Evaluation of the diploma thesis – opponent

Opponent: Chantal Delon-Martin, Ph.D.

Subject matter: Tools Development for Location of Deep Brain Stimulation

Student: Bc. Karolína Pavelová

1. Meeting the requirements of the thesis assignment.

The thesis was a double challenge since it is situated in an interdisciplinary context between mathematics, image processing, signal processing, neuroanatomy and medical imaging and since it was performed in a french laboratory far from the student's cultural environment. The aim of the work was to develop a software solution tool for neurosurgery of deep brain stimulation by helping the selection of brain target. This aim was fulfilled by Karolina Pavelova.

2. Thesis technicality evaluation.

All the steps for the analysis are presented in this report with many figures corresponding to all the steps. However, if the 'how' is reported, the 'why' is lacking that could make the reader understand the rationale for doing all these complicated steps. This would better help understand the links between the different chapters that is not very clear.
The candidate should better state that 'analysis' relates to 'connectivity analysis' based on cross-correlation of time-courses (chapter 3).

The english language is fluent. However, there are few mistyping (Larmor frequency instead of 'Larmour' p.17) or grammar error (“to process” instead of “to processed”, p.23).
Errors are rare but need editing: for instance (p.23), in the brain referential description: the origin is missing (located in the anterior commissure AC) and the 3 axis are not properly described. “X dimension represents the Coronal (left-right) plane, Y dimension represents Axial (anterior-posterior) plane and Z represents Saggital dimension (inferior-superior) plane”. In fact the 3 axis are: x-axis is the left-right direction, y-axis is the posterior-anterior direction and z-axis is the feet-head direction.

There are few missing information about the subjects of the study (Age? Gender ?).

The statistical analysis is lacking (at least for group level connectivity difference between tinnitus subjects and control subjects). What statistical tests were performed at group level ? Why ? How was the threshold chosen ?
At group level, a seed-to-voxel connectivity analysis was performed but motivation for this choice is not reported (3.4). At individual level, the motivation for performing a voxel-to-voxel analysis is not stated (3.5).

3. Results evaluation of the thesis.

The result of Karolina Pavelova's work is a software solution written in Matlab that permits to define for individual tinnitus subject the best target for deep brain stimulation. It will be used for helping the surgeon as expected. Moreover, it can be extended for other target locations related to other pathologies.

4. Evaluation of the new findings contribution.

The work is novel in that it analysed new data on tinnitus that remain poorly understood in the literature. And it provides a confirmation for our hypothesis on tinnitus aetiology.
The results obtained with Karolina Pavelova are part of a publication in progress.

5. Utilization and selection of information sources.

Information sources are comprising not only classical review publications, book chapters and scientific publications but also software resources with their http addresses. They are properly selected. Their order remains unclear.

6. Question for the defense of the thesis.

In your work, what is the aim of the group connectivity analysis ?
What is the aim of the individual connectivity analysis ?

7. Summary evaluation.

Karolina Pavelova integrated well into the french laboratory, from both a scientific point of view and from a human point of view.
Based on existing neuroimaging tools, she learnt to use them and she developed a software solution under MATLAB environment for targeting location for deep brain stimulation that should be used for neurosurgery planning. Her thesis document lacks clarity, in particular for motivation, but gives exhausting view of what was performed during this work.
In addition, her work will be integrated in a scientific publication.

Overall assessment: very good

Venue: ___Grenoble_____, date: __16/05/2017_____ _Dr C. Delon-Martin_____
opponent's signature