



To Whom It May Concern

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LEUVEN April 24, 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 thesis considers the design of novel distributed estimation and control algorithms as well as their application to spatially distributed damping systems. Triggered by the advent of distributed sensing, actuation, and computation capabilities, distributed analysis and design algorithms are currently active research areas in the fields of system theory, estimation, and control. Moreover, the application to distributed active damping systems is highly relevant as well, as in the ongoing quest for making structures lightweight, they also become highly flexible and lightly damped. Hence, the subjects covered in the thesis are highly relevant to the current needs of the scientific community.

The thesis is centred around four main objectives, which are clearly stated in the thesis introduction and are rigorously fulfilled in the main technical chapters of the thesis: (i) develop novel decentralized design methods for cooperative observers that, in contrast to the current methods which only apply to undirected graphs, can handle directed graphs; (ii) augment the decentralized observers with a decentralized controller while preserving a partial separation between the observer and the controller design; (iii) Extensively validate the developed estimation and control algorithms for distributed active damping applications, both in simulation and in experiment; (iv) develop Bayesian distributed sensor fusion algorithms as a first step towards Bayesian distributed estimator design.

In order to achieve the aforementioned objectives (i) and (ii), Mr. Zhang has resorted to a combination of Lyapunov stability theory and graph theory, whereas in order to realize objective (iv) the former is replaced by Bayesian theory. These tools and methods are the workhorses of the majority of distributed estimation, control and sensor fusion algorithms and are hence, appropriate to tackle the theoretical challenges in the thesis. In addition, the experiments performed in view of objective (iii) are executed thoroughly and according to the current standards.

By realizing the objectives mentioned above, Mr. Zhang has made a substantial and innovative contribution to the state of the art. This finding is also supported by the publications of Mr. Zhang in internationally renowned scientific journals and in the proceedings of top international conferences in the field. Moreover, I believe that in his research Mr. Zhang has displayed creative scientific work and that his work will spark further developments and innovations in the future.

NO. OF PAGES 2

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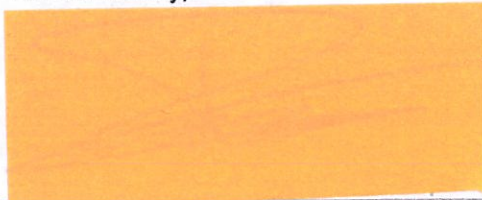
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In summary, I am convinced that the author of the thesis proved to have an ability to perform research and to achieve scientific results. I do recommend the thesis for presentation with the aim of receiving a Ph.D. degree. In case you have any questions about my review, please feel free to contact me at goele.pipeleers@kuleuven.be.

Yours sincerely,



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