**RAJPUT — Multimedia**

<2 tables, 2 figures, much Hindi text>

**Multimedia and E-Learning-Based Approach to Indian Heritage Texts: The Case of *Śrīmadbhagavadgītā***

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This paper attempts to explore the multimedia (MM) and e-learning-based approach to Indian Heritage Texts (IHT)*.* India has rich intellectual traditions stored in the form of Sanskrit texts. Today digitization of IHT is needed to preserve this rich tradition for a long time and to make it accessible in dynamic MM forms. In this age of digital humanities, the digital form of learning is emerging rapidly in the field of education and has changed remarkably in the past few years. MM and e-learning-based technologies make learning easier and smarter and provide anywhere, anytime learning in a cost-effective manner. This paper presents the MM and e-learning-based approach to the popular IHT *Śrīmadbhagavadgītā* (SBG)text. The R&D for this work has been done and is available athttp://sanskrit.jnu.ac.in/sbg. This system provides an e-book and multidimensional, user-friendly search engine for SBG.

**An Introduction to *Śrīmadbhagavadgītā* (SBG)**

SBG is a part of the Ancient Indian Heritage (AIH) text *Mahābhārata* (MB), where the famous conversation between Lord Kṛșṇa and Pāndavas Prince Arjuna in *Bhīșma* *parva* (sixth chapter of MB), chapters 25 to 42 is known as SBG. SBG literally means ‘Song of the Absolute’. Very deep thoughts and broad ideas of *upanișada* and Vedas are collected here in a precise manner. The SBG is a simple text full of wisdom and has been very popular in our times as well. The online learning-based system for this text can be very useful to this community of learners.

**Survey of Existing Systems**

There are some links where IHT and SBG are available in digitized format. Here most of the texts are available in scanned format or in PDF, and some of them are searchable.

• *Indology*: http://indology.info/etexts/archive/etext/

• *Sanskrit web-net*: http://www.sanskritweb.net/

• *Clay Sanskrit Library*: http://www.claysanskritlibrary.org/

• *International Gita Society*: http://www.gita-society.com/pdf/sanskrit-verses.pdf

• *Sanskrit Documents*: http://sanskritdocuments.org/doc\_giitaa/doc\_giitaa.html

• *The Sanskrit Library*: http://www.sanskritlibrary.org/tomcat/sl/

• *Rastriya Sanskrit Sansthan, New Delhi*: http://www.sanskrit.nic.in/ebooks.htm

The following systems have been developed as multidimensional search engines of IHT:

• *Online Indexing of Mahabharata*: http://sanskrit.jnu.ac.in/mb/index.jsp

• *Online Multilingual Amarakosha*: http://sanskrit.jnu.ac.in/amara/index.jsp

# • *Ayurveda Search*: http://sanskrit.jnu.ac.in/ayurveda/index.jsp

**Development of MM and E-Learning-Based System for SBG**

The detailed procedure for the development of MM and an e-learning-based system for SBG is given as follows:

• Selecting the most authentic text of SBG among the available editions and digitization of text.

• Preparing illustrated content and database for SBG*.*

• Developing a database for SBG.

• Developing a Java server engine for search.

• Developing a web interface for input and display.

*Digitization of Text*

In order to digitize SBG, the data file named geeta\_lexicon.txt was created as given below:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **BhagavadgitaShloka** | **BhagavadgitaIndex** | **MahabharataIndex** | **HindiTranslation** | **Sandhi-splitShloka** | **Anvayakrama** |

