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Reconstructing non-uniform circumferential flow field in turbomachines from spatially undersampled data

This new system uses customizable algorithms to calculate optimal placements for low-cost, non-invasive probes in turbomachinery, enabling reliable, timely warnings of flow disruptions and reconstructing flow fields to enhance operational efficiency in various machines.

Researchers at Purdue University have developed a new system for reconstructing non-uniform circumferential flow fields in turbomachines. Gas turbine engines provide power to airplanes and ships. In these turbomachines, upstream stators operate machine blades and often unintentionally disturb flow as well as pressure and temperature by inducing mechanical vibrations. This can cause system stalling which can lead to permanent gas turbine engine damage. Probe technologies are being used to detect lags and disturbances in a machine's cadence but are often expensive and have difficulty accurately detecting fluctuations, often providing delayed warning signals. Purdue researchers have created a system that can calculate optimal locations to place low-cost, non-invasive probes in turbomachinery. The system can use the data collected by the probes to reconstruct a flow field and send a reliable, timely warning alert if harmonic rhythms are disrupted. In addition, the customizable algorithms developed by Purdue researchers are adaptable between different machines. Enhanced circumferential flow is achievable for turbomachines including gas turbines, windmills, and hydraulic turbines.

Advantages:

-Robust

-Reliable

-Improved Warning Capability

-Efficient

-Sensitive

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Category

Artificial Intelligence & Machine Learning/AI Model Optimization & Acceleration Tools

Energy & Power Systems/Power Generation

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-Accurate

-Low-Cost

Potential Applications:

-Gas Turbines

-Oil and Gas

-Wind Turbines

-Monitoring and Managing Gas Turbine Engine Health

Related Publication: "Reconstructing Compressor Non-Uniform Circumferential Flow Field from Spatially Undersampled Data: Part 1 Methodology and Sensitivity Analysis"

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TRL: 4

Intellectual Property:

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