CIPHER (Communities of Interest to Promote Heritage of European Regions) - Internet Cultural Portals and the Development of an Irish Cultural Heritage Forum - (www.cipherweb.org)

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Abstract

This paper outlines the concept of heritage forums and introduces the CIPHER project, which aims to encourage public participation in heritage through the provision of access to bodies of Internet data. By developing multi level web sites ('Cultural Portals') CIPHER aims to provide meaningful, access tailored information to a wide range of interest levels. The system involves descriptive and interpretive assessments combining elements such as text, mapping, photography, documents, drawings and reconstruction models CIPHER within an ontological narrative structure.

One example of the CIPHER project is the Irish Cultural Heritage Forum (www.explorer.ie), which aims to provide an Internet access point that will help to guide both public and professional interests to a greater understanding of Irish heritage information. The forum will enable users from novice to professional level to explore archaeological narratives and search for relevant artefacts and monuments. The Explorer Cultural Heritage Forum utilises an ontological database to store all narrative and archaeological information.

Introduction

Initiated in April 2002, the CIPHER project is a thirty-month project supported by the European Union. The CIPHER project aims to provide public access to cultural heritage information around the region of Europe utilising new technologies. The principle activity of the project is to investigate and establish a series of Cultural Heritage (CH) Forums. A CH Forum is a portal website which allows all those interested in its content to explore, learn, interact and contribute information to the web site.

Traditionally CH Forums allowed users to gain access to heritage datasets, however, the domain and context within which this data resides in is often neglected. The resulting user experience is acceptable if the user has previous domain knowledge, but if the user is new to heritage concepts the CH Forum does not fulfil its intended purpose. The CIPHER project identified that new methodologies for knowledge modelling were required to satisfy this remit. The development of ontological database and narrative content structures enable users to explore CH domains, with CH information contained within an ontological CH framework. To increase shared user experience content creation and forum tools allow users to build and share heritage stories and information.

The Irish cultural heritage forum explorer.ie is one of the four CH Forums developed as part of the CIPHER project. This forum was developed by The Discovery Programme and The Dublin Institute of Technology, and provides public access to an Irish archaeological domain including: The Discovery Programme archaeological databases containing the Irish National Sites & Monument Record (SMR), and archaeolo-
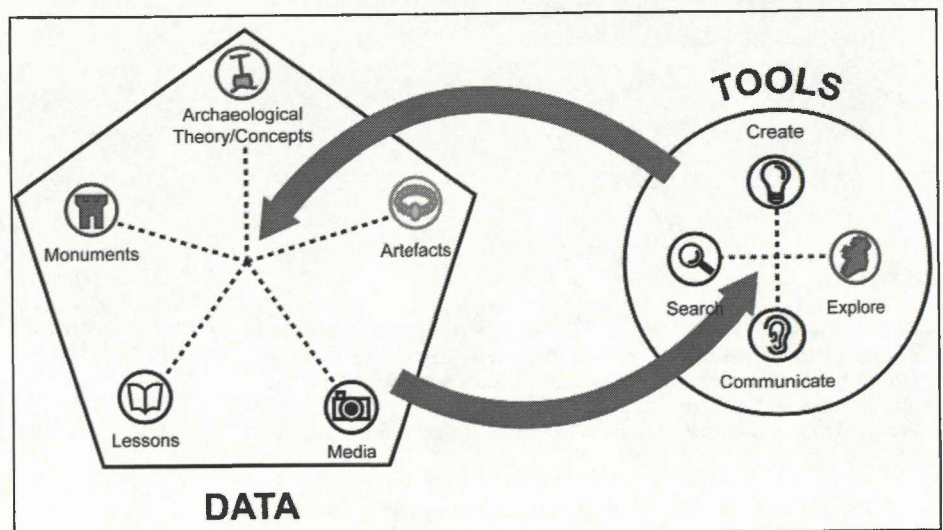

Figure 1 Schematic diagram illustrating the two core components of the Explorer CH Forum

gical artefact data provided by The Discovery Programme and the National Museum of Ireland.

