Some Issues in the Indexing of Images

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This article discusses some of the intellectual issues involved in the indexing of visual or pictorial images, postulating that the indexing of images should provide access to images based on the attributes of those images, and provide access to useful groupings of images, not simply access to individual images. The attributes of images can be divided into four categories: "Biographical" attributes, Subject attributes, Exemplified attributes, and Relationship attributes. When creating groupings of images, it is important to consider the following issues or questions: When should the grouping occur? What are the groupings based on? What level of detail is necessary? and What groupings will be useful? More research is needed into the ways images are sought and the reasons that they are useful.

Seeing the forest, rather than simply the trees, is always a difficult undertaking. Nevertheless, that is what we are about to attempt: A broad look at some of the intellectual issues that need to be considered when indexing images, from the perspective of what the indexing of images should accomplish. Although technological and other implementation issues are important in the indexing of images, they will not be discussed here; This article concentrates on what can be indexed in an image and on what that indexing should accomplish, rather than on exactly how the indexing should be performed. It is hoped, of course, that a discussion of what should be accomplished in the indexing of images will be useful when making decisions about the specific manner in which that indexing should be performed.

Images, in the context of this article, are those images that are pictures, images that depict; not the images that record text electronically by representing textual characters with images of those characters rather than with codes. Although images may be both still and moving, we concentrate here on still pictures, such as photographs, slides, paintings, prints, drawings, and illustrations, although occasional references will be made to moving image materials. Images that need indexing may appear in almost any discipline: In science, for example, there are collections of photographs from expeditions, of remote sensing images, of medical illustrations; in art, there are works of art themselves and slide and photograph libraries of reproductions; in history, there are collections of documentary photographs and of illustrated ephemera. There are also general picture collections, from the school or public library collection of pictures cut out of magazines and mounted on cardboard to the vast holdings of the Prints and Photographs Division of the Library of Congress. Images may also be organized in different kinds of files, ranging from the relatively primitive "self-indexing" vertical file to the fully automated index linked to an electronic database of images. Images may be organized separately from other materials or integrated with them. Although images are of many kinds, come from widely varying disciplines, and may be organized in different kinds of files, it is still possible to generalize about the purpose of indexing images, about what the indexing of images should accomplish.

What Should the Indexing of Images Accomplish?

The indexing of images should accomplish two things: first, the indexing of images should provide access to images based on the attributes of those images; and second, the indexing of images should provide access to useful groupings of images, not simply access to individual images. In the following sections, we try first to describe the attributes of images upon which access can be based, then discuss some of the issues involved in placing images in useful groupings.

Attributes of Images

Images of different kinds or from different disciplines will have their own particular attributes that in turn are different, or appear to be different, one from the other. Prints in the fine arts might have attributes like artist and printing process; photographs from a scientific expedition might have attributes like date, time, and locale. However, these attributes can be categorized and generalized, based partly on the nature of images and partly...
on classification theory, to the point where they apply to all images. When deciding what attributes of an image, or set of images, can be used to provide access to those images, it is useful to think about the attributes in the context of the four general categories set out below, as a sort of checklist to make sure that no potentially useful attribute has been overlooked. These four categories are: “Biographical” attributes; Subject attributes; Exemplified attributes, and Relationship attributes. Let us look at each one in turn.

“Biographical” Attributes of an Image

This category of attribute has to do with what might be called the “biography” of an image, and may be further subdivided into two smaller categories. First, there are those attributes that deal with the “birth” of an image: Its progenitors or creators, whether they are photographers or artists, the time and place of its creation, and any name or title given to it by its creators. Second, there are those attributes that deal with the image’s “travels” through the world: Where it is now, where it has been, how much it costs or has cost, whether it has been altered in any way. These attributes are relatively objective, although in the case of particular images some of these attributes may be either unknown or unimportant.

Subject Attributes of an Image

This category of attribute is the one that most people are thinking of when they consider the indexing of images. It is certainly one of the most problematic and least objective categories, as well as being, frequently, an important one.

