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SOL: Spatial and historical web-based interface for On Line architectural documentation of Kraków's Rynek Główny

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Our paper presents recent developments of a co-operation program that links the MAP-GAMSAU CNRS laboratory (Marseilles, France), specialised in computer science and the HAiKZ Institute of Kraków's Faculty of Architecture, specialised in architectural heritage and conservation.

Before undertaking any action to a listed buiding or interventions in its neighbourhood, it is vital to gain a clear understanding of the building in question. Numerous heterogeneous data detained by diverse institutions has to be handled. This process can be greatly easened by enhanced classification of the information together with building-oriented database entry mode.

A major question addressed by our research is how to draw a link between the GIS technology paradigm, the traditional database systems, and an architectural scale 3D representation of the building that would show historical layers and serve as an entry point to the database.

The development we present ("SOL", http://alberti.gamsau.archi.fr) is a multidisciplinary platform independent information tool dedicated to education and research. SOL uses an http protocol centred computer architecture connecting a relational database, a VRML 2.0 representation module and a web search interface. It allows searches and updating of the database through a standard text based interface, a VRML 2.0 graphical module and a thematic search interface.

SOL is experienced on the urban fabric of the Rynek Główny in Kraków in which 3D-localised and historical-period relevant information can be searched.

The choice of a web-centred development, both in the search and updating interface and in the representation module provides platform independence and distant access to the database, and enables successive contributions of students or researchers.

1 Background of the research: the ARKIW co-operation program

1.1 Institutions involved

Within Kraków polytechnic's faculty of architecture, the HAiKZ institute deals with research and teaching in the field of history of architecture, urbanism and conservation. The main areas of its activities and interests are:

- research on the development and history of architecture (with a special attention to specific problems of polish architecture)
- evolution of the conservatory theory and doctrines
- problems of preservation, conservation and modernisation of historical architectural monuments

science as applied to architecture, urbanism, architectural heritage. Gamsau is a multidisciplinary CNRS laboratory, hosting architects, computer scientists, geographers and mathematicians.

Researches performed in the laboratory focus the completion of knowledge representations of the domain permitting scientific investigations on architecture and urban fabrics. Its activities follow three guidelines, based on the development of computer technologies and methods:

- Modelling of the architectural knowledge.
- Rendering, visualisation and network tools.
- computer-based implementations on the architectural heritage field.

Figure 1: North-West panorama of Kraków and Kazimierz dated 1576 (woodcut)

- studies on architectural and urban developments
- history of architectural details
- specific problems of wooden architecture

Institute of History of Architecture and Monuments Preservation has strong practical skills and knowledge of the conservation and preservation of architectural and urban heritage, a thorough experience and understanding of Krakow's architectural specificity, and long educational experience.

The MAP-GAMSAU laboratory is a research team, located within the school of architecture of Marseilles, addressing questions related to the field of computer

1.2 Aims of the research program

The ARKIW programme deals with both questions related to the representation of architecture in the computer science discipline and to its historical evolution processes and its conservation techniques and knowledge[1][2].

Its main theme is a contribution to the building-up of heritage investigation methods, the experiencing of knowledge modelling approaches, and the use of information technologies in the recording and protection and studying of the architectural heritage.

The development of web-based patrimonial information and representation tools proposed is targeted at researches

and post-graduate studies or training. Case studies are chosen in order to experience and validate a technical platform dedicated to the formalisation and exchange of knowledge related to the architectural heritage (architectural data management, representation and simulation tools, survey methods, ...). A special attention is drawn on the evolution of the urban fabric and on the simulation of reconstructional hypothesis.

1.3 Methods in use

GAMSAU-MAP's research in the field of the architectural heritage implements an architectural model considered as the core of an interdisciplinary representation. Handling the exchange of experiences and skills covering the wide scope of the architectural conservation discipline requires the use of models able to represent diverse points of view and practices. Relevance of this interdisciplinary approach therefore relies on the ability of a computer-based system to convey within the simulation process the information detained. High development prospective in web technologies along with necessities of a collaborative approach of the research naturally lead us to promote this approach as our major development frame. Architectural analysis is considered as a non-ambiguous mean to federate information both on morphological aspects (issued for instance of a survey campaign) and more specific aspects of the patrimonial field [3][4][5].