OVERVIEW OF THE EXPLORER HERITAGE PORTAL STRUCTURE

The structure of the Explorer CH Forum can be divided neatly into two sections: firstly the data structure and data content that describes and represents the CH Forums heritage domain, and secondly the tools that allow users to explore and interact with the described domain (see Fig.1). The first major component of the Explorer CH Forum is the storage of cultural heritage data. This consists of national cultural data sets and associated media, including: images, text, and video linked together in a hybrid ontological - relational database management system (RDBMS). The second major component is the Explorer toolset, which allows users to access, interact with and contribute to the previously mentioned datasets. Tools that will be available include: semantic search functions, lesson exploration and creation tools, and forum tools for sharing and discussing cultural heritage information.

DOMAIN CONTENT

The domain content for the explorer CH forum is provided by several national and state organizations who have the responsibility to collect and catalogue information relating to archaeological and historical monuments and finds, resulting in over a centuries worth of Irish cultural heritage information. These catalogues at present are still in the process of digitisation and their structure is poorly defined and monitored. Even though there are problems with the totality and accuracy of these data sets, the Explorer CH Forum uses them as the central archaeological data set.

[1] The National Sites and Monument Record (SMR)

The SMR represents the complete list of categorized monument data for the Republic of Ireland that have archaeological or historical interest. The SMR is maintained by Dúchas; the National Heritage Service and consist of 123,504 monuments. Each individual SMR contains positional and dating information and is a classified by within one of 786 non-hierarchical monument classifications types that have evolved over time.

[2] The Discovery Programme Digital Archive and Research Knowledge

The data sets represent the totality of the digital archaeological artefacts and monuments information collected over the previous 10-year period the Discovery Programme has been in existence. Research projects carried out by the Discovery Programme have provided a large amount of well described and catalogued information relating to Iron Age and Bronze Age Ireland, including artefact databases, three dimensional survey plans and illustrations. The second element of data provision by the Discovery Programme consists of the staff's expert knowledge of the archaeological and historical domain, and consists of descriptions of archaeological concepts, theories and relationships.

[3] National Museum of Ireland Artefact Catalogues

The National Museum of Ireland houses and archives the largest collection of archaeological and historical artefacts in Ireland. Of this complete dataset only a small proportion exists in digital form and no standardized classification system has been adopted.

[4] Standardisation of Data Sets

As specified above in the there has been little comprehensive standardisation of Irish archaeological data sets. As Explorer is utilising three disparate data sources, effort has been made to formulate a standardised classification system that both organises and captures archaeological relationships.

The development of a new heritage classification system was beyond the remit of the short research time of the project. It was acknowledged by Explorer domain experts that research into standardised heritage classifications has been carried out by national heritage bodies (Baines 2001) and should be taken into account when developing an Irish classification system. Adoption of a recognised CH terminology would allow an Irish heritage data set to inherit the established standards including the MIDAS (Monument Inventory Data Standard). With the assistance of English Heritage (EH) the Explorer CH Forum has adopted the online EH monument and artefact thesauri (Charles 2001) to create a standardised Irish archaeological thesaurus. The EH thesauri represents a controlled vocabulary that allows archaeological objects to be related by similarity within a hierarchical domain. Using Irish CH experts, the Dúchas SMR has been mapped to corresponding classifications within the EH thesaurus and new preferred terms created for certain Irish monuments and artefacts (e.g. EH Burnt Mound would have a preferred Irish Thesaurus term of Fulacht fiadh) and new subclasses created (e.g. new Torc jewellery class within the artefact thesaurus).