Images convey information, or meaning, in ways that are inherently different from the ways in which text conveys information or meaning. While text conveys meaning through the use of conventional and arbitrary symbols, images convey meaning by resembling objects, by representing objects as they appear. The fact that authors use both text and images in conjunction with each other to convey their ideas is a kind of proof that images can do some things that text cannot, and suggests that not only do images convey information in different ways from text, but they may possibly convey different information. Theoretical exploration of the differences between text and images, and the ways in which images convey meaning and information, may be found in the literature of art history (Panofsky, 1962), of education (Duchastel & Waller, 1979), and in literature that combines art with philosophy and psychology (Arnheim, 1966; Gibson, 1966; Goodman, 1972). That text and image convey meaning in different ways does not mean that the subject attributes of text are completely different from the subject attributes of images, but rather that the subject attributes of images have certain aspects that, if not unique, are at least particularly important for images. There are three aspects to the subject attributes of an image that are especially useful to consider. These aspects are discussed in greater detail in an earlier article by this author (Shatford, 1986), but let us summarize them here.

The first aspect of the subject attributes or images is that an image may be both Of and About; Garnier (1984, p. 19) has expressed this as the difference between the signifier and what is signified. For example, an allegorical image might be Of a man and a lion, but be about pride (Garnier, pp. 76–77); or an image of a person crying might be about sorrow. What an image is Of is perhaps more likely to be concrete and objective, while what an image is About may be more likely to be abstract and subjective.

Second, an image is simultaneously generic and specific; that is, whatever is depicted in an image may be useful for either its specific or its generic identity. For example, a picture of the Brooklyn Bridge might, to one searcher, be useful because it depicts that specific bridge, or, to another searcher, because it depicts, generically, a bridge. Of course, several generic terms may apply to a single specific person, object, or event: the Brooklyn Bridge is a bridge; it is also a suspension bridge. Ideally, access should be provided at all possible generic identities as well as to the specific identity of a person, object, or event; an issue to be considered when implementing the indexing of images is whether to index each individual image with all possible generic terms, or to create links among various levels of generic and specific terms at a system, rather than at an individual image, level. Markey (1983) explored the idea of linking generic and specific terms in a kind of index, separate from the images themselves.

Third, the subjects of an image may be classified into four facets: Time, Space, Activities and Events, and Objects, used very broadly, to include both animate and inanimate objects. An image may be Specifically Of, Generically Of, or About any of these facets. Taking the facet of Objects as an example, and applying it to Sir Joshua Reynolds’ portrait of Mrs. Siddons as the Tragic Muse, one might say that this image is Specifically Of Mrs. Siddons, Generically Of a woman, and About the Tragic Muse. Classifying subjects of images into the facets given above, and suggesting that an image may be Of or About each facet, does not mean that every image will be Of and About each facet, but simply that these are possibilities.

Since subject attributes are the most problematic and “subjective” of the attributes, it is interesting to consider the results of studies of interindexer consistency and images. Markey (1984), using three indexers for each image, found low levels of interindexer consistency: from 1 percent to 27 percent, depending on the subject aspect being indexed and on whether concept of terminology matches were counted. Pettersson (1988), who asked 97 participants to assign index terms to five still images,
found that although a total of, on the average, 43 different terms were assigned to each image, the most common word had a frequency of 30 percent and the three most common words accounted for slightly more than 50 percent of the designations. Turner (1994), working with moving images, had 181 participants from a variety of backgrounds assign index terms to 44 film stock shots. He found that, although a wide variety of terms was assigned, the most popular term for any given shot was assigned, on an average, by almost 60 percent of the participants. One might speculate that these results suggest that there will be interindexer consistency on certain aspects, perhaps the principal and more objective aspects, of the subject of an image, but that there will be less consistency on secondary and "subjective" aspects.

