Interactive Ceiling Plans of Mural Paintings in Hampi and Lepakshi

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Abstract

Digital preservation of the heritage of temple murals is important as a large number of the paintings in India have been damaged due to improper methods of conservation, neglect, vandalism, water seepage, sunlight, insects, bats, soot and other reasons. Unfortunately, several murals have vanished and many more are on the verge of being lost forever. Hence, the Department of Science and Technology, Government of India funded the multidisciplinary team at the Centre for Cultural Heritage and Tourism Studies, IIACD, Bangalore to research and digitally archive the ceiling paintings of Hampi and Lepakshi.

Art and cultural scholars, painters, photographers, and heritage arts enthusiasts representing the users were invited to work closely with the design and open-source software development team at IIACD in co-creating user-driven, interactive plans of the ceiling murals of the Hampi Virupaksha and Lepakshi Veerabhadraswamy temples. Curated by a design anthropologist, with rich narratives and scholarly annotations prepared by an art historian, painter and folklore researchers, the interactive ceiling mural plans developed by open source software technologists, provide a virtual experience for browsing temple murals and their intangible heritage.

In this paper, we highlight the need for digital archival of murals in India and present the user-design and development of the interactive ceiling plans and their web implementation by a multi-disciplinary team.

Introduction

Murals from the past, especially those that express the religious, social and political views of their period have intrinsic artistic and cultural value. They also play a vital role as material evidences for construction and reconstruction of history. Unfortunately, murals are more vulnerable than any other art form to damage from natural as well as human sources. Digital

archival for preservation of the heritage of temple and other murals in South India is critical as a large number of the paintings have been damaged due to unethical or improper methods of conservation, neglect, vandalism, white washing, sandblasting, water seepage, sunlight, insects, bats and other reasons (see Table 1 and Figures 1-4). Murals in living temples such as the Hampi Virupaksha and Lepakshi Veerabhadraswamy temples are also subject to damage from oil and soot.

Type of damage	***Sites with damage or loss of murals***
Neglect and/or improper conservation methods	• Hucchappana mata, Anegundi, Karnataka • Chennakeshava temple, Sompalem, Andhra Pradesh • Veetrirundha Perumal temple, Veppathur, Tamil Nadu
Whitewashing/Sandblasting (Temples under HR&CE are more vulnerable)	• Pundarikaksham Perumal temple, Tiruvellarai, Tamilnadu • Vasantha mandapam, Alagarkoil, Tamil Nadu • Venugopala Parthasarathyswamy temple, Chengam, Tamilnadu • Theru Malleshwara temple, Hiriyur, Karnataka • Siddeshwara temple, Hollalagundi, Andhra Pradesh
Repainting with synthetic colours by commercial artists	• Varadhamanaswamy temple, Tiruparuttakuram, Tamilnadu • Sri Krishna temple, Guruvayoor, Kerala
Vandalism	• Veerabhadraswamy temple, Lepakshi, Andhra Pradesh
Deterioration from natural and other causes	• Muchukunda murals, Thiruvarur, Tamil Nadu (water seepage) • Narasimha temple, Sibi, Karnataka (exposure to sunlight) • Raghunatha shrine, Veerabhadraswamy temple, Lepakshi (bats) • Vadakkunnatha temple, Thrissur, Kerala (high decibel sound)

Table 1: Examples of Damaged and Lost Murals in South India

The recently formulated "National Policy for Conservation of the Ancient Monuments, Archaeological Sites and Remains" (NPC-AMASR), Archeological Survey of India, February 2014 explicitly states that

> [27] Elements of a monument, such as murals, sculptures, inscriptions and calligraphy should not be restored. Monuments must be restored on the basis of documentary, archaeological or architectural evidences, and not on the basis of any conjecture.

Although ASI conservation guidelines do not permit repainting, we find sites where murals have been touched up or repainted.

Fig 1: Loss of Murals, Hucchappana mata, Anegundi

Fig 2: Sandblasted, Siddeshwara temple, Hollalagundi

Fig 3: Repainted ceiling, Varadhamanaswamy temple, Tiruparuttakunram

Fig 4: Vandalism, Veerabhadraswamy temple, Lepakshi

The urgent need for documenting, interpreting and conserving murals, especially those that are endangered was highlighted by scholars, conservators and other participants in the 2008 seminar "Painting Narrative: Mural Painting Tradition in the 13th – 19th centuries" (January 23-27, 2008) at Dakshina Chitra, Chennai.

