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Feedback control for oscillation damping in cavity flow MOHAMED-YAZID RIZI, SATIE, ENS Cachan, 61 Avenue du Président Wilson, F-94230 Cachan Cedex, France, LUC PASTUR, LIMSI-CNRS, BP 133, F-91403 Orsay Cedex, France, MOHAMED ABBAS-TURKI, HISHAM ABOU-KANDIL, SATIE, ENS Cachan, 61 Avenue du Président Wilson, F-94230 Cachan Cedex, France, YANN FRAINGNEAU, LIMSI-CNRS, BP 133, F-91403 Orsay Cedex, France, SATIE, ENS CACHAN TEAM, LIMSI-CNRS TEAM — It is well known that the cavity flow provides a benchmark configuration to understand the self-sustained oscillations of the impingement shear layer that constitutes in numerous application the first source of acoustic noise. This study is focused on the design of a closed-loop control strategy to suppress the cavity flow self-sustained oscillations. We show that a simple time-delayed feedback control law kills the limit cycle and stabilizes the steady base flow. This control law happens to be easy to implement experimentally and rather robust to changes in flow conditions. To establish a linear dynamical model representing the cavity flow, a closed-loop identification technique (Eigensystem Realization Algorithm - ERA) is used. As expected, results indicate that the oscillation frequencies of the cavity are mainly due to the unstable modes of the linear dynamics. An H_2 optimal controller is designed by exploiting the identified linear dynamical model. Our H_2 controller stabilizes the cavity oscillations and is robust to parameters variations.

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