

An Indian-Australian research partnership

Project Title:	Feedback control of combustion instability
Project Number	IMURA0649
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IITB Department:	Aerospace Engineering

Research Academy Themes:

Highlight which of the Academy's Theme(s) this project will address?

(Feel free to nominate more than one. For more information, see www.iitbmonash.org)

1. Advanced computational engineering, simulation and manufacture
2. Infrastructure Engineering
3. Clean Energy
4. Water
5. Nanotechnology
6. Biotechnology and Stem Cell Research
7. Humanities and Social Sciences

The research problem

Define the problem

One of the principal drawbacks of low-emission gas turbines is their susceptibility to combustion instability. We seek to stabilize such engines for robust operation in low-emission mode. Combustion instability and its manifestations are topics of intense current research. Our first objective is to obtain a model for combustion instability that is amenable to feedback control development. There are some simple models available in the literature, that may need further refinement for this purpose. Subsequently, we will explore several candidate control algorithms including model reference adaptive control and distributed parameter control will be evaluated for applicability to the problem at hand, using a computational model of a combustor. Once a couple of candidate algorithms are chosen and refined in computer simulations, those algorithms will be implemented on an experimental setup and the performance of the closed-loop system will be evaluated.

Project aims

Define the aims of the project

To develop a computational combustion model and design a feedback controller for mitigation of combustion instability in gas turbine and aircraft afterburner configurations

Expected outcomes

Highlight the expected outcomes of the project

A reliable computational combustion model of a gas turbine and a reliable feedback controller maintaining combustion stability

How will the project address the Goals of the above Themes?

Describe how the project will address the goals of one or more of the 6 Themes listed above.

Stabilisation of combustion in gas turbines will allow for their safe operation in clean, low-emission mode.

Capabilities and Degrees Required

List the ideal set of capabilities that a student should have for this project. Feel free to be as specific or as general as you like. These capabilities will be input into the online application form and students who opt for this project will be required to show that they can demonstrate these capabilities.

The ideal student would have knowledge both of fluid dynamics and control theory. The project will be primarily computational in nature – so students with exposure to computational fluid dynamics and/or computational evaluation of control algorithms should be given preference.

Potential Collaborators

Please visit the IITB website www.iitb.ac.in OR Monash Website www.monash.edu to highlight some potential collaborators that would be best suited for the area of research you are intending to float.

Prof. Hoam Chung

Please provide a few key words relating to this project to make it easier for the students to apply.

Combustion instability, feedback control, acoustics