Exemplified Attributes of an Image

Images may be of a particular kind, that is, they may exemplify, or be an example of, something. Dooley and Zinkham (1990), speaking of special materials, call these attributes "object characteristics," and distinguish them from the subject of the material. For example, an image may be an etching or a photograph or a poster, which is quite different from an image that represents, or is of, etchings or photographs or posters.

Relationship Attributes of an Image

Images can be related to, or associated with, other images, or textual works, or even objects. Indicating the existence and nature of these relationships can be an important part of the indexing process. Some examples of related images include: A preliminary drawing and a finished painting; architectural plans; and an image of the finished building. Textual works may be related to an image in several different ways. For example, an image can appear as an illustration in a text; or it can illustrate a textual work in the sense of depicting something that is described there, as Millais' painting Ophelia illustrates the Queen's speech describing Ophelia's death in Shakespeare's Hamlet (Act IV, Scene vii). Textual works may also describe an image, as do, for example, critical reviews of a work of art. An example of objects related to an image is the seabed samples taken on a scientific expedition, which are related to the photographs that document where the sampling occurred (Sharma & Kodagali, 1990). When indexing these relationship attributes it may be important not only to identify the related image or work or object but to indicate the nature of the relationship.

Now that we have considered the attributes that an image may have, the attributes that can be used to provide access to images, let us look at the issues involved in providing access to useful groupings of images.

Access to Useful Groupings of Images

Why is it important to provide access to useful groupings of images rather than simply to individual images? There are three reasons: first, in some disciplines, such as art history, the juxtaposing and comparing of images that share one or more characteristics are essential to the research process (Brilliant, 1988); second, a searcher may not be able to verbalize all of the criteria for a desired image, and will therefore need to be able to look at a group of images that meet those criteria that can be verbalized in order to identify the precise image needed (Pacey, 1982); and third, a searcher may have highly specific criteria that can be more efficiently identified by a visual scan of a group of images than by extraordinarily detailed textual descriptions or indexing (Besser, 1990).

The issues involved in placing images in useful groupings can be regarded as a series of questions: When in the indexing process does the grouping of images occur? What are groupings based on? What level of detail is needed as the basis for groupings? Is it possible to predict which groupings will be useful? Let us look at each of these questions in turn.

When in the indexing process does the grouping of images occur? Although groupings of images can be created at the time of retrieval, there is also the possibility of creating groupings at the time of indexing. When indexing images, one can choose to index groups of images collectively or single images individually or some combination of the two. Ohrbach (1990) discusses and gives examples of these options as applied to the cataloging of photograph collections. Grouping of images at the time of indexing may be based on their provenance, as with archival materials, or on other attributes of the images, "such as a common creator or subject matter" (Ohrbach, 1990, p. 170).

At least two factors, besides time and cost, are to be considered when making the decision as to whether to create a fixed grouping of images at the time of indexing or to rely on retrieval to create varying groupings of images. These factors are: The degree of homogeneity of a group of images, since the more homogeneous they are, the less one is sacrificing by indexing them as a fixed group; and the possible benefit of providing access to a group of images as a whole, rather than as disjointed parts, so that a researcher gains access to a range of related items in their original context.

What are groupings based on? The obvious answer to this question is that groupings should be based on the attributes of images. And this answer is essentially correct, but it needs to be amplified.

Sometimes, groupings of images need to be based on the attributes of what is represented in the images rather than on the attributes of the images themselves. This means that it may be more important to index the attributes of what is represented in an image than to index the attributes of the image itself. To take an obvious ex-
example, indexing the name of the photographer who took a picture of an artwork is likely to be much less important than indexing the name of the artist responsible for the artwork represented in the photograph. Of course, in the case of a photograph by Stieglitz of a sculpture by Rodin, indexing both photographer and artist might be important. Similarly, in a collection of architectural photographs, indexing the materials of which the depicted buildings were made may be more important than indexing the materials of which the photographs are made. The concept of the Represented Work as distinct from the work in which it is represented has been discussed elsewhere by Shatford (1984). The important thing to remember is that one has a choice: One can choose to index the attributes of an image itself, or to index the attributes of what is depicted or represented in that image, or to index the attributes of both the image and what is represented in it.

