Development of an Information Support System for Yogic Science using Knowledge Organization Systems†

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Abstract: This paper deals with the design and development of an information support system for yogic science using specially designed knowledge organization systems such as a yoga glossary and yogic thesaurus. A machine-readable Sanskrit-English bilingual glossary, thesaurus for yogic science is developed using Greenstone Digital Library software, and also there is a web portal for the yogic science community, which includes a list of all major yoga institutes, research centers, libraries, glossaries, thesauri, yoga subject term visualization maps, Google groups, forums, online digital repositories, and online public access catalogs related to the discipline of yoga.

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1.0 Introduction: need for the study

Swami Vivekananda Yoga Anusandhana Samsthana (S-VYASA) is an academic and research centre for yoga and allied sciences and has links with a number of institutions in India and abroad. The digital library of S-VYASA consists of an online catalogue of information resources– books, reports, conference proceedings and full texts of research papers, theses and dissertations are accessible on their website at www.svyasa.edu.in. Yoga is an ancient discipline and many of the early works are in Sanskrit, e.g. Patanjali's Yoga Sutras (PYS), Gheranda Samhita, Yoga Vasistha, Hatha Yoga pradipika, Shiva Samhita, etc. Even today researchers in Yogic science publish in San-

skrit on the subject. In recent times, however, there are books, reports and papers on yoga, its application and effects on human health in English and in some other languages of Latin origin. In this context the need for a vocabulary management tools was ascertained. Hence we undertook this research for the design and development of an information support system using knowledge organization systems (KOS) such as glossaries and thesauri.

There are several yoga teaching, practicing and research centres, but very little information is available about their activities and contributions to society. There are several yoga teachers spread all over the country and abroad but details of their expertise and wisdom are not well known. There are several publications on yoga and its application, in the form of books, journals, research papers, conference proceedings, dissertations, monographs, audio and video cassettes and CDs, but there is no comprehensive documentation centre. Hence there is a need to bring together all items published and further regular updating is very essential to maintain continuity in the citation of relevant documents on yoga.

In this paper we discuss the need for designing an online digital library on yoga and related aspects. The aim of this paper is to indicate how a library similar to other digital libraries in the world on yoga can be designed. We show some examples of the institutes which have taken up similar initiates as those planned here. The existing online digital repositories of yogic science that are listed in the web portal created by using Google are shown (https://sites.google.com/site/yogaandalliedsciences/).
As a suitable example for design and development of a yogic science digital library we discuss the networked consortium for sharing of resources in yogic science at the National Information Centre for Yoga and Allied Sciences (NICYAS). As an introduction we discuss some basic concepts relating to yogic science. Yogic science information resources are published in a variety of formats and in order to enable the library-and-information centres to serve the varied needs of their users it is essential that information is shared among the various Yogic science organizations. This will help in cutting down library expenses. No study of this nature has been undertaken so far in the field of yoga in India.

Yoga is one of the six orthodox systems of Indian philosophy. It was collated, co-ordinated and systematised by Patanjali in his classical work, the Yoga Sutras, which consists of 185 terse aphorisms. In Indian thought, everything is permeated by the supreme Universal Spirit (Paramatma or God) of which the individual human spirit (jivatma) is a part. The system of yoga is so-called because it teaches the means by which the jivatma can be united with, or be in communion with the Paramatma, and thereby attain liberation (moksa).

In India, research and academic libraries in the field of yoga are building digital libraries. The yogic science fraternity requires access to digital information resources. Yoga is the very foundation not only of Indian culture but also for other cultures of the world. Yoga is an ancient discipline. It is recognized as an important and valuable heritage of India. The word yoga is derived from the Sanskrit root yuj meaning to bind, join, attach and yoke, to direct and concentrate one's attention on, to use and apply. It also means union or communion. It is the true union of man's will with God.

2.0 Use of multiple knowledge organization systems (KOS) together

An information system is designed to store, retrieve information and provide different services to meet the needs of different classes of users (researchers, students, practitioners, the general public). It needs user-friendly interfaces, good indexing and retrieval facilities. It is well recognized that methods and devices to manage the terminology used in the system are necessary both at the data entry stage and in formulating search expressions to secure adequate relevance and recall. A knowledge organization system such as schemes for subject classification, thesauri, taxonomies, term nets, etc. alone is not adequate. A combination of two or more such devices can provide better facility and satisfaction to users of an information system.