DATA STRUCTURE

To model archaeological objects and concepts the explorer CH Forum utilises the concept of ontologies to create a data structure in which to place all central CH Forum data. Ontologies represent a way for domain experts to model knowledge by specifying a concept. Gruberd describes ontologies as being "...a description of the concepts and relationships that can exist for an agent or a community of agents" (Grüber 1993). When applied to digital data structures ontologies allow us to model both hierarchical, inherited and associative relationships between objects, concepts and people. Using a series of hierarchical class structure including super-class, sub-class entities, objects can be grouped into conceptual groups.

CIPHER project partners the Knowledge Media Institute (KMi) and the Czech Technical University (CTU) has designed Apollo: a dedicated ontology creation software. Apollo uses the concepts of: "classes" to develop an organisational hierarchy within data structures e.g. castle class, "instances" that allow actual real archaeological objects to exist within the ontology (e.g. Dublin Castle); and "slots" that provide the

attributes and descriptive characteristics of the concept/object you are trying to capture. The Apollo software also creates hereditary functions with all attributes (slots) from super-classes being inherited by their children (e.g. a sub-class of daggers would inherit all the applicable attributes of edged weapons).

Four separate ontologies have been designed for use within the Explorer CH Forum, which model its central domain content. They include: monuments, artefacts, archaeological concepts and theory, and people. Each of these ontologies can be related to each other through linking mechanism within the classes and instances structure. By using the adapted EH thesaurus the majority of the monument and artefact thesaurus were already provided. Due to the experimental nature of Apollo, completed ontologies were exported to a standard RDBMS environment (MySQL) to allow for easier data management and Internet implementation.

CURRENT CH FORUM SEARCHING METHODS AND THE EXPLORER AUDIENCE

The Explorer CH Forum uses exploration mechanisms common to most other CH Forums, including search facilities based on semantic methodologies and geographic extents. Many on-line CH Forums are designed in such a way that some previous knowledge of the domain is required e.g. a public user would carry out a search on a CH Forum to find a list of hillforts within their county. However, allowing this user to search through online data using a common semantic search mechanism assumes that they understand both the concepts of hillforts, and where they are located within the

User Category	Description of Users	Example of Users
Basic	Users have no to little previous knowledge of cultural heritage domain Users are 12 years old or younger Non computer experts	Primary school children Users with learning difficulties
Intermediate	Users have no to little previous knowledge of cultural heritage domain Users are over the age of 12 Non computer experts	Secondary school children Adult users with little or no experience of cultural heritage General members of the public
Expert	Users have differing levels of cultural heritage domain knowledge Previous computer knowledge	University and college students Members of special interest groups Professional users e.g. cultural researchers, national organisations

Table 1 Summary of potential Explorer user groups

complete CH classification structure. These preconditions to getting access to CH Forums content has not been intentional, but more of an over sight by the CH Forum designers who have often used a specialist vocabulary for such a long period of time that it becomes second nature to use it liberally.

As the CIPHER project is a member of the EU "Heritage for All" programme and much of the information held was being directly, or indirectly funded by the general public, it was decided that the Explorer CH Forum should be aimed at a large as possible spectrum of potential user groups. Three major user groups were identified as potential users of Explorer, with a combination of their previous knowledge and age group being the determining factor to which group a user would belong. A brief description of each user group and possible examples is summarised in Table 1.

The Explorer CH Forum will also have a user authentication system that will record user details such as age and possible previous cultural knowledge, so they are guided automatically towards the correctly targeted content.

NARRATIVES AND LESSONS

Traditionally CH forums would present information methodically using lists of cultural data simply extracted from cultural databases, e.g. monument lists. For the Explorer CH Forum to work effectively for the prospective audiences identified in Table 1, new methodologies of facilitating cultural information exploration were needed.

