



Kosice, March 31, 2016

To: *Doc. Ing. Milan Polivka, Ph.D.*
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Review of the doctoral thesis
“Travelling Waves in Distributed Control” by Dan Martinec.

Based on the letter from doc. Ing. Milan Polivka, Ph.D., the Vice Dean for Graduate Studies and Research at Faculty of Electrical Engineering of the Czech Technical University in Prague, in the instructions provided in that letter, I am providing my opinion on the doctoral thesis of Dan Martinec.

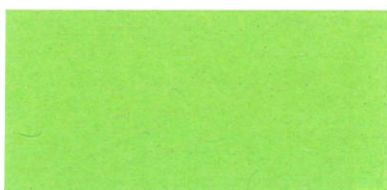
- (a) The topic of research is of great importance, with huge number of potential applications in signal and action propagation in multi-agent systems, and in control of such processes.
- (b) The objectives of the thesis that are declared in Section 1.3 are fulfilled.
- (c) Mathematical methods for analysis and numerical methods for computations and simulations are used professionally and correctly.
- (d) The thesis contributed to advancement of knowledge in the field of wave propagation and control in distributed systems. What I especially like in this thesis is the discovered link between travelling waves in multi-agent systems and the fractional-order derivatives. I consider this as an important contribution and a new direction, which could be further developed by Dan Martinec and others. However, instead of referring to the book by Das, the original sources should be cited, like Oldham and Spanier (1974), or Miller and Ross (1993), or Podlubny (1999). This link opens a large set of useful and inspiring analogies between systems in viscoelasticity, electrical circuits, multi-agent systems, etc.
- (e) In my opinion, this thesis complies with all requirements for an independent scientific work, is based mainly on the papers published by the author (I found and briefly examined 18 papers by the candidate, of which he is listed as the first author in 8 papers).

Some of the ideas in this thesis reminded me Chapter 3 of the book by M. Krejn and F. Gantmacher “Oscilljacionnye matricy i jadra i malye kolebanija mehaničeskych sistem” (1950). I believe that for the future research it could be useful to look at Krejn-Gantmacher problems from the viewpoint presented in this thesis.

The quality results, presented in this thesis, are also put in a nice form, with very good English, carefully crafted coloured illustrations, and high quality typeset in (La)TeX. It is worth trying to get this thesis published in “Springer Theses” series (<http://www.springer.com/series/8790>).

I recommend this work for defense, and I believe that by his publications and by the submitted thesis Dan Martinec proved that he deserves the title of *philosophiae doctor*.

With best regards,



prof. RNDr. Igor Podlubny, DrSc.