3.0 Prior literature

Some of the previous studies in the field are those of Hudon (2001), Jorna and Davies (2001), and Kwasnik and Rubin (2003), which have dealt with problems of multilingual thesaurus design and development. Earlier studies mostly deal with terms of Latin origin. There are very few studies dealing with terms of non-Latin origin. Neelameghan (2001), Neelameghan and Raghavan (2005), and Raghavan and Neelameghan (2008) describe their work of preparing bilingual and multilingual thesauri, F-thes (Sanskrit, Farsi, English) and G-tamthes (Tamil and English). A comprehensive and well-organized information support system in the field of yoga is very much needed with special emphasis on KOS for management of vocabulary of the field.

A yogic science project proposal for the creation of a National Information Centre for Yoga and Allied Sciences (NICYAS) at Prashanti kuteram was conceived by Neelameghan and Rajashekar in 1999. Yoga is practiced and taught in many centres of the world and many papers are generated. Some of the institutes we list have already initiated networking and exchange of information

with many of these centres in India and abroad. The vision to create NICYAS is intended to avoid duplication of work and regular updating of the information related to yoga and allied science to disseminate information to every corner of the world.

4.0 Methodology

The principal objectives of this study are:

1. To design and develop a bilingual glossary for the yoga domain.
2. To design and develop a bilingual thesaurus for the yoga domain.
3. To create a knowledge map for the yoga domain; and,
4. To hyperlink terms in the thesaurus to corresponding terms in the glossary.

The completion of the thesaurus and preparation for the glossary required for the design of an information system in yogic science was carried out in a step by step manner. The design of the thesaurus involved the following eight steps:

Step 1: Study of the subject by examining the literature available on the subject, moving progressively from reference sources – dictionaries, glossaries, encyclopedias, etc., to the more detailed material, such as, papers in periodicals, proceedings of seminars, conferences, symposia, etc.

Step 2: Creating a corpus of terms.

Step 3: Identifying user needs from yoga library user's profiles.

Step 4: Selection of terms from the corpus in consultation, personal interaction, discussion with subject specialists, research officers, scientists, divisional deans, faculty members of the yoga university, library users in the yoga university residential campus and the users of yoga information systems. Terms were collected and the relationships among them were discussed to construct the thesaurus.

Step 5: We recorded each term in the format chosen as most convenient. The layout of the ultimate product was decided and the thesaurus was constructed accordingly.

Step 6: Thesaurus construction started with WINISIS software, later MultiTes Pro BETA version was used to create a bilingual Sanskrit-English glossary interlinked to the thesaurus.

Step 7: The customized collection format for Greenstone Digital Library Software (GSDL) was prepared by the Sarada Ranganathan Endowment for Library Science, Bangalore (SRELS) and same format was used for creating a glossary and thesaurus using GSDL.

Step 8: We created a hierarchical map of yoga terms using MicroSoft Office Word SmartArt™ graphics to visually communicate information for better visualization of yoga subjects; this was uploaded at https://sites.google.com/site/yogaandalliedsciences/home/yoga-terms-visualization/.

5.0 Sources of concepts and terms

The corpus of terms was gathered from existing dictionaries, glossaries and lexicons. Relevant terms from the OM database and the F-Thes glossary were transferred[1] (Neelameghan and Raghavan 2005). A collection of over 5000 books, peer-reviewed journals such as *International Journal of Yoga* (IJOY), *International Journal of Yoga Therapy*, research reports, theses and dissertations were used for identifying core concepts. Some selected secondary sources were also consulted (see appendix).

6.0 Software used for designing the information system

In this work we used three software programs; namely WINISIS, MultiTes Pro BETA version, and GSDL software.

6.1 WINISIS

The construction of a thesaurus started with WINISIS software, CDS/ISIS 1.5 for windows from UNESCO 2003, because it is easy to install and use. The relevant terms were transferred from the OM database and the F-Thes glossary, which were developed using WINISIS. Excellent hyperlinking was possible within and outside the database, but was not Unicode compatible; later we moved to MultiTes Pro BETA version.

6.2 MultiTes Software

MultiTes Pro BETA version was provided by Paul Matheu, MultiTes, USA. The bilingual Sanskrit –English glossary was created using MultiTes Pro software, because it is Unicode compatible, data can be imported from Notepad, it is easy to create customised fields and to generate alphabetical reports that can be uploaded to the Internet. However, MultiTes Pro is not open source and not freeware. Later we moved to GSDL software.