[1] Narrative and Story/Lesson Concepts

In the tradition of teaching and learning it is taken that people will understand subjects through the concepts of story telling rather than trying to comprehend a subject by reading facts. Examples include the difference between parables and rules, and general conversations where learning information from people often consists of a story containing a series of facts placed in a comprehensible context (Mullholland 2002). This tool of story telling has been applied as a main concept within the Explorer CH Forum. The concept of a story within the Explorer CH Forum can be described as a series related narratives that encapsulate and relate a cultural heritage philosophy to its target audience. An example of a story could be an account of a Bronze Age conflict between two warring groups, with the story being able to explain the theory of Bronze Age weapons and society. Narratives can exist as several formats including: text, images, and video or audio media. Narratives are also aimed at their respective audiences outlined in Table 1, with an example being a story aimed at children that explains food during the medieval period, which consists of a series of pictures that illustrate the process of milling wheat. However, one could explain this same concept to an expert audience by writing a series of narratives based around evidence of medieval cooking artefacts, together with appropriate photographs and illustrations.

A framework matrix of stories, or lessons describing the central concepts of archaeology and early cultural history in Ireland has been created (see Fig.2). Domain experts within the Discovery Programme and other CH institutions have created stories that populate this matrix, and act as the central learning resource within the Explorer CH Forum.

[2] Integration of Narrative and Lessons to Explorer's Central Data Ontology

The concept of the lesson and narrative are intrinsically linked to the central CH data sets and ontologies described in Section 3 and 4. Where a lesson or a narrative is related by its content to a class or instance within the Explorer ontology; such as an artefact, a relationship can be created to link a story with a reference to an actual object. By making this relationship the concepts of lessons, CH classification onto-

logies and object instances are fundamentally linked. An example of this could be were a lesson describing the use of hillforts in the Bronze Age can be linked to the classification of hillforts within the monuments ontology and possibly and an instance of a hillfort such as Mooghaun.

A lesson can be related to as many classification and instances as possible. This link can now act as a two way connection in exploring cultural heritage, where you can learn about objects and there context and then get access to examples of such objects from the national CH data set, and alternatively one can approach the subject from the other direction and search for a specific object and get access to any lesson or narratives that have been related to it. The concept of lesson and cultural objects being related within the CH Forum allows for more "lateral" exploration of cultural heritage. Users of the CH Forum can move from a lesson to related cultural object and onto another related lesson and so on.

[3] Narrative and Lesson Construction Tools

Using the authentication system described within section 5, users of the CH Forum are allowed to create, edit and publish their own CH lessons and stories. Allowing the user to do this produces three clear benefits to both the user and CH Forum:

1. Increases the amount of online cultural content
2. Creates an empowered experience for user
3. Allows for users to increase their understanding of a subject as the process of organising ideas into a comprehensible lesson forces the user to fully learn and understand the subject.

Using a Java applet the user enters a lesson title and some text that will make up a narrative for an object called a meta-lesson. The author/user is then encouraged through a series of wizard interfaces to relate their lesson narrative to classes and instances within the Explorer monument, artefacts, theory and people ontologies. The author can also upload and relate media to the lesson narrative, and subsequently this media is then related to relevant classes and instances within the Explorer ontology. Once a meta-lesson has been created it can be linked together with a series of other meta-lessons into a larger lesson and published upon the Explorer CH Forum. Users can also group together meta-lessons that have been created by other users into a new lesson that they find interesting.

Access by other forum users to user created lessons may be limited to a specified used defined interest group, created using the forum tools. An example of this would be were the stories created by a primary school teacher would be available to only the students in their class. Outside of this private group access will be restricted. It is envisaged that certain users will gain accreditation to become expert lesson creators, that allows for their lessons to be publicly accessible to all Explorer users. Certain Explorer domain administrators will govern the nomination of the expert lesson creators.

FUTURE EXPLORER DEVELOPMENTS

At present the Explorer CH Forum is only half way towards its full completion. Over the next 16 months increased functionality is being added to Explorer CH Forum.

