Flamenco Image Browser:
Using Metadata to Improve Image Search During Architectural Design

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ABSTRACT
Current user interfaces for image search are not successful at supporting architects' information access needs because they 1) do not recognize the context of architectural design, and 2) require complex textual queries that often result in either too many or too few images. This paper describes a new approach: using metadata about the images to aid search by generating dynamic query previews. Previews will help users visualize the contents of the collection, aid in making queries both more general and more specific, and help them to follow an information scent through a collection by giving them hints about where to go next. This paper describes a prototype system and plans for evaluation.

Keywords
Search process, interaction styles, user-centered design.

PROBLEM DESCRIPTION
Architects commonly begin work on a new design project by looking at images of related projects. Image search is an important part of the design process, and searching is tightly interwoven with other activities, most notably sketching. Providing architects access to large on-line image collections has the potential to help them find images relevant to their tasks. However, the advantages of access to networked image collections have largely by-passed architectural design because of two limitations to the user interfaces: 1) ignoring the context of architectural design, and 2) requiring complex textual queries that return too few or too many results.

Although on-line image collections for architecture are available, some containing 40,000 or more images, most architects avoid using them and find it easier to work with physical documents [2].

Understanding Architects' Image Search Tasks
To better understand why current interfaces are so unsuccessful, we visited architects' workplaces to learn about their current image use practices and access needs [2]. Architects work in studios at large drafting tables with layers of paper and drawing tools scattered around. Helpful images are often tacked up in the work area for inspiration or easy reference. Architecture is a visual domain, and because of their training, architects share a common visual vocabulary, even though it may be difficult for them to describe what they see in an image using words.

This context suggests that an environment other than a desktop computer using textual input could be a better fit with designers' image search practices. Our previous work indicates that pen-based interaction on devices such as a digital desk or tablet may be more appropriate for architects' image manipulation needs. However, in order for these devices to become more effective, improved pen performance and alternatives to drag-and-drop interaction are necessary [1].

Another limitation of current image search interfaces is the awkward interaction model requiring specific queries that yield too few or too many results. This limitation is common to search interfaces in all domains. Our interest in creating an interface responsive to architects' search needs is one example of our larger research goal of creating a framework for producing specialized search interfaces for a variety of disciplines (the Flamenco Projects) [3]. We anticipate that the interaction techniques we propose as helpful for image search will have applications in other domains as well. Although one domain-specific difference with implications for user interaction is that text information retrieval uses the title to stand in for the document, and to determine relevance it may be necessary to read the document, while with images its possible to determine relevance at a glance.

FLAMENCO: USING METADATA TO AID SERACH

As an alternative interface for searching image collections we propose the Flamenco (FLexible Access to MEtadata in NOvel Combinations) Image Browser, an interface that dynamically generates query previews to give the user hints about where to go next [4]. We describe here an early prototype for the Flamenco interface. We have access to an architectural image collection consisting of 36,000 images, each with at least 9 fields of associated metadata. Metadata, or data about data, describes the contents of the images and includes descriptors such as location, architect, style, and kind of building. Part of this metadata is a 4,000 term thesaurus describing hierarchical relationships between descriptors of the built environment.

Query Specification: Hints About Future Actions

The Flamenco interface differs from conventional interfaces in two ways: query specification and display of results. The user makes queries by finding 1-3 image(s) of interest, moving them to the query area, and then searching for "more like this." The initial images of interest will be obtained either from the user's personal image collection or by browsing through a hierarchical list of categories, although typing in a textual query is also allowed. We believe that avoiding textual queries will better support architects' search practices because 1) the interactions will be more compatible with the pen-based systems we believe will be part of architects' workplaces, (the pick and drop interaction technique of moving images to the query region is designed to be effective for pen interfaces on large display surfaces [5]); and 2) relying on the system to use the metadata to make suggestions of alternative terms and ways of both broadening and refining searches will allow the architects to work in a manner similar to their non-computerized work practices. The interface gives hints at every stage of the search process by showing a list of alternative kinds of metadata associated with the results, along with numbers indicating how many images are associated with each kind of metadata.

Dynamic Display of Results

The Flamenco Image Browser sorts the results of a query into four different regions, with each region showing a different group of images matching a different kind of metadata shared with the query. For example, one region could show images of other buildings by the same architect (more by Frank Gehry), while other regions could show images from the same location (more from Bilbao, Spain), or of the same kind of building (more museums), or made of the same material (metal exterior).

Users browse through the results by selecting a different *kind* of metadata shown in a particular region (for example by replacing the region showing images by the same architect with a region showing images with curved floor plans), or by changing the *value* of metadata shown For example, if the region of images with the metadata <*kind*: material> and <*value*: metal> includes 700 images many of which are gold-domed churches, the user could see that changing the *value* of the material from metal to titanium will return only 25 images. Thus users can refine their search using the hierarchical terms describing the images, a technique which could also be used to expand the query if too few hits are returned.

The current prototype layout has two key features 1) results images are grouped by which metadata type they share with the query images, and 2) many images can be seen at once, which is desirable because finding unexpected relationships between images is one way architects determine relevance. We believe that using metadata to help with query specification and sorting results will be useful for architects' image search needs; however the example described here is only one possibility for how the concept could be implemented.

FUTURE WORK

We plan to implement the prototype and conduct empirical user studies of architects' searches using a pair-wise regression test model to evaluate the effectiveness of this interface against a simpler interface.

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