6.3 Greenstone Digital Library software

In the meantime SRELS was working on GSDL and the same customised collections format was used for creating a glossary and thesaurus. GSDL was developed by the University of Waikato, New Zealand and promoted by UNESCO. Easy to install, customisation also is possible. It imports data from WINISIS. The collections can be exported to CD/DVD, but take more time for building larger collections and updating. GSDL was used for building bilingual thesauri (Kumar and Nikam 2011) as it was Unicode compliant and allowed hyperlinking within the thesaurus as well as to external sources.

7.0 Scope and Limitation of the Study

The present study covers a broad area of yoga and its branches. But only the yoga glossary and thesaurus are used as they are helpful in finding translated words, near equivalent words and transliterated words in both Sanskrit and English languages. The glossary and thesaurus cover the needs of the users of yogic sciences information systems only. The limitation is that the system will be especially useful for students and teachers of yoga as it deepens the knowledge about the yoga.

The study also covers different types of yoga systems beneficial to scholars, researchers, teachers and practitioners of Yoga. The present work will open a new vista in research on the rich and highly variegated tradition of yoga as handed down by the nātha-siddhas and munis to the advantage of their posterity. This will also go a long way toward reestablishing the fact that the knowledge of the siddhas and munis is authentic and authoritative as it dawns from intuition. They combined 'parikśa' (mental investigation) with discovery by intuition to produce systematic knowledge.

Further information system development is limited to the Indian environment. Whenever exact translated words were not available in English, near equivalent and transliterated terms for the original Sanskrit terms were included in the study. We have not done evaluation with users, because the system is developed based on S-VYASA Yoga University users' needs extracted from library users' profile.

8.0 Outcomes of the study

8.1 Interface features

A bilingual glossary containing 1924 terms for the yoga domain was designed and developed. A Sanskrit-English bilingual glossary was developed using MultiTes Pro v2011.02.20ux BETA version. The display of alphabetical generated glossary terms shown in Figure 1 as well as the glossary are uploaded for wider usage at http://www.svyasadde.com/library/inc/YG/alpha.htm and https://sites.google.com/site/yogaandalliedsciences.

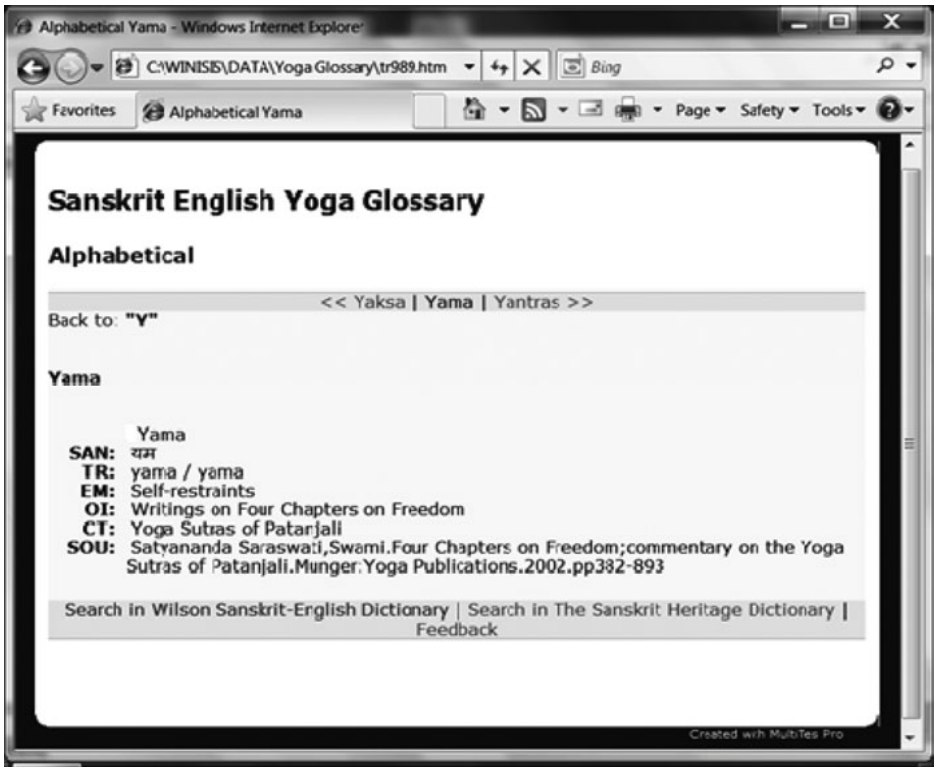

*Figure 1.*Yoga glossary showing the description for the term "Yama"

A yoga bilingual thesaurus called Y-Thes for the yoga domain was developed using WINISIS software and later exported to GSDL. Display of Y-Thes in WINISIS and the Sanskrit-English yoga glossary as linked to the yoga thesaurus are shown in Figure 2.