The above geeta\_lexicon data file contains SBG *śloka* (or Shloka—Sanskrit poetry or verse) in original form. When a user searches a specific keyword or alphabet on the system, it replies in original form and displays in Unicode Devanagari. Index is the unique identification (id) number of each *śloka* in respective *adhyāyas* of SBG and also has an MB reference. If a user searches keyword, then the following output would come out: the *śloka* with its detailed reference, Hindi translation of *śloka*, sandhi-split (an agreement or alliance of words or [containing](http://www.spokensanskrit.de/index.php?tinput=containing&direction=ES&script=HK&link=yes&beginning=0) [a](http://www.spokensanskrit.de/index.php?tinput=a&direction=ES&script=HK&link=yes&beginning=0) [conjunction](http://www.spokensanskrit.de/index.php?tinput=conjunction&direction=ES&script=HK&link=yes&beginning=0) [from](http://www.spokensanskrit.de/index.php?tinput=from&direction=ES&script=HK&link=yes&beginning=0) [one](http://www.spokensanskrit.de/index.php?tinput=one&direction=ES&script=HK&link=yes&beginning=0) [to](http://www.spokensanskrit.de/index.php?tinput=to&direction=ES&script=HK&link=yes&beginning=0) [the](http://www.spokensanskrit.de/index.php?tinput=the&direction=ES&script=HK&link=yes&beginning=0) [other](http://www.spokensanskrit.de/index.php?tinput=other&direction=ES&script=HK&link=yes&beginning=0)) of *śloka* and *anvaya* (the natural order or connection of words in a sentence, syntax, construction) of *śloka*.

Sample data collected for the lexicon in text file in Devanagari Unicode is the following:

धृतराष्ट्र उवाच 1.1p 6023001p धृतराष्ट्र बोले धृतराष्ट्रः उवाच धृतराष्ट्रः उवाच धृतराष्ट्रः/NS उवाच/KP

धर्मक्षेत्रे कुरुक्षेत्रे समवेता युयुत्सवः। मामकाः पाण्डवाश्चैव किमकुर्वत सञ्जय॥ 1.1 6023001 हे सञ्जय!धर्मभूमि कुरुक्षेत्रमे एकत्रित,युद्ध् की इच्छावाले मेरे और पान्डु के पुत्रों ने क्या किया? सञ्जय, धर्मक्षेत्रे कुरुक्षेत्रे युयुत्सवः एव समवेताः मामकाः च पाण्डवाः किम् अकुर्वत ? धर्मक्षेत्रे/NV कुरुक्षेत्रे/NS समवेताः/KN युयुत्सवः/NV मामकाः/SN पाण्डवाः/NP च/APY एव/A किम्/SN अकुर्वत/KP सञ्जय/NS ॥/PUNC 1.1/PUNC ॥/PUNC

Another data file that provides a separate search for chapter 1, *Arjuna vișāda yoga*, with images and description named by adhyaya1.txt consists of the following format.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **BhagavadgitaIndex** | **MahabharataIndex** | **BhagavadgitaShloka** | **Image** | **Discription** |

The above data provides for the following search options on ‘bhagavadgita search page’. Its structure is **Adhyaya**🡪 **Shloka** 🡪 **Details**.

When a user sends a query related to *śloka* or Hindi translation of SBG, the system replies with a description or details of the *śloka* and also provides the related media.

Sample data collected for adhyaya1.txt file in text file in Devanagari Unicode are as follows:

1.01 6023001 धर्मक्षेत्रे कुरुक्षेत्रे समवेता युयुत्सवः। मामकाः पाण्डवाश्चैव किमकुर्वत सञ्जय॥ image1.jpg हे सञ्जय!धर्मभूमि कुरुक्षेत्रमे एकत्रित,युद्ध् की इच्छावाले मेरे और पान्डु के पुत्रों ने क्या किया? धर्मक्षेत्रे/NV कुरुक्षेत्रे/NS समवेताः/KN युयुत्सवः/NVमामकाः/SN पाण्डवाः/NP च/APY एव/A किम्/SN अकुर्वत/KP सञ्जय/NS ॥/PUNC 1.1/PUNC ॥/PUNC

The third data file is adhyaya\_list.txt, which contains a list of *adhyāya*. This file is prepared for the *Adhyāya* button for search on **bhagavadgita search page.** Sample data for the file are as follows:

Adhyaya No. Adhyaya Name

1 अर्जुनविषादयोगः

2 साङ्ख्ययोगः

The last text file in Devanagari Unicode made as part of the data file is geeta­\_links.txt, which contains existing online links for SBG. Sample data are the following:

*Online links for bhagavadgita*

http://www.youtube.com/watch?v=20CAZWAL\_DE&noredirect=1

The Part of Speech (POS) information also has been added because Sanskrit is rich in morphology. It has inflectional, derivational morphology, so giving POS tagging information will prove useful. POS tagging or morpho-syntactic tagging is the procedure of assigning to each word in a running text a label that indicates the status of that word within some system of categorizing the words of that language according to their morphological or syntactic properties (Gopal et al., 2012).

