Hemalata Iyer  
School of Information Science and Policy, University at Albany, State  
University of New York, USA

Jeanne M. Keefe  
Visual Resources Librarian, Architecture Library, Rensselaer  
Polytechnic Institute Troy, NY, USA

The WordNet as an Auxiliary Resource to Search  
Visual Image Database in Architecture

1. Introduction
In this age of world wide communication, and the resulting thrust towards  
universality, the domain specific specialized vocabularies used in the visual  
resources and bibliographic databases pose limitations of access. Although they  
provide adequate access to the experts in the field, a layperson with little or no  
knowledge in the field (lay user) is constrained by the terminology. The meaning of  
the index terms used in the databases or the choice of search terms is not easy for  
such a user. It presupposes the ability of the users to demarcate and discriminate a  
concept/entity from other entities, and a lay user is often unclear about the  
connotations of the terms, and the subtle differences in their usage within the  
domain.

The challenge to any indexer of visual resources is the subjective nature of  
the interpretation of the image itself. Images very seldom contain any textual  
information besides title, creator or date. However, images also need to be accessed  
for content and context as well, and context and content description are very often  
left to “the eye of the beholder.” Utilizing standardized terminology can help  
classify and define an image more accurately, thereby improving accessibility.  
However, the special needs of a lay user still remain to be addressed. The use of as  
an auxiliary resource may help alleviate this problem to some extent. This paper  
presents the findings of an exploratory study to assess the value of WordNet as a  
pre-search tool to aid in the understanding and the identification of concepts,  
including the terminology needed to search visual resources databases in the field of  
architecture. It also reveals the nature of the problems encountered by lay users and  
how specific aspects of WordNet were helpful.

WordNet ¹ is an electronic lexical database based on psycho-linguistic  
thories of human lexical memory, developed and maintained at Princeton  
University since 1985. Sets of synonymous terms (or synsets) constitute its basic  
organization. English nouns, verbs, adjectives are organized into synsets, each  
representing one underlying lexical concept. Several types of relationships between  
the synsets are recorded in Wordnet.

The users’ study was conducted using the visual image database developed  
at the Architecture Library, Rensselaer Polytechnic Institute in Troy, NY. The  
database was developed using the Visual Resources Association’s Core Metadata  
and the Getty’s Art & Architecture Thesaurus for the descriptive terminology
2. Overview of the method

The study was intended in an exploratory way to address the following questions:

- Does the use of WordNet facilitate searching image databases; aid in determining the “aboutness” of images; and assist in their description.
- Are there particular features of WordNet that are especially useful in this process?

This exploratory investigation utilized a multi-phased approach: (a) The observation and video taping of users while they performed designated tasks during their search for images in the RensSearch database. During these searches they used WordNet to help perform these designated tasks. Their computer sessions and vocal reactions were recorded using Camtasia video capturing software for subsequent review. (b) After each one of the online sessions, participants were given a written survey to complete which asked questions specific to their reactions to that particular exercise. In all, there were three sessions. (c) At the end in an interview, the users were asked to describe their reactions to the entire experience. Twenty undergraduate, graduate students, office staff and persons independent of Rensselaer participated in the study.

Session One: Finding Search Terms. Session one served to acquaint the user with WordNet and was designed to test its usefulness as a search tool. A list of eleven art and architecture-related terms were presented and from that list the user had to choose four to search RensSearch database. As the list of terms was non-index terms, the participants had to find alternative search terms in WordNet in order to locate images in the RensSearch database. For example, one of the listed words was mural and in order to find an image in the database they would need to search WordNet to find an alternative term such as fresco or wall painting to find an image.

Session Two: Aboutness. Session two was designed to test the usefulness of WordNet at a conceptual level. Participants were presented with six pages of images from which they had to choose three. Each of these pages contained five or more images of buildings or works of art that were similar in their shape, function or technique. They were asked to look at each set of images carefully and to choose a word that would effectively caption the “aboutness”, similarity or commonality of the subject images. Sometimes that commonality was functional, sometimes it was structural, and in other examples it was material. For example, one page contained a group of images that included a synagogue, temple, mosque, shrine and a church. The optimal term for describing these photos would be religious buildings or places of worship. The participants captioned the groups of images they chose and then searched RensSearch to see if they could find an image with a matching index term. If they didn’t find an image they then went back to WordNet and searched it to see if they could redefine, expand or narrow their original caption to find a term that more adequately described what that image set was “about”.