IDH Vijayanagara and post Vijayanagara Murals - a digital heritage project

Under its unique multi-institutional Indian Digital Heritage (IDH) initiative, in 2011 the Department of Science & Technology (DST), Government of India funded the multidisciplinary team at the Centre for Cultural Heritage and Tourism Studies, IIACD, Bangalore to research and digitally archive the murals in Virupaksha temple at Hampi, Karnataka and the Veerabhadraswamy temple in Lepakshi, Andhra Pradesh.

The IDH Murals project's objectives were:

- to research, capture and digitally archive murals in the Hampi Virupaksha temple and the Lepakshi Veerabhadraswamy temple to help preserve and safeguard the tangible and intangible heritage of the murals
- to compare, analyze and interpret the style, techniques, patronage, narratives, material culture and social life of that period

- to study the epics and canons the murals are based upon and develop a better understanding of the evolution of the painting traditions
- to co-create web-enabled, open-access interactive plans of ceiling murals that can be useful for art historians, scholars, conservators, artists, designers, photographers, and virtual tourists
- to add cultural and pedagogical value through archival of rich narratives and scholarly annotations of the murals
- to add audio and video content that can educate and build value for the tangible and intangible heritage of these murals among school children, local community members, devotees, priests, temple authorities, conservators, tourists and help prevent vandalism and other forms of damage
- to provide a repository of images to other IDH project design and technology teams working on reconstruction, in-painting, digital image conservation technologies
- to provide images, textual narratives, videos to technologists at IIT-Delhi working on the IDH multimedia ontology based experiential exploration of the Girija Kalyana narrative

We present below image capture and user-driven design and development of the interactive ceiling murals plans of Hampi Virupaksha temple's *rangamantapa* and Lepakshi Veerabhadraswamy temple's *natyamantapa*.

Image Capture for Lepakshi Interactive Ceiling Murals Plan - LICMP (2011-2012)

IIACD's multidisciplinary murals project team includes art historians, technologists, a design anthropologist, photographers, designers, artist, art and folklore researchers and a professor of conservation and heritage tourism. A key objective of the IDH Murals project was to-create user-driven interactive ceiling plans of the murals in Lepakshi and Hampi. After conducting textual and field research, the design anthropologist and photographer initially captured low and medium resolution images of the murals in Hampi and Lepakshi and the mural narratives in 2011 for study. A Canon EOS 5D Mark II camera, Zeiss 50 mm and Canon lenses, kinoflo lights, reflectors, tripods, monorail and other professional equipment were used by the photographer to capture high resolution mural images in Lepakshi's *natyamantapa* in 2011. The raw images were converted to Tiff images and stitched by the photographer in PTGUI and edited in Photoshop.

Digital capture of *mukhamantapa*, *rangamantapa*, cave, *pradakshana*, *ardhamantapa* and the *prakara* murals was done in medium resolution in August 2012 to quickly create version 1 of the Lepakshi Interactive Ceiling Murals Plan (LICMP) temple for presenting to the community and other visitors at the *Lepakshi Ustsava*. In June 2015, the photographer completed the high resolution digital capture of the *ardhamantapa*, *mukhamantapa*, *pradakshana* area, cave area, Raghunatha shrine and *prakara* murals. Canon EOS 5D Mark II cameras, Zeiss and Canon lenses, LED lights and other professional equipment were used to shoot the murals in high resolution. Raw images were stitched in an updated version of PTGUI and edited on Photoshop.

Image Capture for Hampi Interactive Ceiling Murals Plan - HICMP (2011-2014)

Several trips were made to Hampi Virupaksha temple, Hucchappana mata and other sites in Hampi and its vicinity to research and capture the murals images in low and medium resolution for further study. ASI permissions to shoot the Hampi murals in high resolution with equipment were delayed. Unable to photograph the Virupaksha bazaar in July 2011 for their IDH project as the bazaar was being demolished, an NID photographer shot the temple murals with a Hasselblad camera. We obtained these images from NID's IDH project Principal Investigator for creating the Hampi Interactive Ceiling Murals Plan (HICMP) in exchange for IIACD's Lepakshi *natyamantapa* mural images. They wanted to study the material culture and social life of the period.

User-driven Development and Design of Interactive Mural Plans

In this section we describe our approach to creating open access, innovative *interactive digital ceiling mural plans* of the murals, with rich narratives and annotations. Our aim was to design and develop a user-driven interactive ceiling plan of the Hampi *rangamantapa* and Lepakshi *natyamantapa,* where the user can experience and appreciate the murals, zoom, pan and browse image details, obtain scholarly annotations, rich audio, video, and textual narratives.