1.4 Sol: initial tool of the research program

Kraków' s main square (rynek główny) has been chosen as the field of experiment for our co-operation program. Referencing researches on the making and the evolution of its urban fabric is naturally a pre-requisite. SOL (Sources On Line) has been initiated as a basic on line documentation tool for researches involved in the program and can be defined as a "self-growing"

information source since its updating interface is open on the net to any computer connected to internet. SOL is a reference search tool in which criteria resulting from the analysis of each source are added to traditional bibliographical and iconographical data. It therefore proposes not only a catalogue-like approach of the sources but an added-value referencing modus. Each contribution to the system added through the updating interface is the result of a critical lecture of the source and is made available for the community of teachers and researchers involved, thereby enriching a collaborative information module .

Figure 2: Kraków's main square
Plan K.Bąkowski 1785 *in*
Tołwiński T. "Urbanistyka" [1]

1.5 Benefits of a collaborative approach

Our co-operation is about providing tools for the studying of architectural heritage environments and enabling computer based simulations of archaeological hypothesis. Our method is based on the analysis of non-ambiguous architectural elements thoroughly described in [biblio]. It is therefore vital to provide a computer formalism for the architectural model that would be relevant in the scope of conservatory research and education.

As a result of this collaborative approach , technical choices were made in order to provide a platform-independent access to all developments, to implement end-user interfaces to the architectural model, and to ensure the bibliographical referencing of the hypothesis through the SOL tool.

2   The SOL tool objective

SOL (Sources On Line) is a bibliographical, iconographical and cartographical database search tool for the web, accessible from any computer connected to internet. It references data connected to the urban fabric of Kraków' s main square (rynek główny) or to problems related to the architectural conservation and protection discipline. As an addition to standard bibliographical data identification (author, edition, etc..), it features additional information, or "dedicated points of view" for each source. This mechanism connects each entry to data concerning for instance building considered, architectural detail, historical period mentioned, etc.. Specific query interfaces (textual, cartographical, 3D) allow the questioning of each point of view.

Since its relevancy relies on the researcher's analysis of references, such a tool can prove useful only if it mirrors the constant evolution of his sources. An updating web-based interface is therefore proposed in order to allow distant interventions on the database itself.

2.1   Sol's main requirements:

References in the SOL database are books, researches, papers, etc.. On the other hand, our program is about urban fabrics, architectural objects, and their evolution. A fist strong requirement for the system is to connect both inside the data sheet itself and in the query interface presentation the fist to the second. This means providing the data sheet with morphological-oriented information for instance, and retrieving it through a graphical localisation interface. A formalism of "dedicated points of view" has been developed in order to add to each data sheet such feature.

Another strong requirement for the system is to allow through the updating interface not only the addition or modification of entries, but also an interaction with the "dedicated points of view". Adding criteria is implemented so that new building-

specific problems (e.g. "the ave-bell of the old town hall", "the ceiling morphology of the cloth hall", etc..) , new generic theme (e.g. "wood roof covering" in materials and techniques thematic group) can be added to the system. This requirement corresponds to the necessity to encourage a collaborative construction both of the database's contents and of its search criteria.

3   The database contents

3.1   Basic data sheet elements

References contained in the SOL database are 450 bibliographical, cartographical and iconographical sources gathered during the current research program. Standard elements of definition include author and publication identifications, as well as standard dating elements and additional comments.

3.2   Database scope

SOME LINES ON KRAKOW MAIN SQUARE AND FOCUS ON 2 BUILDINGS, WHY AND WHEN RESEARCHES STARTED, WHAT KIND OF DATA IS AVAILABLE? WHTY REFERENCES ARE USED IN CONSERVATION ? …

Nineteen elements of Kraków's rynek główny are referenced in the system. These elements are buildings or architectural items that may exist or have existed, have undergone transformations, have been partly or totally destroyed. SOL's scope is therefore the successive urban development of Kraków's main square. Evolutions are one of the "dedicated points of view" implemented in the system.

4 The "points of view" approach

"Dedicated points of view" allow the system to take into consideration elements of information that do not fit in a traditional bibliographical cataloguing. These elements of information are mentioned or represented in the source, they consequently stem from a studying of the references.

Their addition to the data sheet gives a possibility to query the database on conservatory-research relevant criteria. A short description is given below:

Urban fabric-> Relation to buildings and urban item located on the main square.