Groupings of images may then be based on the attributes of images, or on the attributes of what is represented in images. However, when we say this, do we really mean that the groupings are based on the attributes of images, or do we mean that the groupings are based on what might be called the “values” of the attributes? If we take “attribute” to be, for example, “author” or “subject,” then those attributes can be said to have particular “values,” for example, “Degas” or “cat.” In other words, do we intend to group images together because they all have the same author, or because they are all indexed with a particular person’s name? Although this might, at first glance, seem to be a distinction without a difference, it is not. “Degas” can be a “value” for both of the “attributes” listed above: “Degas” is the “author” of his paintings, but the “subject” of photographs taken of him. The issue that is raised, then, is this: When we group images together, do we want to create groups of images that have the same value for the same attribute, or do we want to create groups of images that have the same value but possibly for a variety of attributes? In the “Degas” example, do we want to create two groupings of images, one consisting of those images for which Degas is the author, and another consisting of those images for which he is the subject? Or do we want to create one grouping of images that combines images by Degas with images of him?

Perhaps the best solution is to provide access to images based on the values of the attributes, but to identify, and distinguish among, the various categories of attributes. For example, provide access to all images for which “Degas” is an index term, but in the resulting grouping create one subgrouping for those images that Degas created and another for those images in which he is depicted. It may be sufficient to base these subgroupings on categories of attributes rather than on specific attributes; that is, it may not be necessary to distinguish Degas as painter from Degas as limner, although it is necessary to distinguish Degas as creator from Degas as subject. Similarly, Dooley and Zinkham (1990) suggest that, while it may not be necessary to particularize attributes within the category of Exemplified attributes, it is necessary to distinguish between Exemplified attributes and Subject attributes. Zinkham and Parker (1986, pp. xvi–xvii) give the example of stereographs: it is important to distinguish between images that are stereographs and images that depict, for example, a family viewing stereographs.

Why is it important to provide access to the inclusive group, where a particular value may apply to any attribute, but yet to distinguish among the categories of attributes within the group? The principal reason is that a searcher may not be able to articulate the distinctions among categories of attributes when making a search, although the searcher may indeed be interested in only one category of attributes; such a searcher may need to be presented with the possibilities in order to make a choice. For example, Herz (1987) presents a searcher looking for images based on their Exemplified attributes—in her case, examples of scientific illustration—who was frustrated at being presented with works about scientific illustration, but who did not perceive that the cause of her problem was the failure of library catalogs to provide consistent access to, and clearly distinguish, Exemplified attributes as opposed to Subject attributes.

What level of detail is needed as the basis for groupings? Earlier in this article, three reasons were given for providing access to groups of images rather than to individual images. Two of those reasons involved searchers interested in retrieving a single image, but who might best served by scanning or browsing through a group of images in order to make their selection. In one situation, some of the criteria for selecting the image might be difficult to particularize, or be highly subjective, as for example, someone searching for a “pretty” or “sinister” picture of something; in another, the criteria might be so highly specific that it would be more efficient to scan a selection of images than to index at the necessary level of detail. These reasons for retrieving groups of images in turn suggest that the emphasis when indexing images should be on recall, rather than on precision. Rather than devoting time to extraordinarily detailed or complicated indexing, or to elaborate parsing schemes that refine verbal searches, it might be better to concentrate on indexing the basic elements of an image and rely on scanning, or browsing, to make the fine distinctions. For example, if someone were searching for images of cats sitting on chairs, it might be sufficient to retrieve all images that contain both cats and chairs, and rely on browsing for the ultimate selection, rather than to try to devise and apply an indexing scheme that differentiated among sitting, running, standing, and sleeping cats, and further specified whether they were on, under, next to, or remote from, chairs.