The Hampi Interactive Ceiling Murals Plan (HICMP) can be viewed at http://bit.ly/1GzdAQ7. HICMP was implemented using Mouchak, a JavaScript framework for

building websites quickly. Mouchak provides a visual editing interface to create a website and edit content, primarily for non-technical users.

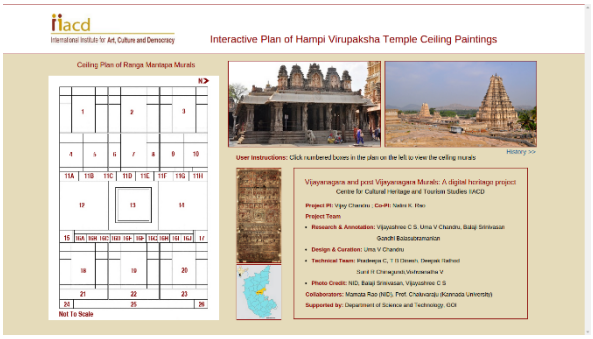

Fig. 5: HICMP - Home page

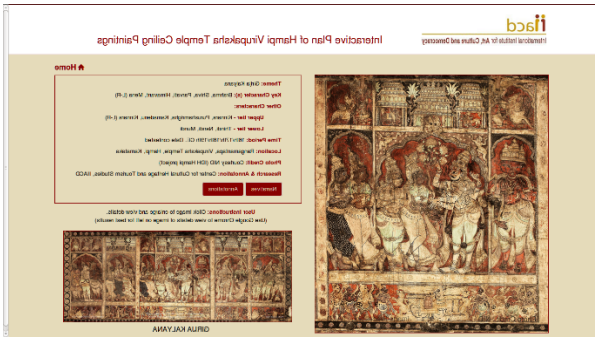

Fig 6: HICMP - Girija Kalyana panel page

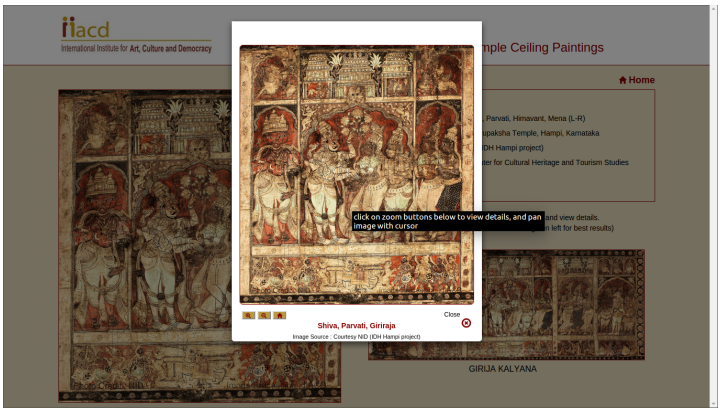

Fig. 7: HICMP – Zoom and Pan Girija Kalyana panel page

After testing the HICMP with diverse users, we found that the Mouchak framework works best on Google Chrome browser. The full range of navigation features of HICMP do not work with Mozilla or Internet Explorer, which are more commonly used. Mouchak is also not compatible with mobile devices or iPad. User's found the number of steps they need to navigate in HICMP to browse image details cumbersome (see Figures 5-7). Given these concerns, as well as the technological obsolescence of Mouchak, which has not been updated for two years, our technologists decided to apply alternate open source toolsets for building web applications when they began to work on the Lepakshi Interactive Ceiling Murals Plan (LICMP).

The web application of LICMP was developed using Google's open source Angular JS and Twitter's Bootstrap tool sets for creating dynamic web applications. Angular JS and Bootstrap

permit seamless integration for feature-rich viewing on mobile and other devices. Regular updates for both are available. All features of LICMP work across browsers, including Firefox, Internet Explorer and Safari and on multiple operating systems and platforms (mobiles, tablets, etc.) Other advantages of Angular JS and Bootstrap are listed in Table 2.

Mouchak framework	***Angular JS and Bootstrap***
Platform-dependent. Available only for development on Linux OS.	Platform-independent.
Works best with Google Chrome browser	Works across browsers like Firefox, Internet Explorer etc.
Not compatible across devices like mobiles and tablets	Seamless integration across all devices
Requires multiple pages to be developed	Entire archive can be developed in in one contiguous page
Permits preloading of images	Permits preloading of images

Table 2: Comparative study of Mouchak vs. Angular JS and Bootstrap Framework

The LICMP can be viewed at http://iiacd.org/lepakshi-interactive-ceiling-murals-plan/

In contrast to the Hampi ceiling murals where each register is divided into smaller panels and subpanels, with the exception of the large procession scene, Lepakshi *natyamantapa* murals are large and horizontally elongated. As some users were unhappy with the small pop up images in HICMP from the pan zoom script of the Mouchak framework, our technologists used OpenSeadragon script, which permits quicker image loading, full screen image browsing and smoother zoom and pan functions (See Figures 8-9).

