

XML BASED MULTIMEDIA DATABASE OF MESTROVIC GALLERY

Maja Čić, Darko Stipaničev

Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture
University of Split
R.Boškovića bb, 21000 Split
maja@fesb.hr, dstip@fesb.hr

Abstract: *This solution demonstrates XML (eXtensible Markup Language) as an alternative to databases and proprietary file formats. The XML database is developed and applied as a catalogue of Ivan Mestrovic's art works and additional documentation funds (photographs and video records, for example). The same database is a source for different kind of multimedia presentation: CD-ROM catalogue, gallery reports and gallery web presentation.*

Key words: *XML database, DOM, Mestrovic Gallery*

1. INTRODUCTION

Two issues have to be discussed: finding the appropriate data structure for multimedia presentation and exploiting the structure. Databases are convenient because they store large amounts of data and access it rapidly. Furthermore, they are well supported by third party vendors. Databases are also open, which means one application can share data easily with other application. This enables a developer to quickly and inexpensively extend the application. On the downside, databases tend to be costly and they can require dedicated servers, which further adds to the cost.

XML (eXtensible Markup Language) data model is a tree of elements, which is a natural match for an object-oriented data structure. The XML supports the definition of language- and platform- neutral facilities. With Document Object Model (DOM), we have got a standard way of accessing and manipulating XML document that can be used by many different software tools.

XML based solution is appropriate for small to medium sets of data because it loads the file in memory. In other words, it is limited by the amount of memory available. Yet, this is not a limitation of XML. XML databases, such as eXcelon (www.exceloncorp.com), can manipulate documents of any size. However, the cost of these databases is comparable to SQL databases, so it's no longer a solution to our present problem. Because of that we have developed our own XML database system suitable for multimedia presentation.

2. SOLUTION BASED ON XML

It is not possible to specify fully what a Mestrovic Gallery database should or will contain at the start of the development process, because its structure and functionality will

evolve over time. Furthermore, the information contained within and presented by reports will also change.

XML is an extensible syntax. It does not define elements or attributes – it is up to the developer to define them. One of the main issues for XML users is deciding on the vocabulary they need for their applications. In some cases, they can turn to standard vocabularies, such as RSS (Rich Site Summary); in other cases, they will need to create their own. A lot of work is in progress to define XML vocabularies for multimedia applications (SMIL - Synchronized Multimedia Integration Language and SVG - Scalable Vector Graphics).

We have chosen to define a set of identifiers according to the sections of Mestrovic Gallery catalogue. Therefore, elements are: stavka (exhibit), arhiva (archive), biblioteka (bibliography), diateka (slide), dokumentacijski_crtez (documentation drawing), filmoteka (film), fonoteka (audio record), fotonegativ (negative), hemeroteka, izlozba (exhibition), klisej (clishé), konzervacija (conservation), reprodukcija (reproduction) and videoteka (video record). Additional element is the time of a last database update (datum_azuriranja).

Each element has its own inventory number marked with <inventar> tag. Setting the id attribute that represents exhibit inventory number creates relation between individual exhibit and its additional documentation funds.

The element stavka that describes an exhibit has 52 child elements. The following is an extract of the XML database of Mestrovic Gallery:

```
<?xml version="1.0" encoding="ISO-8859-2"?>
<baza>
  <datum_azuriranja>četvrtak,17.I.2002. 13:9:47</datum_azuriranja>
  <stavka id="2">
    <inventar>2</inventar>
    <naslov>Djevojka uz more</naslov>
    <autor>Ivan Meštrović</autor>
    <tehnika>klesanje</tehnika>
    <materijal>kamen</materijal>
    <broj_komada>1</broj_komada>
    <vrijeme_izrade>1927</vrijeme_izrade>
    <vrijeme_nastanka>1926</vrijeme_nastanka>
    <naziv>puna plastika</naziv>
    <mjesto_izrade>Drniš</mjesto_izrade>
    <mjesto_nastanka>Dubrovnik</mjesto_nastanka>
    <vlasnistvo>galerija</vlasnistvo>
    <stalni_smjestaj>park</stalni_smjestaj>
    <osoba_odgovorna_za_unos_podataka>Maja Šeparović
      <osoba_odgovorna_za_unos_podataka>
    ...
  </stavka>
  <videoteka id="2">
    <inventar>01</inventar>
    <naslov>Video o skulpturi "Djevojka uz more"</naslov>
    <autor>Darko Stipaničev</autor>
    <datum>1999</datum>
    <url>video_2.awi</url>
  </videoteka>
</baza>
```

3. APPLICATION COMPONENTS

XML based multimedia database of Mestrovic Gallery has three main subsystems: administrator component for input data of Ivan Mestrovic's art works and additional documentation funds, personnel component for search and presentation of complete database, and user component for web site and CD catalogue presentation.

