Notice of the Final Oral Examination  
for the Degree of Doctor of Philosophy  
of  

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MASc (University of Victoria, 2009)  
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“Chart Detection and Recognition in Graphics Intensive Business Documents”  

Department of Electrical and Computer Engineering  

Tuesday, December 15, 2015  
10:30 A.M.  
David Turpin Building  
Room A136  

Supervisory Committee:  
Dr. Alexandra Branzan-Albu, Department of Electrical and Computer Engineering, University of Victoria (Supervisor)  
Dr. Panajotis Agathoklis, Department of Electrical and Computer Engineering, UVic (Member)  
Dr. George Tzanetakis, Department of Computer Science, UVic (Outside Member)  

External Examiner:  
Dr. Lawrence O’Gorman, Bell Labs Research  

Chair of Oral Examination:  
Dr. Elizabeth Vibert, Department of History, UVic  

Dr. David Capson, Dean, Faculty of Graduate Studies
Abstract

Document image analysis involves the recognition and understanding of document images using computer vision techniques. The research described in this thesis relates to the recognition of graphical elements of a document image. More specifically, an approach for recognizing various types of charts as well as their components is presented. This research has many potential applications. For example, a user could redraw a chart in a different style or convert the chart to a table, without possessing the original information that was used to create the chart. Another application is the ability to find information, which is only presented in the chart, using a search engine.

A complete solution to chart image recognition and understanding is presented. The proposed algorithm extracts enough information such that the chart can be recreated. The method is a syntactic approach which uses mathematical grammars to recognize and classify every component of a chart. There are two grammars presented in this thesis, one which analyzes 2D and 3D pie charts and the other which analyzes 2D and 3D bar charts, as well as line charts. The pie chart grammar isolates each slice and its properties whereas the bar and line chart grammar recognizes the bars, indices, gridlines and polylines.

The method is evaluated in two ways. A qualitative approach redraws the chart for the user, and a semi-automated quantitative approach provides a complete analysis of the accuracy of the proposed method. The qualitative analysis allows the user to see exactly what has been classified correctly. The quantitative analysis gives more detailed information about the strengths and weaknesses of the proposed method. The results of the evaluation process show that the accuracy of the proposed methods for chart recognition is very high.