A Unicode compatible software, GSDL, was used for building the bilingual thesaurus as it allows hyperlinking within the thesaurus as well as to external sources and search options using an onscreen keyboard with Sanskrit language.

8.2. Example of display of search terms

Sanskrit terms can be accessed by pressing the "Sanskrit Term" button in the navigation bar. This displays a list of terms in alphabetical sequence. Clicking on any of the displayed hyperlinked terms, say 'यम'(*yama*) ,will retrieve matching records in the pre-selected databases (Figure 3). English descriptors can be accessed by pressing the "English Descriptor" button in the navigation bar. This displays a list of terms in alphabetical sequence.

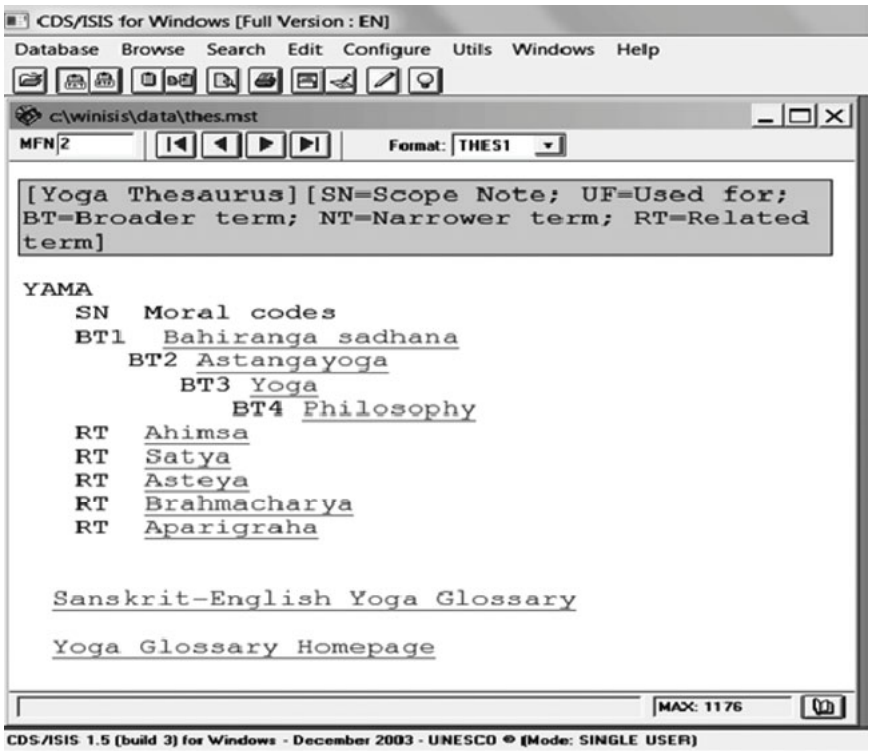

Figure 2. Yoga thesaurus with Sanskrit-English yoga glossary hyperlink

Figure 3. Display of thesaurus in Sanskrit

8.3 Search facility in GSDL

In the Yoga Thesaurus search facility, users can type a Sanskrit term using an on-screen keyboard (Figure 4). For keying in search terms in languages other than English a Unicode compliant keyboard is necessary. The terms may be dragged from the list and dropped in the search box if necessary.

8.4 Hierarchical map of yoga terms

We created a hierarchical map of yoga terms using Micro-Soft Office Word SmartArt™ graphics to visually communicate information for better visualization of yoga subjects. The map was uploaded at https://sites.google.com/site/yogaandalliedsciences/home/yoga-terms-visualization/ and this is shown in Figure 5.

8.5 Term translation practices

Equivalent English words are not available for the traditional Sanskrit origin yoga words and equivalent Sanskrit words are not available for the English yoga words. For many Sanskrit terms or concepts exact English equivalent terms are not available; similarly, for the recent works about yoga in English, Sanskrit equivalent terms for some of the specialized English terms are not available. In such cases hypertext linking to transliterated terms and scope notes or descriptive definitions was used (Figure 6).

