

Multimedia Information System For Marine Archaeology

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Abstract

The Marine archaeological excavations are complex and arduous tasks. The archaeologists have to plan, survey, excavate, document, classify, analyze, interpret, relate and link to the history. With the number of excavations increasing along our Indian coast, the computer assisted archaeological survey can alone find the solution for meticulously handled tasks such as planning, indexing, classification, archiving, and documenting. Archaeological data usually include visual data such as photographs of site, artifacts, antiquities, structures, site plan, maps and the associated text data. Paleographic study is an important part of an excavation that gives a better understanding of their culture and civilization. This paleographic study if complemented with voice data by reading the scripts in a required language, will be of great use to the archaeologists, students and academicians. Here we present a proposed system called, Multimedia Information System for Marine Archaeology - MISMA, which will provide information using the above mentioned multimedia data of text, visual, and voice data. The proposed system will be based on personal computer with interfaces to handle video, voice, high speed graphics and software support on object oriented environment for information retrieval, image processing, multilingual text processing and automated paleographic application.

A. INTRODUCTION

Along our Indian coast, there are numerous ship wrecks and submerged structures that could provide vital information to the archaeologists. Extensive surveys and excavation need to be carried out to unearth from the sea these important structures that could give necessary information to the historians. The marine archeological excavation, despite all the sophisticated equipments, is still a complex and arduous task. The person has to plan, survey, explore, excavate, document, classify, analyze, interpret, relate and link to the history of the Country. Each of these excavations provides volumes of data. The documentation method adopted here makes use of photographs and textual description on paper that is found to be a slow process. With the lack of adequate number of qualified, trained and competent persons in this specialized field of marine archaeology and primitive methods used for documentation, there is backlog of data that need to be documented accurately.

With the increasing number of excavations, computer assisted archaeology can alone be the solution to help in better planning, excavation, documenting and archiving. Computers can contribute immensely in management of data, planning, indexing, storage and documentation. Archaeological data usually include visual data such as photographs of site, artifacts and structures, site plan and maps and text data describing the above mentioned measurements, schedules, position etc. One of the challenging tasks of archaeology is to decipher the ancient

inscriptions. Writings on ancient tablets, structures and coins are a treasure of knowledge, which if deciphered will give a better understanding of the culture and development of the civilizations. This paleography if complemented with phonetics using voice data will facilitate reading the scripts by others.

Thus archeological data set could include a multimedia of text, visual and audio data. Here we describe such a system to be developed, Multimedia Information System for Marine Archaeology - MISMA. The multimedia system will be based on a personal computer with interfaces to handle text, audio and video inputs which will contribute to the multimedia database. The required information can be obtained in a multimedia form. The graphics applications on this system will include reconstruction of broken structures and artifacts, provide clues to the missing links, observe objects in 3-D, aerial view of site and manipulation of inscriptions for analysis. Some of the image processing applications will include enhancement, smoothing, filtering and edge detection.

Thus there is a need for a computerized database management system that will allow storing and providing information with multimedia data of text, image and voice. Such a computer assisted system will also allow help in obtaining comprehensive, reliable and error free data for analysis, study and preparation of final documents.

B.METHODOLOGY

We describe the processes involved in the development of a multimedia information system for marine archaeological application.

a. Data Acquisition and Documentation

This process will include acquisition of multimedia data. These data will include of following types.

- Text* - Descriptions of site, artifacts, items and related information.
- Visual* - Photographs, video images, digital photographs.
- Audio* - Phonetics of inscriptions, translations in English and regional languages of the inscriptions. Voice data for presentation and reports. Description of site and structures as observed by divers.

b. Image Analysis

Image processing techniques will be applied to enhance and sharpen the images, decipher and analyze the inscriptions.

c. Computer Assisted Paleography

An intelligent method will be used to decipher inscriptions and this will be supplemented with phonetics.

d. Graphics Applications

Graphics methods will be used for 3-D viewing, editing and displaying of artifacts, provide missing links to broken structures and artifacts, generate inscriptions, reconstruct the site as described and observed by divers and photographs.

e. Generate multimedia information system using above data sets.

f. Generate multimedia reports and presentation utilities.

This will involve development of software packages for presentation and generating reports.

The above processes are described in detail below.

a. Data Acquisition and Documentation.

The data acquisition and documentation tasks are required at the site of excavation and at the laboratory. We

describe the mode of data acquisition and documentation to be carried out to store them on PC. Data will be acquired in three forms - text, visual and audio.

Usually text and visual data will be obtained at sites and the audio data will be generated at laboratory. The visual data will require some refinements before storing on multimedia system and will be done on system using graphics and image processing methods. The multimedia data that will be acquired and the method of documenting them at site using Field Note Book are described below.

Text - This will include description of items, first hand information as seen by divers, description of site, items, structures and other related details.

