



To Whom it May Concern

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April 30, 2018

Review report on the PhD thesis “Distributed estimation and control with applications to spatially distributed damping systems” submitted by Xueji Zhang

Dear Madam / Sir,

The main scope of Mr. Xueji Zhang thesis is the adaptation of Networked or Distributed Control concept for a class of spatially interconnected systems focusing specifically to vibration reduction of lightweight flexible structures. In order to increase the performance and reduce emissions (aligned to the new environmental standards) companies active at the aerospace and the automotive sectors move towards advanced lightweight structures, which present a different vibroacoustic behavior compared to classical structures. Therefore solutions are needed for the improvement/control of the vibroacoustic behavior of lightweight structures calling for specific effective vibration reduction techniques. Moreover the rapid advances and integration of computing, communication and smart sensing technologies lead to new type, small size, low cost sensing devices equipped with embedded processors and communication capabilities, which in the frame of Network Control Systems can be used for vibration control. Therefore the topic of the thesis is quite challenging in scientific terms and presents high industrial interest.

Mr Xueji in the frames of his dissertation contacted research on the Network and Distributed Control concepts for spatially distributed flexible structures, proposed some theoretical approaches and validated them on experiments of a lightweight flexible structure. More specifically the PhD candidate proposed four decentralized approaches for distributed/cooperative observers over directed graph topology, increasing each time the complexity and generality of the proposed solution. The proposed solutions are robust (to a certain degree) and flexible at a reduced computational cost. The developed algorithms have been tested and evaluated first on different numerical simulations and then on a piezoelectric actuated composite plate. The experimental case study allowed the validation of the developed algorithms in real time. Furthermore the PhD candidate proposed a methodology for distributed homogeneous sensor fusion based on Bayesian theory for static or slowly varying signals.

During his thesis, Mr Xueji Zhang published three peer-reviewed journal papers, two peer-reviewed conference papers (in proceedings) and four conference papers.

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Based on the manuscript prepared by Mr Xueji Zhang and the papers he has already published, I assessed the PhD and I hereby would like to confirm the high quality of the implemented research and the contribution to the state of the art. I would like to further mention that Mr Zhang proved his ability to perform independent and collaborative research and to effectively achieve results, developing theory and validating it with experiments. Therefore I would like to recommend the thesis for admission for a doctoral defense.

Kind regards



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