Figure 4. Search using the on-screen Sanskrit keyboard

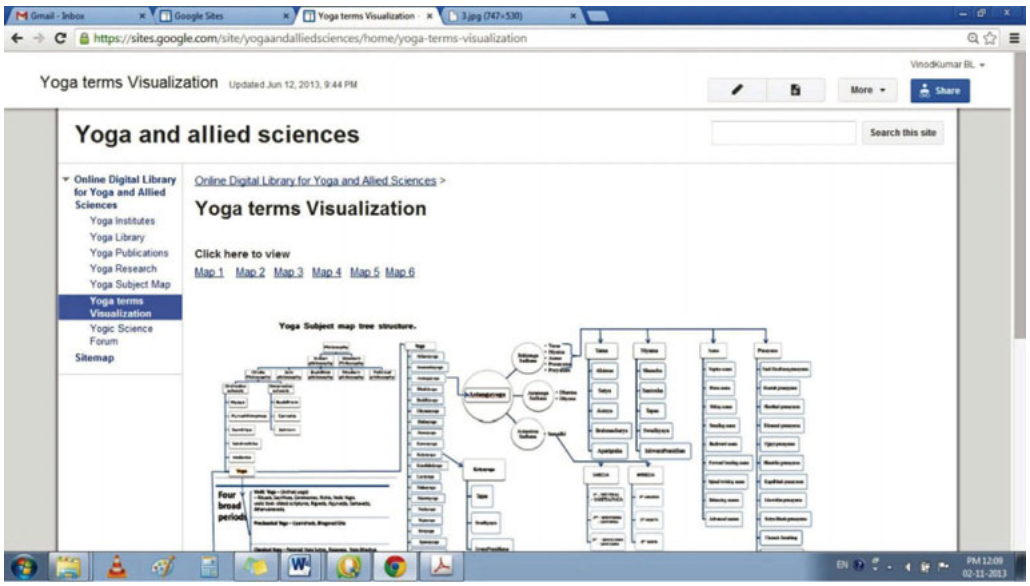

Figure 5. Screen shot of webpage showing the hierarchical map of yoga terms

Issues	Sanskrit term	Equivalent English Term	Solution
Yoga terms in original texts	available	not available	Use near equivalent terms; or Sanskrit transliterated in English
Yoga terms in modern research	Equivalent Sanskrit terms not available	available	Use near equivalent terms; or English transliterated into Devanagari

Figure 6. Equivalent term searches

9.0 Conclusion: proposed advantages and future study

The Sanskrit-English bilingual glossary will help improve understanding of yoga concepts for users. The Sanskrit-English bilingual thesaurus will help for better understanding of the relationship and naviagation among concepts in the yoga. The knowledge map for the yoga domain is created to improve understanding of the concepts and relationships in Yoga. The information support system will facilitate the exchange of knowledge between modern English yogic practitioners and the traditional Sanskrit origin saints/sadhakas.

Goals for future study include creating a classification scheme for yoga and allied sciences. Alternatively, if a definition is available in the target language, one could develop a coding scheme (preferably a classification scheme) for the domain of the thesaurus; in this case the search term might be a code that the system can pick up whatever the language. Coining new terms in the target language will be the task of subject-language specialists when there is no suitable term for a concept in one or more of the languages of the thesaurus. Finally, we hope to undertake discussion with library professors, yoga scholars, yoga practitioners, and subject experts for feedback for further development of the system.

The accessibility of different information resources by a person sitting in a remote and isolated corner of the world through the Internet is going to reduce the burden of establishing duplication of institutional work in different parts of the world and in different countries. This is going to benefit the poor and underdeveloped nations in a big way by reducing the burden of investing huge amounts in designing systems such as the Yogic Science Digital Library. The system permits searching terms in Sanskrit, English and navigation through hypertext linking to equivalent terms, hierarchical terms, and associative terms in a thesaurus. WINISIS provides good hypertext linking facilities among terms in the thesaurus database as well as hyperlinking of terms in the thesaurus to lists, texts and other files outside the thesaurus residing in the same computer as the thesaurus database or in another computer in a remote location. MultiTes Pro software is Unicode compatible and suitable for Indian languages such as Sanskrit/Devanagari. GSDL is a suite of software for building and distributing digital library collections. It assists in organizing information and publishing it on the Internet or on CD-ROM. One of Greenstone's unique strengths is its multilingual nature, Unicode compliance. The visualization maps will help to understand the concepts and their relationships. The hierarchical tree map structure will help aid understanding of the concepts and relationships among them and help lead to the creation of a depth classification scheme and thesaurus. The combination of a yoga thesaurus, a yoga glossary and a subject map is more useful for end users.

Note

1. The multilingual system was named for the Sanskrit mantra "OM" signifying sacred importance.

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Appendix 1.
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