壓電噴射氣流器設計參數效能評估

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摘 要

主動式氣流控制(Active Flow Control)的主要研究目標是發展出一種經濟且具潛能的技術，與傳統的技術相比能夠在空氣動力性質的提昇上造成重大的基本改進。這種研發出的技術應用於航空器上可以減少機械系統的複雜性和液壓系統的失效率、降低噪音和重量、增加能源的效率、加強操控性和使用壽命等。近幾年來研究成果顯示，氣流控制具有能顯著改變氣流流經機翼翼面所產生的揚昇力和拖曳力。而一個高效率的主動式致動器在主動式氣流控制的應用上是不可或缺的要素。其中智慧型材料和結構是一個具有相當潛力的新研究課題，其中智慧型材料製成的主動式致動器也是一項重要的研發領域。本論文的目的在建立一個壓電式合成噴射氣流器的有限元素模型，並建構兩組壓電噴射氣流器的實驗裝置，藉以不同的設計參數對於噴出氣流速度的影響，為未來最佳化提供一個初步的研究。壓電噴射氣流器的設計參數包括壓電致動器覆蓋面積、流場體積、氣室深度以及噴口大小，當這些設計參數有所改變時，以實驗的方法對其特性(頻率、振幅、流速)作量測。藉由模型去分析，探討壓電式合成噴射氣流器的最佳化設計的參數，然後用分析中所發展的最佳化技術去改進壓電噴射氣流器，並對合成噴射氣流之致動器作效能上的評估。並使用使用阻抗分析儀量測壓電致動器的共振頻率、及其等效電路的各項數據。提供一個有效工具來研究壓電噴射氣流致動器幾何尺寸和噴出流體速度的關係。

關鍵詞 : 壓電致動器，合成噴射氣流器，阻抗模型

目錄

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