Ph.D. Thesis Opponent’s Review

Thesis title: Adapting Case-based Reasoning for Processing Natural Phenomena Data

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Reviewer: Jiří Dvorský

Overall Evaluation

Reviewed thesis entitled Adapting Case-based Reasoning for Processing Natural Phenomena Data is focused on emerging topic for the whole society such as disaster management, traffic management etc. Using wide types of sensor networks there are now a lot of data available for processing and consecutive forecasting or estimating of development of the phenomena in the near future. Up-to-datedness of the thesis is evident.

The main contribution of the thesis is successful adaptation of Case-based Reasoning (CBR) methodology for processing natural phenomena data. This adaptation involves the proposal of a robust mechanism for retrieving characteristic patterns from a above mentioned kind of data. Emphasis is placed on data which can be expressed by means of time series. The proposed mechanism are based on methods like a Dynamic Time Warping (DTW), Symbolic Aggregate Approximation (SAX) or Voting Experts (VE) besides authors own ideas and approaches especially in distorted time series data.

Formal Structure and Organization of the Thesis

The thesis is conceptually divided into six chapters. After short introduction in Chapter 1, the Case-based Reasoning itself, current state of the art and applications is given in Chapter 2. The Chapter 3 provides a description of time series processing. A mechanism for retrieval of characteristic patterns in time series is mentioned in Chapter 4. The Chapter 5 brings large amount of authors own experimental results. The conclusion and possible future work is contained in the Chapter 6.

Completion of the Thesis Objectives

The thesis objectives set in the introduction of the thesis were fully met. Results and contribu-tions of the thesis represents are:

- methodology for meaningful segmentation of time series,
- sequence similarity definition, and
- methods for representative of group of sequences.
Remarks and Queries

I consider the thesis very well written, the results were accepted by international community, therefore, I have no doubt about the quality of the thesis. So I have rather general questions:

1. Using for example Voting Experts algorithm, you examined several variations of votes, and studied sensitivity of proposed method, see Section 5.2 and so on. Is there any method how to determine optimal values of this variation? It has to be done by hand with cooperation of domain expert? Generally speaking, is there any method how to tune your methods automatically or it should be done manually?

2. Is there any possibility of patterns extraction acceleration on some specific hardware?

Publication Activities

The author of the thesis has 18 records at Scopus and 7 at WoS, with some minor number of citation. There are list of 22 publications at the end of the thesis, 13 of them are directly related to the thesis subject. I consider these numbers as fully sufficient. Moreover, the author is involved in three projects and five grants since 2008.

Conclusion

I am convinced that the presented Ph.D. thesis represents excellent study providing valuable contribution to the state of scientific knowledge in the area. The author of the thesis proved the ability to conduct research and achieve scientific results. In accordance with par. 47, letter (a) of the Law Nr. 111/1998 (The Higher Education Act) I do recommended the thesis for the presentation and defense with the aim of receiving the Ph.D. degree.

Olomouc, January 4th 2016

[Signature]
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