Session Three: Describing Specific Images. Session Three was designed to test the level of exactness or subject specificity of WordNet in helping a user find particular images in an art and architectural database. Participants were presented with fourteen images from which that had to choose four to search. The images included buildings, structures, drawings, paintings and spaces, both exterior and
interior. They were asked to find the specific images that they chose in the database and were told that if they didn’t find the image by using their own generated terms then to use the WordNet to help them find alternative terms.

**Concluding Interview.** The concluding interview was designed to elicit responses pertaining to the participants’ personal experience with the entire online searching process. They were asked to describe the usefulness of specific WordNet features, such as hyponyms, meronyms, synonyms, coordinate terms and the option to display the different senses of the term. Specifically, how these features helped them with terminology, clarification of ideas, narrowing down larger concepts and making-sense of the concepts and terms. If the participant did not find WordNet useful they were asked to describe in what way it didn’t help them.

3. **Key issues and summary of findings**

The following provides a summary of findings and a discussion of the issues that emerged from the study. It provides insight on the varied ways in which users may look for a work of art and the value of WordNet as a presearch tool.

3.1. **Difficulties finding search terms**

Participants were asked during session one if they had any difficulties finding search terms and whether or not WordNet helped find search terms. 90% responded that it did provide alternative terms; 80% thought that it provided additional terms; 75% claimed that it helped them in making sense of the term and 70% said that it helped to refine the search term.

The analysis of session two revealed the mental strategies that users employed while attempting to identify the “aboutness” and a common caption for a group of images. These are not necessarily mutually exclusive strategies nor were they applied in any particular sequential order. Some of the predominant approaches included:

![Figure 1 - WORDNET as a Source of Search Terms](image)

3.2. **Mental strategies used to determine group image captions**

- Faceted approach: This involved using different aspects of the image such as; form (type of building, functions (usage), geographic location, time period, etc.
- Commonality strategy: Respondents looked for similarity among familiar images to find a caption term.
• Specific to general approach: Respondents formulated generalized concepts by finding specific image attributes.

3.3. Difficulties in determining the group image captions

The nature of difficulties encountered by the respondents and the ways in which WordNet provided assistance is presented below:

• Lack of knowledge: 40% of the respondents had problems due to lack of knowledge of the subject matter.

• Choosing term to describe images: 80% of the respondents had problems with terminology and the following comments reveal how some were aided by WordNet:
  "I didn't know synonyms, WordNet provided them."
  "It gave me options of what to choose."
  "Helped find connecting terms."
  "Gave broader definition of term and related terms."

• Difficulties conceptualizing commonalities: 35% had difficulty finding a common theme amongst the images.

3.4 Describing Individual Images

The findings of session three revealed that 30% of the participants had problems conceptualizing the image. 55% had terminology problems such as, determining the appropriate keywords to use, finding specific terms, and narrowing down the terms, etc.

The WordNet assisted 70% participants in making sense of the terms or images, especially for those that lacked sufficient subject knowledge. With regards to choice of terminology, 80% found WordNet useful in providing synonymous, coordinate and hyponymous terms. As expressed by one respondent "visit the synonym city".

![Figure 2 - Problem Comparison With Regard To Aboutness vs. Description](image)

Figure 2 presents a comparison of the two major problems, conceptual and terminology that participants encountered while performing the tasks in session two and three. Problems with terminology remained the more significant issue.

3.5. The Final Interview

The final interview was structured as a checklist of questions asking for the participants' views on the usefulness of specific WordNet features. Analysis of the responses indicated that it helped in several ways including; setting the term within a larger context (80%), clarifying ideas (65%), narrowing down concepts (80%),
identifying alternative terminology (80%) and making sense of terms and concepts (75%).

An interesting aspect of the findings indicates that participants felt that the most useful WordNet features were hyponyms, synonyms and coordinate terms. One of the negative aspects frequently cited was the confusing countless options it provided.

3.6. Observation of Search Moves Captured by Camtasia Software
The users’ search moves and vocal comments were captured by Camtasia video software and were examined for patterns of search behavior. When participants were asked to determine the ‘aboutness’ of images they frequently used co-ordinate terms and synonyms. In contrast, for describing specific image content, they used the hyponyms and synonyms most frequently.

4. Conclusions
Evidence from analyzing the Camtasia videos and the results of this research indicate that it would be helpful to design a user interface capable of steering the users to a particular feature of WordNet based on the nature of the search. From these findings the conclusion may be drawn that WordNet is useful as a presearch tool in aiding the lay user in art and architectural searches of visual resource databases. Clearly, this topic merits further research.

References
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