Architectural object / details -> Relation to the architectural corpus analysis.

Historical period-> Relation to the period of presence or to the evolution of buildings.

Orientation -> Relation to the angle of view of illustrations

Media type-> References the type of media concerned (text - illustration type- plan)

Thematic group-> Relation to generic problems (materials and techniques, conservation, etc..)

Availability-> Location in Public libraries
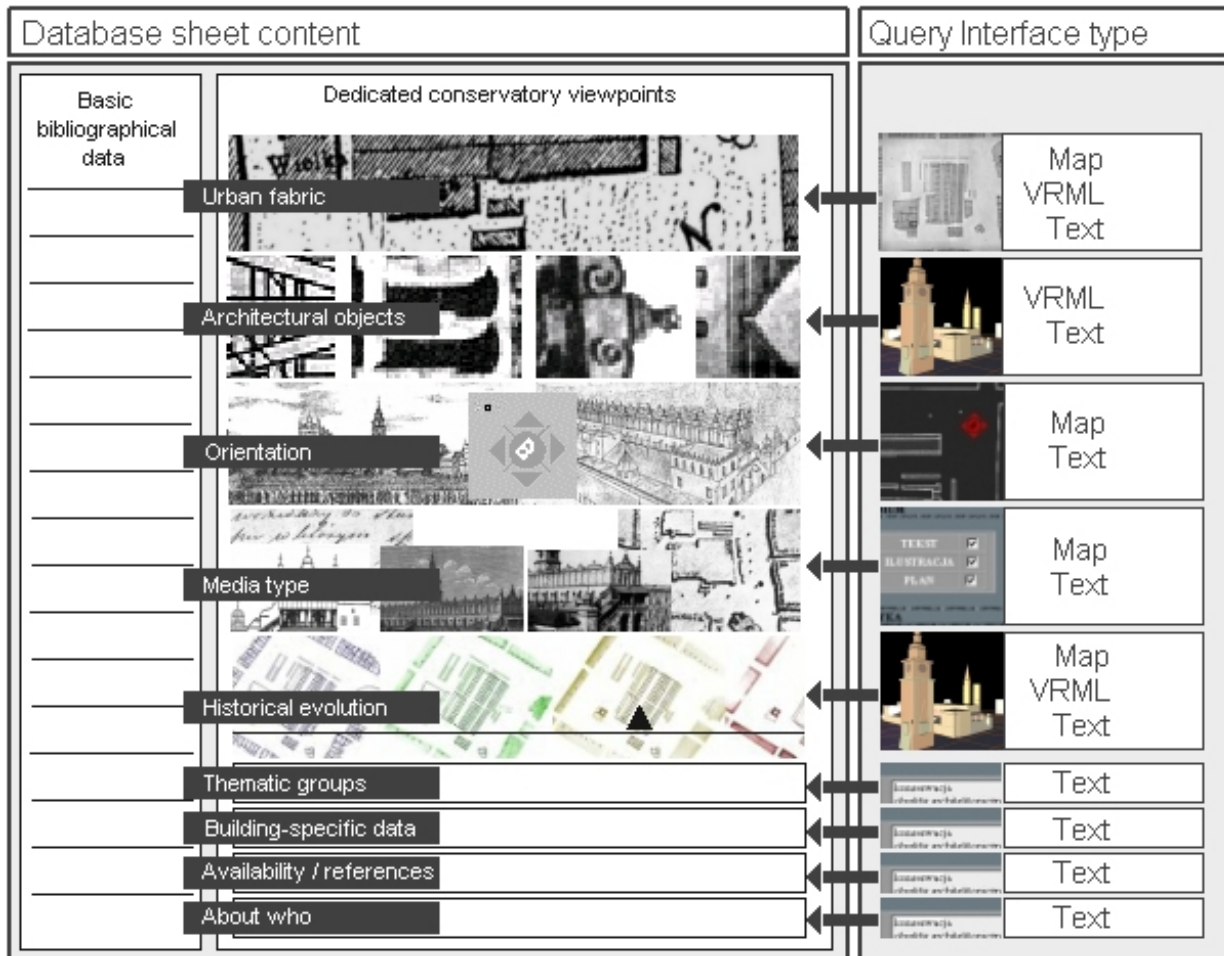
Building-specific-> References building-

Figure 3: database contents additional information and corresponding search interfaces

specific problems (Town hall's clock, etc…)

About who-> Relation to authors or to conservators

URL-> Connection to a url address (access to a local or distant url containing information irrelevant in the context of the database such as thorough text, images, etc..)

