# Needs for Research

Computer literacy is an important issue. Traditional methods for gaining literacy n computers are taking courses and reading books. This is good for acquiring general computer literacy. There are also many specific computer knowledge. Users can visit the official site of the software vendor or consult the official manual or read the built-in help. But the amount of information is limited. That’s why there’s a market for computer books. Reading the books is hard. It is restricted to the book on the user’s bookshelf. Books can be expensive.

Fortunately, there are tons of such knowhow knowledge on the web.

That’s why people look at the Internet. People no longer need go to bookstores. People gain knowledge from the Web. Some knowledge is general and can be applied over and over. The easy to learn and remember. Some is transient and disposable, only done it once. The goal is to follow the steps accurately.

However, search engine has the largest coverage. It’s not suitable for computer knowledge. There is no specialized system for accessing and searching this knowledge base. People are aware of this problem. So they built specialized search engines built for special domains, such as news to show times and images, products to show prices and images, restaurants to show locations and ratings. These were mined from unstructured heterogeneous data.

There are specific needs for each stage of the knowledge life cycle.

**Need to aggregate computer knowhow references from the Web.** The problem is that the search engine can be too general. To be able to restrict the search to only know-how articles, users may need to add qualifying search terms such as manual, guide, tutorial, walkthrough and how-to. But irrelevant results are unavoidable; such as ads about software, product reviews, software catalogs.

**Need for an indexing method more appropriate based on both text and images.** The problem is that know-how articles only indexed by images. It’s been known using images increases a lot learn ability of the articles [cite]. However, visual algorithms are built for specific domains. It is unclear whether that can be applied directly to our problem. Also, vision algorithm has not been designed to consider visual features of software program.

**Need for an easier input method for specifying query terms.** Current input method for specifying queries is difficult. It is hard to come up with the right keywords. To identify the context, there are too many things need to be specified. Users need to indicate the operating system, the name of the application, the name of the window, and the topic, what the users want to know. The result is a long list of keywords, which can be ambiguous. The context and topic are indistinguishable from the search terms. From usability point of view, it is time consuming to type all the keywords.

**Need for a ranking scheme.** Current ranking schemes either based on text content or on image contents. However, simply ranking articles by images may result in articles at the top containing no useful text. Simply ranking articles by text may result in informative articles but on the wrong computer application.

**Need for a scheme to display excerpts to help users judge relevancy quicker.** Current presentation scheme tends to show except from the page by extracting excerpts and highlight the occurrences of the search term. This allows users to know how the search terms are in use. However, it is still difficult to quickly judge whether an article is relevant. The result may contain all the keywords, but without actually following the link to visit and read the page, the user may not really know whether the page is really relevant to the particular application window.

**Need for a more effective, convenient, interactive way to follow knowhow articles.** After the users found an article relevant to the task at hand, it is still challenging to actually follow the article. The users may already be at a step. It is hard to know where in the article the users can read about his current step. It is difficult to search within the reference for the part relevant to the current step. The users need to switch back and forth between the application and the reference. This is very inconvenient. It is even worse if the reference material is a screencast. The video player needs to be paused and played periodically. Seeking within the video is not possible.

**Need for a cheaper and accessible way to create contextually technical references.** Contextual help is useful. But its creation requires access to the API, which can be expensive. Thus, many references are created. But they are created independent of the applications, external the application. It is hard to link the page to the application.

# Goals and Objectives

The overarching goal of the proposed project is to address the needs identified in all stages of the knowledge life cycle as described above.

Develop an algorithm for detecting articles containing computer knowhow.

# Proposed Methods

We propose a multi-modal approach. We use images and text.

## Creation

Allow content providers to attach arbitrary information to programs by images.

Establishing visual links.

Submit an url to the system. And it downloads all the image and index the page.

## Aggregation

There are many existing knowhow knowledge on the Web. We want to aggregate them into a searchable index. The brute-force method would be to systematically crawl major tutorial websites. For this research, we can use a short cut method. Bootstrap method. Use image search engine, take words from a corpus such as a book. Mix in words related to software name. Keep those with screenshots. Train a visual detector for screenshot images. What properties define tutorial knowledge articles?

It is necessary to filter useless pages that are not related to computer knowledge. There are text based methods. Also an image based method. Train a classifier for detecting pages that are computer knowledge.

## Indexing

We propose to index knowledge by text and images. Specialized, multi-modal indexing scheme. Compared to keyword only and text only. Develop a scheme that uses images to create context and evaluate against a sizable dataset and show statistical significance more relevant results than start-of-the-art methods, when evaluated by human users. First page result. Above the fold result. Recall and precision. Use inverted index for fast retrieval. Offline processing.

## Ranking

query dependent. rank results by both visual and textual relevance. Identify many features. Learn ranking, using RankSVM. Improve visual search. Provide faceted search function.

## Querying

allow users to capture sceenshot as query. Allow users to type keywords as query. Use Java to provide cross-platform applicability. Allow users to take multiple screenshots as query.

## Previewing

show image excerpt. Show screenshot in context to let user know the context, what words are before and after that.

## Consuming

monitor the entire screen, matching the screen to the images in a tutorial article. Automatically scroll the page to that image. Allow users to search for content by image. Browser function called Find by image.