Lausanne, June 15, 2021

Assessment of PhD thesis by Tomas Baca

This PhD thesis describes the development of a novel and comprehensive software and hardware system for cooperative sensing and manipulation by unmanned aerial vehicles. The author describes an impressive number of engineering and scientific contributions to perform experiments in simulations and deploy multiple drones in the real world. These contributions include the development of a full software and hardware stack, model predictive control for target identification and precise tracking, development and integration of several types of sensors, development of cooperative sensing and flight coordination, and deployment in the real world. Furthermore, the author's contributions and real-world deployment of the system led to two awards in one of the world's most difficult competitions for drones. The impressive number of peer-reviewed publications that make up this thesis (the largest number that I have seen in more than 20 years) and the high-prestige awards alone are a clear indication of the excellence of this PhD thesis.

In addition, the author has successfully structured, integrated, and collated most of his publications into a cohesive narrative with a very smooth flow of achievements. The novel contributions are clearly stated and the build-up of the story over the years is well explained by the author's own comments. As the author argues, there are no other systems like the one presented in this thesis that allow researchers to perform experiments in simulations, in lab conditions, and eventually in the real world in tough conditions. The software and hardware information has been made publicly available, and I'm convinced that it will help several other researchers to advance the field without developing the necessary infrastructure.

My only remark, if I really have to come up with one, is that the final chapter could elaborate a bit more on the future challenges and directions of the field. It is rare to find a PhD student who touched and contributed to so many aspects of UAV, which is why he is best positioned to offer readers his views of the future. But this could be an interesting aspect to discuss during the oral exam. In summary, I recommend to accept this PhD without any hesitation and to nominate it for a best thesis award.

Sincerely,

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