The LICMP is user-friendly and requires fewer steps than HICMP to enlarge, pan and browse image details. It also has search functions that HICMP lacks. In the early demos of LICMP and HICMP, we used scanned ceiling plans from publications (Rao 2004, Pachner 1985,

Dallapiccola 1997). Given copyright issues, we created our own ceiling plans on Photoshop and AutoCAD.

Fig. 8: LICMP - Home page

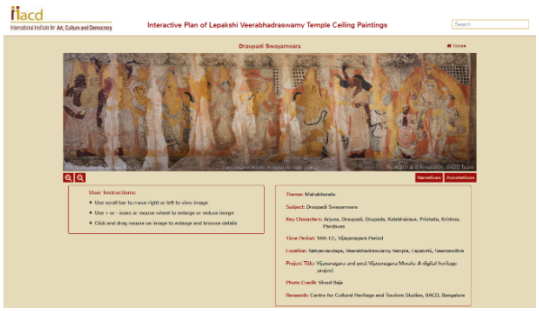

Fig. 9: LICMP - Draupadi Swayamvara panel page

Narratives and Annotations

Stylistic, thematic features and various other aspects of the tangible and intangible heritage of the rich narrative paintings in the Lepakshi natyamantapa such as the Girija Kalyana, Draupadi Swayamvara were analyzed and compared with paintings in the Virupaksha temple rangamantapa in Hampi. Well-researched textual narratives providing rich information on the mythological background, themes, composition, iconographical details, and aesthetic elements were added to the interactive plans. To provide the user with enhanced multimedia experience, audio and video narratives samples were included. From the feedback we received from diverse users we learned that while scholars found the narratives valuable to read in conjunction with browsing the images, a lay user was less likely to engage in reading lengthy narratives. This led us to the idea that annotations would act as an easy guide for laypersons to understand the paintings.

The art historian's search for open source image annotation tools revealed that the functionality of available tools is limited. After experimenting with a few alternatives such as szoter and annotorious, she used a trial version of commercial annotation software called a.nnotate (www.a.nnotate.com) to annotate mural images for the HICMP initially. However, a.nnotate was not economically feasible. As annotated images generated are deposited into their server, losing control over the images was a concern. Our software technologists solved this by incorporating open source Demon Image Annotation plugin for WordPress to add textual

annotations to images. Although this only permits rectangles and has character limitations, the image annotation user interface designed by our technologists was easier for the art historian to annotate the images and annotated image quality was superior. We are working on enabling user annotations through login options.

The art historian digitized rich annotations of each panel in HCIMP and LICMP under the following categories (see Figures10-11):

1. Characters
2. Iconography, Mudras and Asanas
3. Weapons and Musical Instruments
4. Clothing, Hairstyle and Ornamentation
5. Background