[1] Forum Communication Tools

The Explorer CH Forum will provide users with the ability to share ideas, lessons and experiences with other Explorer users and Explorer domain experts. Users will have the ability to set-up forum groups that share similar interests. This maybe a local history group, or an individual school class. Within their personal CH Forum space they can publish and share stories, and using communication tools discuss Explorer content. One envisaged use maybe from local interest forums that would construct lessons and stories on local monuments, artefacts, and history. Provision is being made to allow groups to have designated experts related to the, e.g. County cork Local History CH Forum would have a link through the Forum to the local heritage officer.
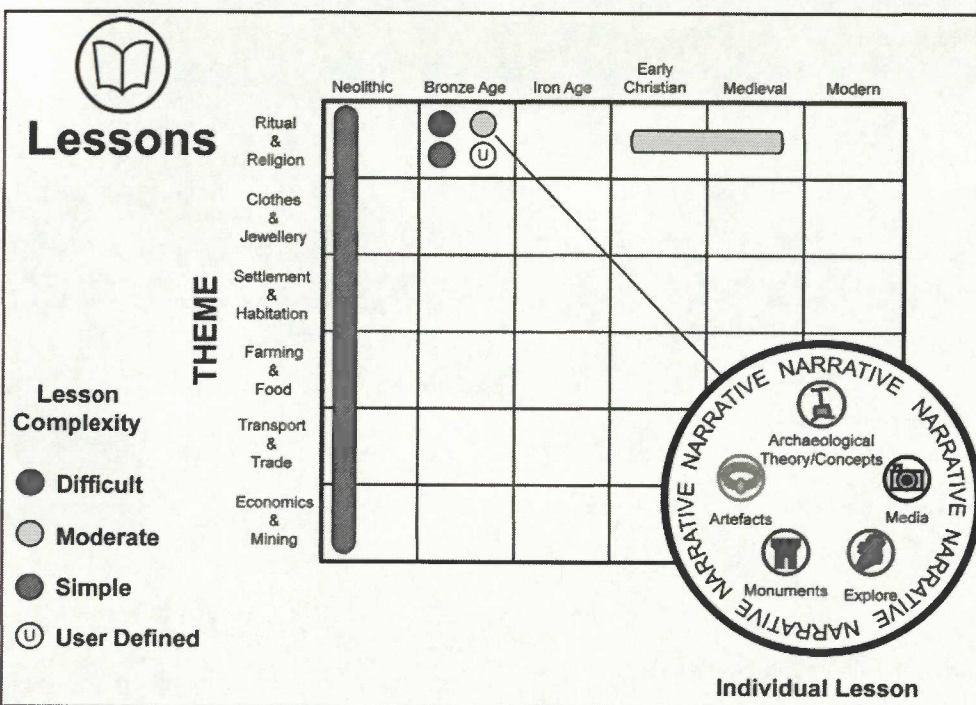

Figure 2 Illustration of the Explorer lesson matrix containing example stories/lessons aimed at the various CH Forum audiences. Included is a closer look at the concept of a story consisting of media and data encapsulated by a narrative context

[2] VRML Narrative Interface

Utilising the increasing amount of three-dimensional information from detailed archaeological surveys of monuments and artefacts, the Explorer CH Forum will have a dedicated VRML browser that will enable users to explorer interactive three-dimensional models. These models will contain embedded narratives similar to those used within the lesson concept, e.g. a three-dimensional model of a monument can be explored, with the user being able to visit defined interest points within the model which through the use of text, audio, image and video media explain the context and the "story" behind the monument.

CONCLUSION

In this paper, we have presented an original approach to organising, creating and sharing cultural heritage information. The CIPHER project and the Explorer CH Forum demonstrates a coherent way to manage and combine disparate cultural data within an environment that is beneficial to both heritage data standards, classification systems and user comprehension due to the creation of cultural ontologies. The conception and construction of a lesson methodology and the narrative exploration environment allows CH information to be targeted at various audience groups, and allows CH Forum audiences to become empowered by the presence of online lesson creation tools and forum communication tools. (A version of the web application software can be found at http://www.explorer.ie/)

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