

## MASTER'S THESIS

### Semantic search of multimedia data objects through collaborative intelligence

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# Semantic Search of Multimedia Data Objects through Collaborative Intelligence

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# Abstract

With the rapid advancement of multimedia technologies and the Internet, multimedia information can be easily created, shared and distributed, using not only computers, but also numerous other portable digital devices. As multimedia information has become fully ubiquitous in our lives, searching for multimedia data objects has thus become an important activity. It is certainly notable to be able to find a solution for searching multimedia information effectively and efficiently. However, this type of search is far more difficult than searching text-based documents since the inherent high-level semantic image features and concepts require a degree of intelligent judgement that cannot be mechanised or automated. Furthermore, the most challenging problem facing the semantic search of multimedia data objects is the ability to index them.

Here, we present an innovative approach that enables the semantic search of multimedia data object by the discovery and meaningful indexing of their semantic concepts. Such objects may include images, videos and different music or audio formats. The basic framework of our indexing approach is to capture human judgement from user search queries in order to build semantic indexes which relate search terms to the semantics of multimedia objects while maximising user

satisfaction.

This approach is particularly effective for the retrieval of multimedia objects, such as images and audio and video data, where a direct analysis of the object features does not allow them to be related to search terms, e.g. non-textual/icon-based search, deep semantic search or when search terms are unknown at the time the multimedia repository was built.

By analysing the users' search queries, relevance feedback and selection patterns, semantic concepts can be discovered and migrated through an index hierarchy. Through the growth and evolution of the index hierarchy, the semantic index may be dynamically constructed, validated and augmented. Our system also incorporates a high degree of robustness and fault tolerance. We also incorporate genetic variations into the design to allow objects which may otherwise be hidden to be discovered. The index convergence behaviour and its modelling are examined. Experimental results indicate that the present approach is able to confer significant performance benefits in the semantic searching and discovery of a wide variety of multimedia data objects.

**Keywords:** Evolutionary, Genetic Algorithms, Multimedia Indexing, Relevance Feedback, Semantics

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