Since the one of the requests for this application was to have a relatively low hardware requirements, data input component is designed as a miniature Java web server supporting servlet technology. Java offers serialization (`java.io.ObjectInputStream` and `java.io.ObjectOutputStream`) what makes saving of complex data structures to disk easy. Access to the administrator component of the application is through password protected web page. After successful authorization, data-input servlet generates specific HTML form for data entry. When the data is submitted, XML-file-generation servlet is invoked to save new data to the XML file on hard disc. The name of the person that commits changes to the database is registered in each exhibit record.

Administrator application component runs only on a local computer in Mestrovic Gallery. Completed database will be put on a public web server for web users to explore.

User application component works on a subset of a database, while personnel component gives full insight to the database. Both these components are designed as client-side applications executed through web browser. In this application, data search and presentation is performed through JavaScript scripts because JavaScript has built-in XML DOM support and it easily fits in a HTML page. JavaScript functions make possible to add HTML text in the web document that is processed at the time, as well as generate a completely new HTML page.

Personnel application component allows database searching according to inventory number or according to exhibit elements. Created interface for the database searching is a web page with the form shown in Figure 1. User application component restricts database search criteria and results to 15 significant exhibit elements. No additional documentation funds can be presented to the web user.

W3C's Document Object Model gives programs access to web data by defining an object-oriented API for HTML and XML documents. It represents a document as a hierarchy of objects, using object classes such as `Element`, `Attribute`, `Text`, and so on, that closely models the structure of the document.

For example, a document element is represented by an `Element` object in DOM; an element contained within an element is represented as a child `Element` object; and text contained in an element is represented as a child `Text` object. Through this API, script can access and manipulate individual parts of a document without having to parse the document.

The data presentation of the exhibit with inventory number 2 for the CD-ROM catalogue and Web users is shown in Figure 2.

