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Review of dissertation thesis
submitted to the First Faculty of Medicine of Charles University in Prague

Title: *Modeling of Binaural Hearing*
Author: *Mgr. Peter Tóth*
Supervisor: *Prof. MUDr. RNDr. Petr Maršálek, PhD.*
Consultant: *Doc. Ing. Zbyněk Bureš, Ph.D.*

The submitted dissertation thesis represents a nice and succinct description of three interesting results in computational modeling of information processing underlying binaural hearing. Most importantly, however, the thesis is essentially a summary of two already published papers and one excellent preprint, in all of which Peter Tóth is the first author.

Computational studies summarized in the thesis focus on an important yet still unresolved problem of sound source localization, in particular on computational properties and the role of a sound localization circuit. All topics described in the thesis represent an area of active interest and research from experimentalists and theoreticians alike. Presented results thus have a clear potential of being of interest to the wide neuroscientific community, not only auditory physiologists and modelers.

The thesis is written clearly and concisely on 51 pages, and includes a completely sufficient reference section. Important appendices add three papers authored by Peter. As a side note I would like to point out that the "thesis proper" contains only three figures, which is a little surprising given the very well documented manuscripts in the Appendix.

The bulk of the thesis focuses on three challenging questions about parameters and properties of a sound localization circuit in mammals. Already published results include an analytical description of synaptic mechanisms underlying coincidence detection by single neurons in the medial superior olive (MSO), and an interesting statistical take on a description of parameters of input and output spike

trains of MSO neurons. The remaining results focus on the role of interaural coherence in guiding sound localization in a challenging acoustic environment. The Results are followed by a thorough Discussion of context and potential implications of all described results.

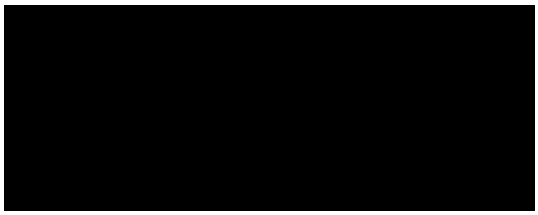
The thesis represents a well-rounded summary of Peter's graduate research projects. Moreover, two main results have been published already in international journals, and a third manuscript has been prepared for submission. The author has indeed demonstrated that he is capable of producing independent scientific results and contribute to the field of computational modeling in the auditory system. I believe the thesis fulfills all requirements and I recommend it for defense in the field of Biomedical Informatics.

Finally, I have two questions for the author:

1. On top of agreeing with experimental results, successful models of biological systems can also produce testable predictions, thus suggesting that these models are capable of capturing some of the essence of the systems under consideration. Do you think that your model of synaptic mechanisms underlying coincidence detection in the MSO can provide any predictions that could be potentially tested experimentally?

2. Given sufficient resources and enough personal interest, what would be the next interesting challenge in modeling of binaural processing, i.e. is there perhaps an extension of your modeling studies that you would like to perform next?

Bratislava, 14 September 2020



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