroelastic instabilities are not only restricted to aircraft wings or helicopter blades, but also to the blades of modern wind turbines.
- A **decrease in power generation** is observed when modern wind turbines suffer from aeroelastic instabilities. Similarly, rotor blades in turbo machineries are also airfoil like structures which are susceptible to these aeroelastic instabilities.
- The aeroelastic instabilities in the rotor blades can have disastrous consequences in which the **broken components behave as high speed projectiles** having the potential to cause catastrophic damage.
- It is therefore necessary to have mechanisms that can **forewarn of impending aeroelastic instabilities**.

Technology Category/ Market

- **Aircraft - Aeroelastic Modelling**
- **Applications** - Aircraft Structures, Wind Energy, Turbomachinery.
- **Market** – Global Aircraft Manufacturing market was valued at USD 413.51 B in 2021 and is expected to grow at a CAGR of 3.7% by 2030.

TRL (Technology Readiness Level)

TRL- 3, Proof of concept stage.

Research Lab

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Technology

METHOD

- 1 •Acquire data from a set of contact sensors.
- 2 •Analyze data acquired from the set of contact sensors.
- 3 •Determine recurrence quantification of intermittent states in the data.
- 4 •Compare data acquired from contact sensors with one or more schemes.
- 5 •Generate precursors for detecting impending aeroelastic instability.
- 6 •A suite of measures for foretelling an impending flutter instability is obtained from time series analysis techniques wherein the features, patterns and recurring nature of trajectories in the aeroelastic response data are suitably quantified.

Intellectual Property

- IITM IDF Ref. 1210
- IN 426834 - Patent Granted

Key Features / Value Proposition

- In case online measurements are not available, the proposed system and method provide an offline setup to systematically carryout a scaled airfoil and acquire airfoil response continuously under offline conditions.
- The current method prevents aeroelastic instability enormous expenditures incurred due to fatigued airfoil like structures. (Fig.1)
- Other undesirable phenomenon like loss in power generation (in case of wind turbines) and abrupt structural failures can be eliminated.

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Images

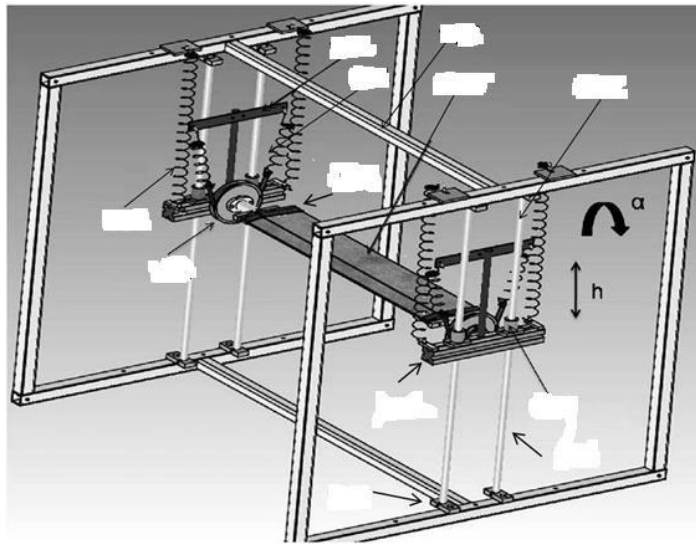


FIG. 1 illustrates a system for generating precursors to detect aeroelastic instabilities in offline mode.

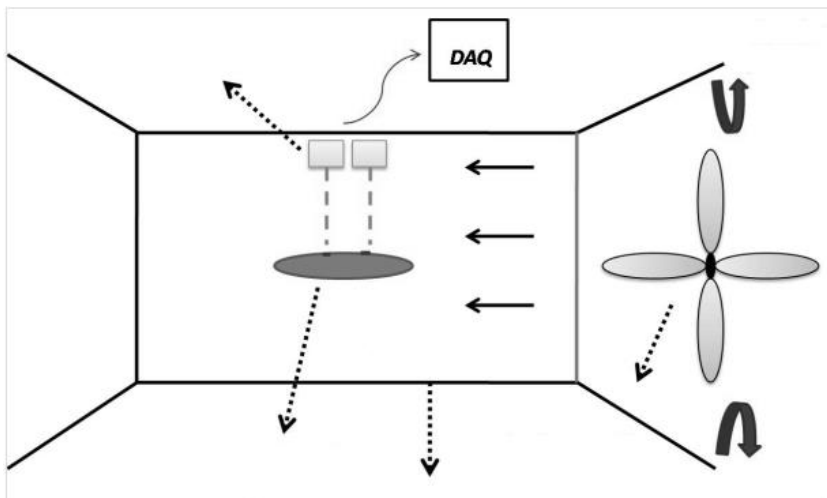


FIG. 2. illustrates a wind tunnel in which the system for generating precursors in offline mode is placed.

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