Visual Data - There cannot be a better document for archeologists than visual data. Visual data play an important role and are indispensable in any information better than words used for describing them. It will include in-situ data of strata, structures, artifacts, site and inscriptions that cannot be easily described in words.

The visual data will be acquired at site with cameras of type film, digital, and video. Underwater photographs will be taken of excavation site and structures and photographs will be taken on land of the excavated items. These photographs will be taken so as to bring out required details and features. The photographs will also be taken from at least three different angles to provide a dimensional view. The video cassette will be played on a video player interfaced to multimedia system to view and store required images on the system. Since the digital camera cannot be used for underwater applications, underwater and land photographs of the color film will be photodigitised using either frame grabber or digital camera and stored on system.

Audio Data - Audio data at site will include description of underwater structures, site and objects as seen by the divers. Since all archaeologists may not be participants in the diving team, the description as seen by divers will form an important and authentic document. This audio data at site will not be stored on multimedia database, but will be used in presentation application for better description and also as a proof of first hand information. Since audio data occupies a large storage space and textual data would suffice to provide description, it will not help much in providing audio data in database.

Audio data will be used in the database for the paleographic and phonetic analysis of inscriptions. The

inscriptions will be translated and read with audio output. The script will be first deciphered and audio equivalent with phonetics and proper pronunciation will be stored of the inscriptions and scripts. Thus the system will speak out the deciphered and analyzed script. The audio of the translated script in English and other languages will also be stored. This will help in learning and better understanding of various scripts easily.

FIELD NOTE BOOK

Since archaeological excavations are a collection of records of history, it is essential to document all items properly during excavation. At site, the archaeological supervisor will be provided with field notebook for field documentation, which will allow to enter data as done on paper with site register earlier. The field notebook will be a PC notebook that will be of light weight, portable, battery operated. This full fledged PC will have facilities for multimedia operation. This will replace the field registers used by the archaeologists at sites. This field notebook will have the format usually followed by archaeological supervisor at excavation sites. Since the software will be of standard format documentation and reporting methods will be uniform. Since texts are entered using keyboard, it will be legible and avoid bad handwriting. Inability to comprehend the hand written documents on paper will give improper and distorted descriptions during final compilation. These ultimately result in storing wrong data. The field notebook will contain daily activities, date time, site description, description and identification mark of artifacts, three dimensional measurements, location of collection, site plan, schedules, references to collection bags, references to photographs and other related parameters.

b. Image Analysis

Image analysis will be carried out on the visual data. Usually photographs taken underwater will lack clarity and will be blurred. Photographs taken on land may at times be of poor quality due to improper lighting and defect in camera. Image processing techniques will be used to obtain better visual data from these photographs. Image processing functions will be performed on the visual data for enhancement, edge detection, filtering and smoothing.

c. Computer Assisted Paleography

Writing is treated as a source of vital information of a civilization and culture. It is proposed to use computer assisted methods for deciphering the inscriptions. These scripts once deciphered will be translated in English and

other languages. Thus inscriptions will be read out by the multimedia system for the user and their meaning will be provided in a language selected. The paleographic study will help in understanding the writings. Each alphabet will be deciphered and pronunciation will form part of the data of the inscriptions.

d. Graphics Applications

Graphics will be used for 3-dimensional viewing of site and artifacts. Structures provide missing links of broken items, to view as whole the reconstructed objects and structures. The excavated pieces of artifacts, objects and structures will also be assembled together.

e. Generate Multimedia Information System

Multimedia information System (MIS) will be generated using text, visual and audio data captured using above described methods.

MIS will provide information required for archaeologists of all excavated sites with required parameters. The system will be based on a multimedia database package. The package will allow for script and visual programming. It will also have interface to a presentation software and C language. The hard copy of text and visual information can be had on paper or any other storage media. This will help in archiving of multimedia data and posting of required information.

f. Generate Reports and Presentation Utilities.

Reports and documents are required to disseminate knowledge. These reports will be generated with images and texts obtained from database. The images can then be manipulated moving around to desired locations in text. The images can also be provided with annotations, markings to highlight the area of interest, compressed and zoomed and use other graphic facilities as per the requirements. Since the documents are stored on PC, multiple copies can be easily reproduced of text and image without loss of clarity and distortion.

The presentation package will allow for a tour of the submerged site view and get information of the excavated items, facilitate a look at the resurrected structures from excavated items and read the inscriptions.

g. Conclusion

It is felt that the proposed multimedia information system will be of immense importance to the marine archaeologists, researchers, students and public. Using this

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multimedia system, effective and quick reports, presentation packages and education packages can be prepared. Multiple hard copies of reports with good quality text and high resolution images can be generated immediately without loss of clarity. Method of acquiring data, reporting and documenting using Field Note Book at excavation sites with multimedia facilities is also

described. The system will include multimedia data acquisition, data management, an intelligent system for paleographic studies, image analysis, graphics application, multimedia report generation and presentation packages. It is felt that such a system will find importance in marine archaeological investigations.