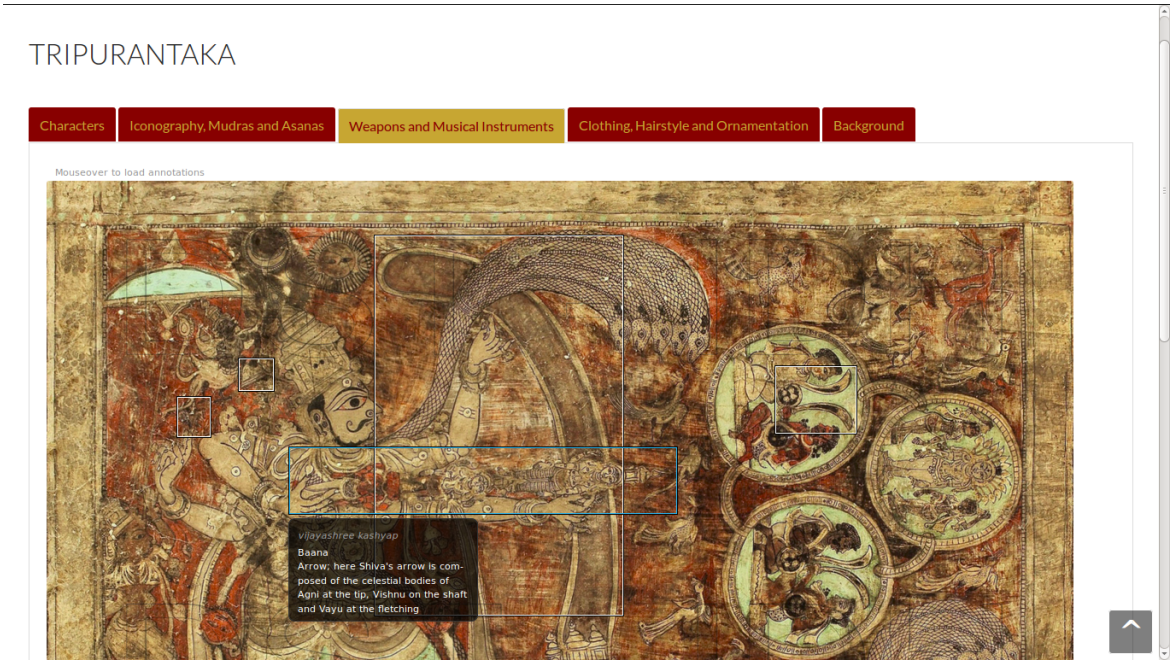

Fig. 10: HICMP Annotated Tripurantaka panel

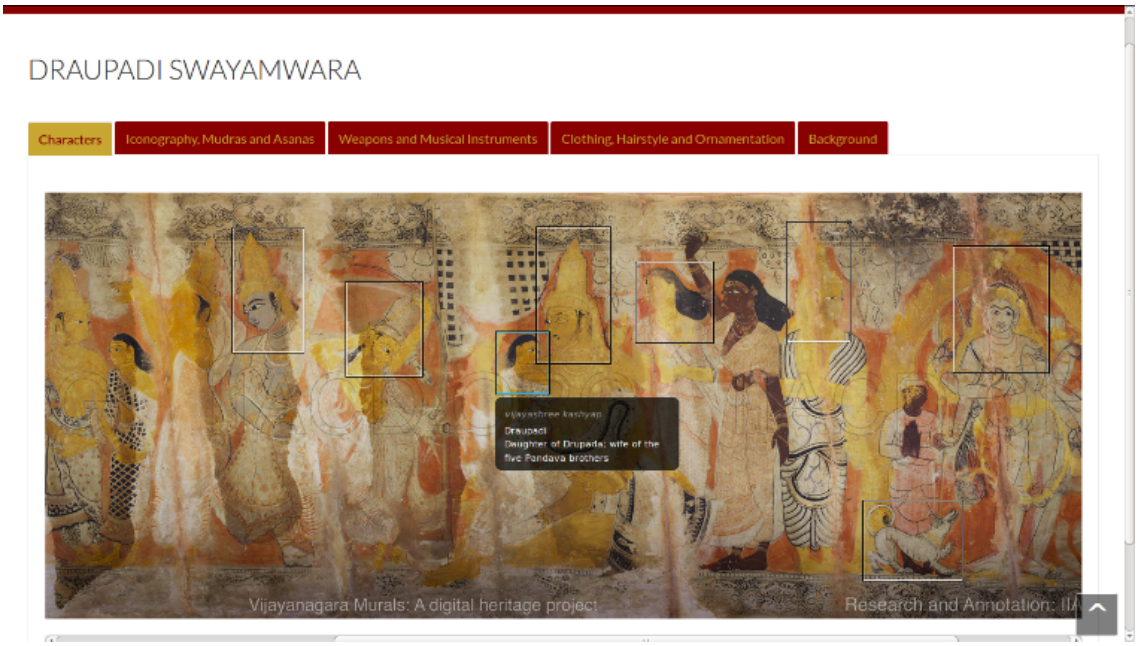

Fig. 11: LICMP Annotated Draupadi Swayamvara panel

Conclusion

The open access, user-driven interactive ceiling plans have been developed so that experts as well as laypersons can navigate the experience the rich visual history of Hampi and Lepakshi temple murals to the level of their interest. Users who are unable to go to the temples can view the murals and their rich history.

Our future plans include meeting the needs of specially challenged users with fine motor, visual and print challenges. This requires developing audio components in all the pages especially the narratives and annotations pages and further user on unmet needs of special needs users. We also aim to localize and seek support for translation across Indian languages.

We plan to include login options in future to allow for multiple narratives to emerge. Interactive plans of ceiling murals in other murals in these two temples and other temples of South India are in progress. They will be integrated in a larger South Indian Murals archive with HICMP and LICMP.

By its very definition, digital preservation refers to development and access of digital materials that survives beyond media and challenges of technological obsolescence. We aim to adhere to the principles of digital preservation in the South Indian Murals archive ensuring availability of content for repurposing should there be a technological/media advance.

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