5 Web interface: accessing / adding data

A Web interface has been implemented in order to access and interact with the SOL database. Standard CGI forms, basic entry modes to the system, are used in standard text-based query interfaces. Other query interface types however are preferred in performing searches on the building-oriented "Dedicated points of view": cartographic interfaces and VRML 2.0 3D interfaces.

5.1 The web interface's query modes

All points of view can be handled through standard text-based search interfaces in which basic criteria are proposed starting from a media type choice. A text-based "choose your search mode" query mode allows the user to choose in the thorough list of criteria the ones he considers as relevant for his purposes since the system generates contextual search interfaces.

Plan-based interfaces are proposed to handle the urban fabric, orientation, historical evolution and illustration type search modes. VRML 2.0 scenes featuring architectural object on the main square are another search mode, dedicated to architectural scale and historical evolution searches.

5.2 The Updating procedures

Two updating levels are provided:

Updating data: a text interface displays the fields to fill in, and manages problems related to data missing and accentuation (polish fonts).

Updating criteria: current criteria are displayed in a text interface in which additional criteria can be added. The system manages the updating of criteria lists and allows the user to carry on his data updating with the added criteria and takes them into consideration in the query interface.

6 Web interface implementation

6.1 Accessing DBMS through Perl object modules

The SOL system technical background is a relational DBMS software interfaced for the web through Perl (Practical Extraction Report Language) object modules developed for the program.

In Object oriented programming, a field of knowledge is split into elementary concepts, structured through refinements of classes. Objects thereby organised are described in a "behaviour and purpose" approach, allowing a programmer to order an action from an object without knowing precisely how the action will be handled by the object.

This formalism is widely used in GAMSAU's architectural model [1][3] developed in JAVA .

The interface programming language chosen here, Perl, is an interpreted language commonly used in web developments handling CGI.

So-called "OO modules" developed here in Perl perform only some Object -oriented like programming basics: Abstraction , inheritance, polymorphism and reusability.

Objects attributes and methods are described in modules used to handle the successive interfacing stages.

Hierarchies of such objects perform most of the connection, information coding and inputs handling. Restricted to these purposes, Perl OO modules are a satisfactory technical answer.This choice enables beginner programmers to develop new interfaces to the system never mind

whether they know or not the structure of the database.

6.2 VRML scene authoring

The ARKIW program is part of a wider research called MOMA in which a VRML authoring tool called HUBLOT has been developed [][]. The VRML 2.0 scenes presented as a database interface can be produced with this tool in which a non-computer scientist formalises reconstructional hypothesis buildings based on the analysis of relevant architectural corpus.

VRML authoring, and more generally 3D representation, is therefore not considered as an end but as an entry to patrimonial information and as the evolutive mirror of a research.

7 *Ongoing developments*

The SOL system is currently under validation process between the partners of the program. It has been developed in order to experiment a first collaborative platform for patrimonial information and greatly encourages computer scientists and researchers in the scope of conservation to question one another. Other developments of the program strongly focus on the making of reconstructional hypothesis inside an online authoring interface[1].

The analysis of the architectural and urban evolutions of Kraków's main square is today a crossing point for historians, architects, archaeologists, etc.. Computer scientists are therefore confronted to a phenomenon in which both the concepts (the objects) and their representations for diverse disciplines evolve at high speed.

Education and research in the scope of architecture and its history are in return questioned on how the development of information technologies, representation techniques, and platform-independent developments can enrich their discipline.

