Information technology — JPSearch —
Part 1:
System framework and components

Technologies de l'information — JPSearch —
Partie 1: Cadre système et composants
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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

In exceptional circumstances, the joint technical committee may propose the publication of a Technical Report of one of the following types:

- type 1, when the required support cannot be obtained for the publication of an International Standard, despite repeated efforts;
- type 2, when the subject is still under technical development or where for any other reason there is the future but not immediate possibility of an agreement on an International Standard;
- type 3, when the joint technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example).

Technical Reports of types 1 and 2 are subject to review within three years of publication, to decide whether they can be transformed into International Standards. Technical Reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

ISO/IEC TR 24800-1, which is a Technical Report of type [3], was prepared by Joint Technical Committee ISO/IEC JTC 1, Information technology, Subcommittee SC 29, Coding of audio, picture, multimedia and hypermedia information.

ISO/IEC TR 24800 consists of the following parts, under the general title Information technology — JPSEach:

- Part 1: System framework and components
Introduction

JPSearch aims to provide a standard for interoperability for still image search and retrieval systems. There are many systems that provide image search and retrieval functionality on computer desktops, on the World Wide Web (i.e. websearch), on imaging devices, and in other consumer and professional applications. Existing systems are implemented in a way that tightly couples many components of the search process. JPSearch provides an abstract framework search architecture that decouples the components of image search and provides a standard interface between these components.

Aligning image search system design to this standard framework facilitates the use and reuse of metadata; the use and reuse of profiles and ontologies to provide a common context for searching; the provision of a common query language to search easily across multiple repositories with the same search semantics; allows image repositories to be independent of particular system implementations; and for users to move easily or upgrade their image management applications or to move to a different device or upgrade to a new computer.
Information technology — JPSearch —

Part 1:
System framework and components

1 Scope

1.1 Interoperable Image Search and Retrieval

This Technical Report specifies two things. The first is a framework for interoperability for still image search and retrieval. The second identifies an architecture and the components in this framework, the linkages between components, and which of these components and links are to be standardized in JPSearch.

The image search and retrieval framework will be determined by real use cases (tasks) and will leverage on lessons learnt in the long history of text retrieval where, for example, different users issuing the same query may be looking for (very) different results. This is important because it means that the framework must be general enough to support many possible approaches to image retrieval, e.g., from using only low-level image features, to text annotations, to community input, or a mixture of such approaches.

From the framework and components, and the linkages and flow of data between them, the parts of JPSearch that need to be standardized can be determined.

1.2 Motivation

There are many applications that provide image search and retrieval functionality on computer desktops, on the World Wide Web (i.e., websearch), on imaging devices, and in other consumer and professional applications. These implementations are characterized by significant limitations, including:

- Lack of the ability to reuse metadata

  The biggest problem in still image management is consistent and complete user or system annotation (in whatever form) of images. A user makes a heavy investment if and when they annotate an image or a collection of images. For example, a user adopts System A for storing and managing still images. The user discovers System B, which provides improved and desirable functionality, but is effectively prevented from switching to System B because the metadata in System A cannot be easily (or at all) used in System B. In this example, users are impeded in using the applications or systems that best suit their needs; and system providers are unable to compete freely with their products.

  This problem generalizes in community based image sharing systems, where multiple users may annotate the shared images. In most cases, however, an image has a single owner and there is a need for the ability to merge community metadata back into the owner's image management system. This ability would help overcome the difficult problem of manual still image annotation.

- Lack of a common query format and search semantics

  There is a trend towards shared image repositories. These could be on the web, but there are also systems that publish user repositories residing on their local (e.g., home) machines for (normally access controlled) public viewing and annotation. As the number and size of such repositories increase (a monotonic increasing trend), search becomes an essential function for users to navigate shared repositories.
Unfortunately, the various systems providing image search, whether on the desktop or on the web, do not provide a common way of specifying a search. This is not the same as having a common user-interface since the look and feel is up to a system provider to provide and for the user to like or not like. The problem is that a query such as “white car” may be interpreted as a Boolean “white” AND “car” or “white” OR “car”, or “white car” as a phrase, etc., and the interpretation may be different when the search is done against the image data or against text metadata, or against other metadata. Users are confused because different systems return different results for the same query. System providers need a reference standard to remove ambiguity and make searching over shared repositories consistent.

- Lack of a common format for handling context in searching

A large adult describing a 5-foot tall man may use the word “short”. A small child looking at the same person may say “tall”. This does not mean that the person is both “short” and “tall” at the same time; rather it is the context that has changed. Similarly, when a doctor does a query using the term “skin cancer”, he or she probably expects a very different set of images from when a patient searches with the same query term. Searching for images always takes place in a context. This context may be implicit or explicit.

Some systems allow the user to specify a context and there are other systems that automatically imply a user’s context. There is no way for the context in one search system to be used in a different search system. A common format for handling context allows a user to carry their context with them to different search engines. It also allows the context to be owned by the user and not by the system, i.e., it protects the user’s privacy.

These are just three examples of where still image search systems can benefit tremendously from interoperability. Other examples include how metadata can be created, evolved and stored, and also how image collections can have metadata different from and augmenting the metadata of a single image.

Existing systems are implemented in a way that tightly couples many components of the search process. JPSearch provides an abstract framework search architecture that allows an alignment of system design to a standard framework. Among other things, this alignment facilitates the use and reuse of metadata, the use and reuse of ontologies to provide a common language for contexts, the provision of a common query language, provide standardized interface to system components, and the ability to provide still image search and retrieval functionality across multiple repositories.

1.3 Outline of the Technical Report

There will be 7 clauses to this report. They are arranged as follows:

Clause 2 provides definitions of terms and abbreviations.

Clause 3 reviews the traditional approaches to image search and from various examples, motivates the importance of the user in the search process, the importance of making explicit the user task and user evaluation, and that meaning in images may be as much added from outside as extracted from the image itself. This motivates the next clause, which are the real use cases.

Clause 4 describes the real use cases of the various ways searching does take place. In particular, there could be multiple entry points into the overall search framework. These would include automatic, semi-automatic, and human (user) driven searches. These would include specific use cases and motivating examples of searches for images.

Clause 5 describes the overall search and management process. This can be considered the requirements specifications for a general search and management architecture.

Clause 6 describes the 4-layer architecture for JPSearch and explicitly identifies the components in the architecture, and what their roles and positions are in the architecture. We will describe how the use cases described in Section 3 map to the layers of this architecture.

Clause 7 specifies the overall structure of JPSearch.