

## DOCTORAL THESIS

### Semantic image similarity based on deep knowledge for effective image retrieval

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# Abstract

A flourishing World Wide Web dramatically increases the amount of images uploaded and shared, and exploring them is an interesting and challenging task. While content-based image retrieval, which is based on the low level features extracted from images, has grown relatively mature, human users are more interested in the semantic concepts behind or inside the images. Search that is based solely on the low level features would not be able to satisfy users requirements and not effective enough. In order to measure the semantic similarity among images and increase the accuracy of Web image retrieval, it is necessary to dig the deep concept and semantic meaning of the image as well as to overcome the semantic gap.

By exploiting the context of Web images, knowledge base and ontology-based similarities, through the analysis of user behavior of image similarity evaluation, we established a set of formulas which allows efficient and accurate semantic similarity measurement of images. When jointly applied with ontology-based query expansion approaches and an adaptive image search engine for deep knowledge indexing, they are able to produce a new level of meaningful automatic image annotation, from which semantic image search may be performed. Besides, the semantic concept can be automatically enriched in MPEG-7 Structured Image Annotation approach.

The system is evaluated quantitatively using more than thousands of Web images with associated human tags with user subjective test. Experimental results indicate that this approach is able to deliver highly competent performance, attaining good

precision efficiency. This approach enables an advanced degree of semantic richness to be automatically associated with images and efficient image concept similarity measurement which could previously only be performed manually.

**Keywords:** Image Index, Image Retrieval, Semantic Similarity, Relevance Feedback, Knowledge Base, Ontology, Query Expansion, MPEG-7 ...

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# Table of Contents

<b>Declaration</b>	<b>i</b>
<b>Abstract</b>	<b>ii</b>
<b>Acknowledgements</b>	<b>iv</b>
<b>Table of Contents</b>	<b>vi</b>
<b>List of Tables</b>	<b>xi</b>
<b>List of Figures</b>	<b>xiii</b>
<b>Chapter 1 Introduction</b>	<b>1</b>
1.1 Current Challenges in Image Retrieval . . . . .	3
1.2 Motivations and Significance . . . . .	8
1.3 Outline of this Thesis . . . . .	10
<b>Chapter 2 Literature Review</b>	<b>13</b>
2.1 Content-Based Image Retrieval . . . . .	14
2.1.1 Feature Extraction . . . . .	18
2.1.2 Relevance Feedback . . . . .	23
2.2 Concept-Based Image Retrieval . . . . .	29
2.3 Summary . . . . .	35

<b>Chapter 3</b>	<b>Semantic-Based Concept Similarity of Image</b>	<b>36</b>
3.1	Image Semantic Concept Similarity Measurements . . . . .	37
3.1.1	WordNet Distance . . . . .	37
3.1.2	Wikipedia Distance . . . . .	41
3.1.3	Flickr Distance . . . . .	43
3.1.4	Confidence . . . . .	46
3.1.5	Normalized Google Distance . . . . .	46
3.1.6	PMI Similarity . . . . .	48
3.1.7	PMING Similarity . . . . .	49
3.2	Semantic Space and Context-based Image Similarity . . . . .	52
3.3	Summary . . . . .	63
<b>Chapter 4</b>	<b>Ontological Query Expansion Based on Similarity</b>	<b>64</b>
4.1	Introduction . . . . .	65
4.2	Semantic Query Expansion Using Ontology Architectures . . . . .	70
4.2.1	SIM-CYC Distance . . . . .	70
4.2.2	Framework of CYC Based Query Expasion Image Search Model	71
4.2.3	CYC-WordNet Based Query Expansion System Work . . . . .	72
4.2.4	User Iterative Selection and Pruning . . . . .	73
4.3	Optimization of Ontological Expansion . . . . .	76
4.4	Extended ROC Analysis . . . . .	78
4.5	Summary . . . . .	80
<b>Chapter 5</b>	<b>An Adaptive Image Search Engine for Deep Knowledge</b>	
	<b>Indexing</b>	<b>81</b>
5.1	Relevance Feedback . . . . .	83
5.2	Evolutionary Self-Organizing Search Engine . . . . .	84
5.2.1	Adaptive Search Engine Architecture . . . . .	87

5.2.2	Query Processing . . . . .	88
5.2.3	Feedback Processing . . . . .	95
5.2.4	Introducing New Terms and New Objects . . . . .	97
5.2.5	Term Insertion . . . . .	97
5.3	Summary . . . . .	101
<b>Chapter 6 Image Retrieval Based on MPEG-7 Description Structure</b>		<b>103</b>
6.1	Analyze and Match MPEG-7 Descriptors . . . . .	104
6.2	Exploiting the Relationship between Image Metadata and Semantic Content . . . . .	107
6.3	Architecture for image Semantic Information Extraction . . . . .	111
6.4	Automatically Structural Casting to MPEG-7 Representation and In- dex Building . . . . .	113
6.4.1	Scheme of Information Extraction and Standardization . . . . .	113
6.4.2	Real user participative interface . . . . .	116
6.5	Automatic Tags Generation for MPEG-7 Descriptions . . . . .	118
6.6	Summary . . . . .	121
<b>Chapter 7 Experiments and Evaluation</b>		<b>122</b>
7.1	Experiments of Semantic-based Image similarity . . . . .	123
7.1.1	Semantic Image Similarity Measurements . . . . .	123
7.1.2	Comparison of Different Concept Distance Measurements . . . . .	127
7.1.3	Context-based Group Similarity . . . . .	128
7.1.4	Summary . . . . .	139
7.2	Experiments of Knowledge-based Query Expansion . . . . .	140
7.2.1	Experimental Results . . . . .	140
7.2.2	Summary . . . . .	143
7.3	Experiments of Evolutionary Self-Organizing Search Engine . . . . .	144



7.3.1	Simulated User Test Model . . . . .	145
7.3.2	Real User Test Design . . . . .	149
7.3.3	Performance Evaluation . . . . .	151
7.3.4	Test Results and Discussions . . . . .	152
7.3.5	Summary . . . . .	164
7.4	Experiments of Image Retrieval Accuracy Based on MPEG-7 Descrip- tors . . . . .	165
7.4.1	Experimental Results . . . . .	165
7.4.2	Summary . . . . .	166
7.5	Summary . . . . .	170
<b>Chapter 8</b>	<b>Summary and Future Research Directions</b>	<b>171</b>
8.1	Summary and Contributions . . . . .	172
8.2	Future Research Directions . . . . .	174
8.3	Conclusions . . . . .	176
<b>Bibliography</b>		<b>177</b>
<b>Appendices</b>		<b>207</b>
A.1	A Subset of Experimental Results (Formula Combination: $avg-avg-avg$ , Similarity type: Conference) - Table 1 . . . . .	207
A.2	A Subset of Experimental Results (Formula Combination: $avg-avg-avg$ , Similarity type: NGD) - Table 2 . . . . .	207
A.3	A Subset of Experimental Results (Formula Combination: $avg-avg-avg$ , Similarity type: PMI) - Table 3 . . . . .	207
A.4	A Subset of Experimental Results (Formula Combination: $avg-avg-min$ , Similarity type: Confidence) - Table 4 . . . . .	207

A.5	A Subset of Experimental Results (Formula Combination: $avg-avg-min$ , Similarity type: NGD) - Table 5 . . . . .	207
A.6	A Subset of Experimental Results (Formula Combination: $avg-avg-min$ , Similarity type: PMI) - Table 6 . . . . .	207
	<b>Publications</b>	<b>214</b>
	<b>Curriculum Vitae</b>	<b>217</b>