Of course, what might seem to be “extraordinary detail” in one collection of images may be an unacceptable
level of generality in another. However, Préaud and Rio (1978) offer useful general guidelines for choosing the level of detail in indexing images: first, do not index a part that is implicit in a whole, that is, do not index "fingers" if "hand" is indexed; and second, do not index anything that is not clearly delineated, unless its mere presence in an image is unusual and worthy of note.

Is it possible to predict which groupings will be useful? We have discussed groupings of images in terms of the stage of indexing at which they are created, their basis in the attributes of images, and the level of detail on which they should be based. Is there any way to predict which groupings will be useful? In other words, is there any way to choose among the attributes that an image may have, and to index only those that will provide useful groupings? Is there any way to determine that searchers will want groupings of images based on certain attributes and not on others? Although an imaginative person can think of conditions under which any and all of the attributes described earlier in this article would be usefully indexed, practical considerations can force selectivity on the indexer. What is available to give guidance in making a selection among possible attributes to index, to use as guidelines for creating useful groupings of images?

It is clear that different searchers will be interested in different attributes. A good illustration of this is given by Diamond (1969). In the process of developing a list of index terms for a college slide collection, faculty members from three different disciplines (history, literature, art history) were asked to assign terms to a selection of slides. Diamond discovered that each discipline came up with different kinds of terms, really, different attributes of images, by which the faculty members wanted to be able to retrieve the slides.

It is also clear that which attributes are important depends to some extent on the kinds of materials being indexed. Various authors have described and justified, either anecdotally or theoretically, which attributes should be indexed for specific kinds of materials: for example, Ohrbach (1988) makes a good case for the importance of the photographer, whether individual or corporate, in photograph collections; Roberts (1988) and Pacey (1982) describe access needed to art collections and in art libraries; Turner (1990) gives convincing reasons for indexing Office but not Aboutness in a film stock shot collection; Yee (1990) discusses the importance of subject, genre, and form access to films.

The authors cited in the preceding paragraph base their choices of which attributes to index on the nature of the images being indexed and on the perceived potential use of those images. All of these authors have been involved in providing access to image collections, and justify their choices with a combination of theory, logic, and anecdotal evidence. Studies that would justify the choices with quantitative evidence remain to be done, but it should be kept in mind that a good qualitative assessment may be more valuable and essentially accurate than a bad quantitative study.

Nonetheless, it would be helpful if there were studies of image materials that provided quantitative evidence on the relative usefulness of the various attributes of images in providing access to those images. Unfortunately, use or user studies of image materials are not numerous, and of those studies that exist, very few contain information as to which attributes of image materials it would be useful to have indexed. A possible exception is a study by Bradfield (1976), which includes a list of sample queries made by users of slide collections; however, the queries were not collected systematically, nor analyzed in terms of the attributes of images. Devising ways to analyze searcher's queries in terms of the attributes of images that should be indexed in order to satisfy these queries would be a useful direction for research.

Conclusion

In this article, we have discussed providing access to images based on their attributes, and what these attributes are; we have also discussed the importance of providing access to groupings of images, and the issues, or questions, raised in considering how these groupings should be created.

When devising indexing schemes or indexing images, it is necessary to decide which attributes need to be indexed, which can be simply noted in conjunction with images, and which may be left for the searcher for the images to perceive. That is, it is necessary to determine which attributes are needed to provide useful groupings of images; which attributes provide information that is useful once the images are found; and which attributes may, or even should, be left to the searcher or researcher to identify. It is also necessary to make decisions about whether to index images collectively or individually, to what degree and in what way the different attributes of images need to be differentiated, and what level of indexing is desirable. Research is needed into the ways that images are sought and the reasons that they are useful in order to improve our ability to select attributes on which to base indexing and to construct useful groupings of images.

It is hoped that, although this article does not give a prescription for indexing images, that it does at least provide the means for diagnosing some of the difficulties in providing access to images.

References