*Preparation of Images*

Chapter 1 of SBG has a great scope for animation. The scratching was done for more than 25 characters and for each verse according to its meaning. Images were scanned in jpeg format. Images will prove useful to prepare animation in Flash software.

**Architecture of the System**

Java-based technologies like Apache Tomcat, Java Servlet, and JSP have been used for developing an MM-based e-book system for SBG and web designing. The web application of SBG is developed in the front-end of JSP with Java Servlet, the back-end of RDBMS and JDBC connectivity, and data files. The web server for Java-JSP is Apache Tomcat 4.0, and the RDBMS used is MS-SQL Server 2005, Database in Unicode scheme. The developed system accepts the given input word of SBG text in Devanagari Unicode UTF-8 format. The database at present is a UTF text file with complex arrangements of data. Given the advantages that relational databases have, the TEI standard is what all our projects at JNU will adhere to, but for that we have to adapt it to our requirements. The following model describes the interaction in the multi-tier architecture of the indexing system of SBG:

**MS-SQL Database**

**Respond**

**Apache**

**Tomcat**

**Java**

**Servlet**

**JBDC**

**Request**

**How Can We Use the System**

The multidimensional search-based e-book of SBG is available at http://sanskrit.jnu.ac.in/sbg in three forms. First, search the database directly by providing input in Devanagari UTF-8. Second, search the database by using Devanagari alphabets on the website. Third, click on *adhyāyas* given in the dropdown box on the system. Users can get details with sutras in which they exist by just one click on an indexed word. The full structure of input and output is given in the following chart:



**Conclusion, Limitations, and Future R&D**

This research paper highlights the need for digital humanities to present and preserve IHT texts using current MM and e-learning-based technologies so that the vital knowledge can be expressed in attractive media. The system has dynamic input mechanisms for a multidimensional search engine and allows online accessing.

The current system of SBG has limitations because an MM-based e-book is available only for chapter 1 of SBG. The system also does not connect to other lexical resources that are under construction.

The present system for SBG has tremendous potential to be used as a model system for developing an MM-based e-learning system for IHT texts. An animation system of SBG will prove very useful for young and old alike.

**References**

**Bhowmik, P.** (2009). *Evolving E-Learning Methods for Teaching Sanskrit Grammar Based on CBSE Syllabus for 9th and 10th: A Critical Study.* Ph.D. thesis, SCSS, J.N.U. New Delhi.

**Gopal, M., Jha, G. N. and Giri, A.** (2012). Application of BIS Tagset for Sanskrit: Case of Verbs and Particles. Presented at a CIIL seminar on *POS Annotation for Indian Languages: Issues and Perspectives*, Mysore, India, 12–13 December 2012.

**Mani, D. and Jha, G. N.** (2006). Online Indexing of *Ādiparva* of *Mahābhārata*. In the *Souvenir Abstracts of 28th All-India Conference of Linguists*, Banaras Hindu University, Varanasi, 2–4 November 2006, p. 125.

**Moreno, R. and Mayer, R. E.** (1999). Cognitive Principles of Multimedia Learning: The Role of Modality and Contiguity. *Journal of Educational Psychology,* **91**(2), http://www.learning-theories.com/cognitive-theory-of-multimedia-learning-mayer.html.

**Robb, J.** (1998). Are Digital Books Good Enough to Curl Up With?CNN.com, 9 October, http://edition.cnn.com/TECH/computing/9810/09/digbooks.idg/.