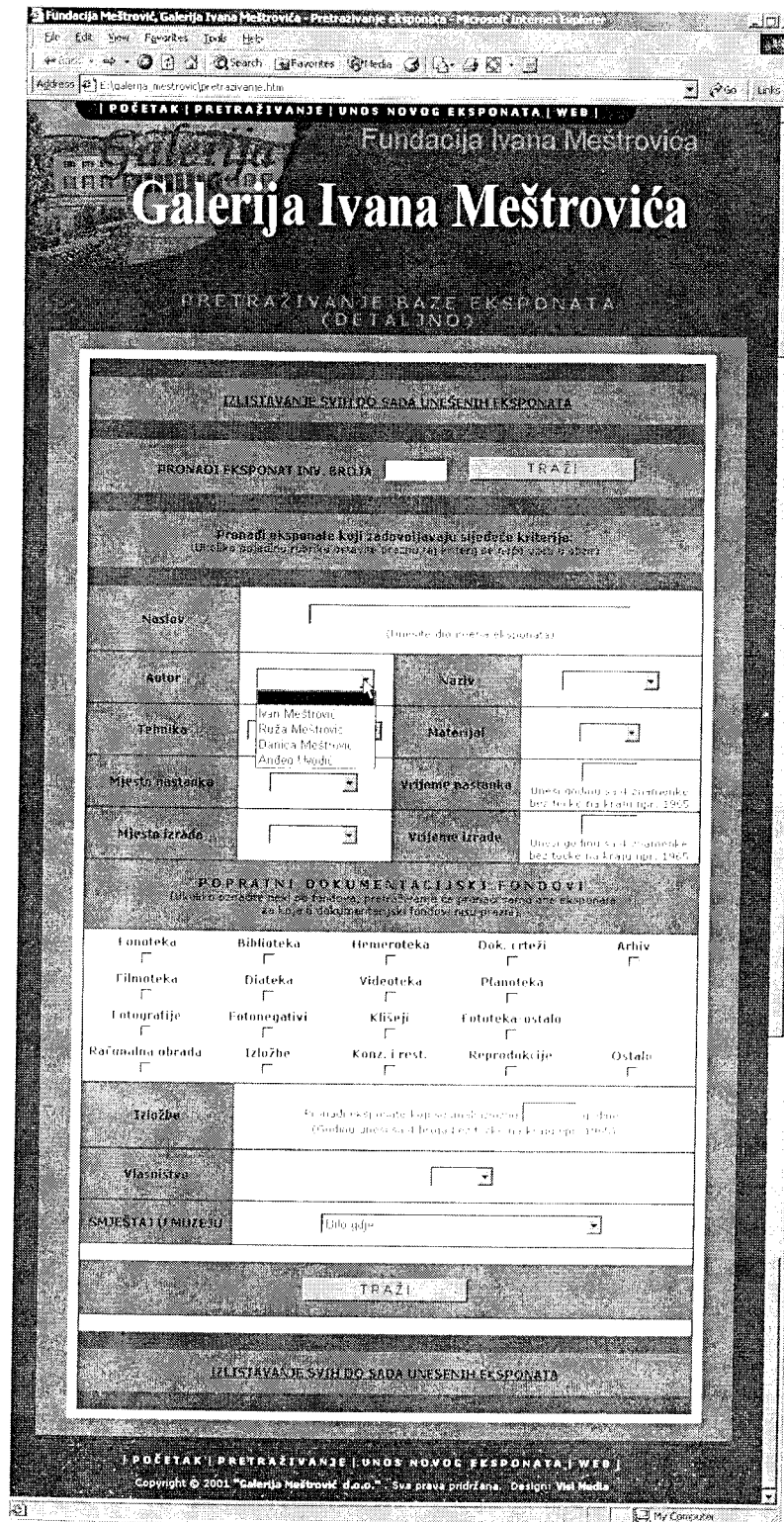


Fig.1. The personnel application component page for database searching

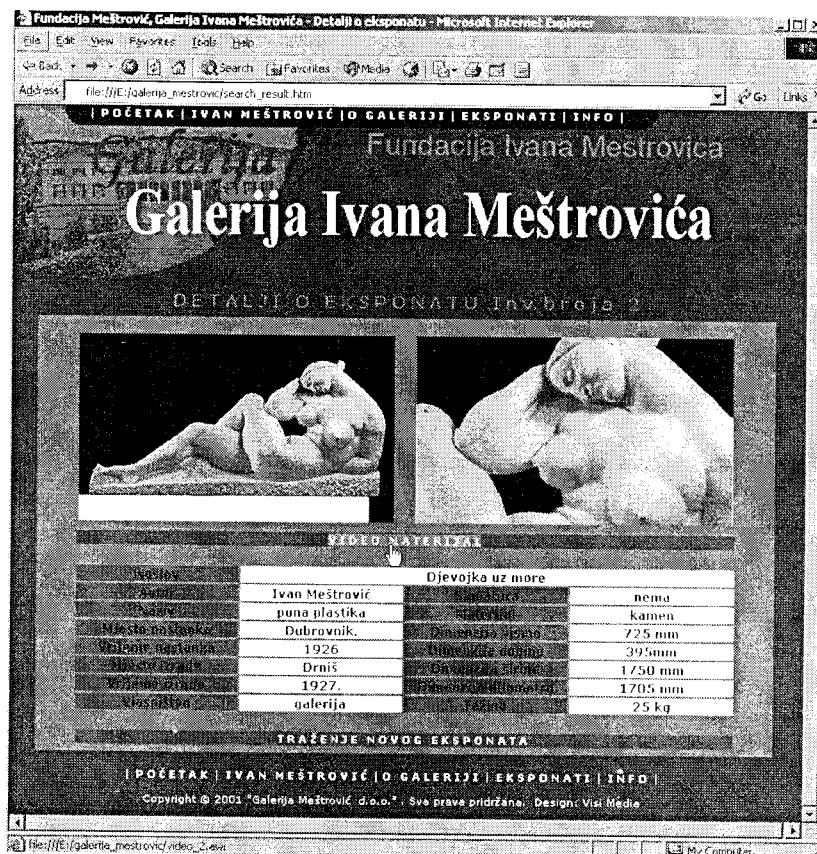


Fig.2. The Web and CD-ROM data presentation of the exhibit with inventory number 2

4. CONCLUSION

The presented solution demonstrates XML as an alternative to databases and proprietary file formats. The trade-off for creating small, scalable, application independent database with low hardware requirements that comes out from XML limitations is relatively small. Considering the size of the Mestrovic Gallery XML database (less than 100.000 records) and access frequency no greater than one every 10 seconds, the performance of this application is comparable to database engine.

XML data structure is declarative so it is easy to discuss it with non-developers. XML keeps growing so no lack of third-party tools exists. DOM allows dynamic content to be implemented on the client, rather than forcing all such implementation on the server, and thus lessens client-server message traffic. The Mestrovic Gallery client-side application can run on the Web site and from CD-ROMs on multiple platforms.

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