As an answer to the growing complexity and quantity of data gathered in architectural heritage environments, the implementation of an architectural model
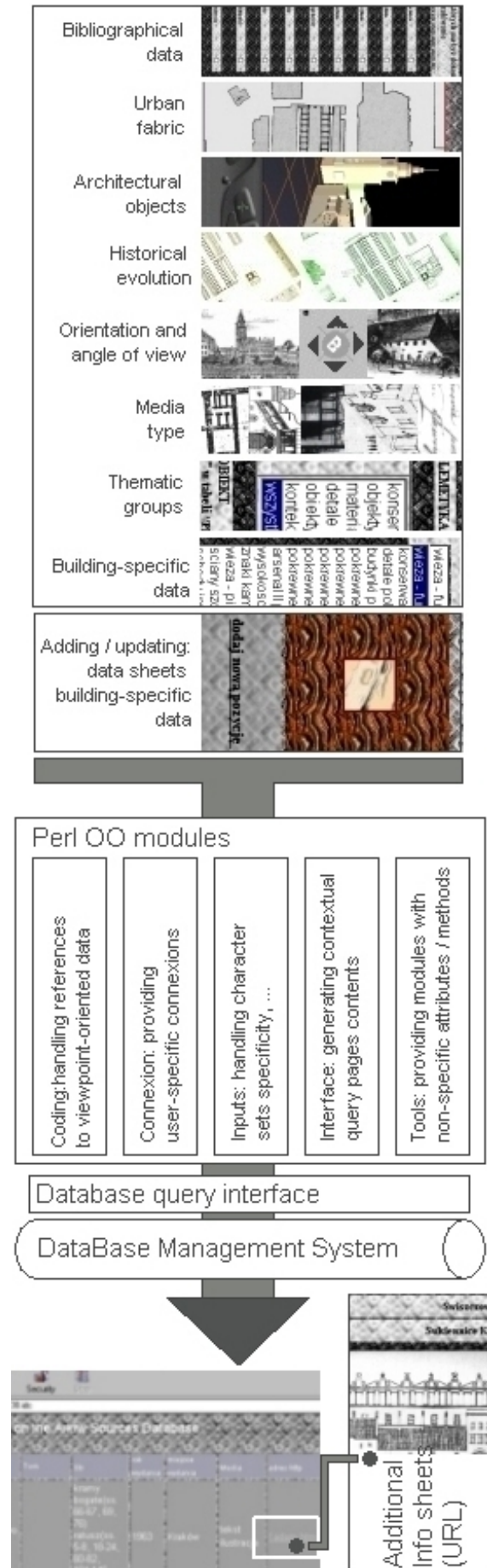
generating spatial non-ambiguous nodes of information can greatly favour a better recording and understanding of urban fabrics.

Bibliography

[1]   Java collaborative interface for architectural simulations *A case study on wooden ceilings of Kraków*
International Conference On Conservation Kraków 2000
23 et 24 novembre 1998, Cracovie, Pologne.
Jean-Yves Blaise & Pierre Drap : gamsau UMR MAP 694.
Iwona Dudek, mgr inz.arch. : Institute of History of Architecture and Monument Preservation Cracow University of Technology Faculty of Architecture

[2]   Collaborative network tools for the architectural analysis in conservation research
CYBER-REAL DESIGN 1998 23-25 April 1998 Białystok, POLAND. Proceedings, pages 75 à 85.
Institute of History of Architecture and Monument Preservation Cracow University of Technology Faculty of Architecture
Iwona Dudek, mgr inz.arch. Jacek Czubinski, Dr arch.
Jean-Yves Blaise & Pierre Drap : gamsau UMR MAP 694.

 [3]   From photogrammetrical survey to architectural models monitoring through a virtual reality interface.
Complex Systems Intelligent Systems & Interfaces du 26 au 28 mai 1998 Nimes, France.
Publié dans La lettre de l'IA, numéro 134-135-136 mai-aout 1998 pages 168, 175.
Jean-Yves BLAISE, Pierre DRAP, Michel FLORENZANO

[4]   Interfacing virtual reality and a survey process. An experimentation on the bigot model of ancient rome.
CAA 98, 26èmes rencontres Computer Applications in Archaelogy
Du 25 au 28 mars 1998, Barcelone, Espagne.
Jean-Yves BLAISE, Pierre DRAP, Michel FLORENZANO

[5]   PAROS, Photogrammétrie et modèles objet appliqués à l'étude de l'architecture construite
Revue Informatique et Statistique dans les Sciences Humaines
1997, numéros de 1 à 4, pages 163 à 190.

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Web references:
Arkiw web site
http://alberti.gamsau.archi.fr
Moma research web site
http://moma.gamsau.archi.fr
WA PK
http://www.pk.edu.pl