ARKIW Architectural evolution of Town Hall in Kraków: system of information and knowledge representation, simulation of reconstructional hypothesis

Iwona Dudek, Jean-Yves Blaise

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Evolutions architecturales de l'hôtel de ville de Cracovie: un système d'information et de représentation des connaissances, simulation d'hypothèses de reconstruction.

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The ARKIW programme's main theme is a contribution to the enhancement of heritage investigation methods, the experiencing of knowledge modelling approaches, and the use of information technologies in the representing; recording and studying of the architectural heritage through Internet.
It is establish in the frames of the scientific co-operation between UMR MAP CNRS/MCC 694 (France) and Institute HAiKZ from Faculty of Architecture, Kraków (Poland).

Le projet ARKIW a pour objectif le développement d'une plate-forme d'investigations scientifiques sur l'architecture patrimoniale partagée sur *Internet. Sa préoccupation centrale est donc l'intégration des méthodes informatiques et des problématiques patrimoniales, double ancrage auquel correspondent les spécialités respectives du laboratoire MAP-GAMSAU et de l'institut HAiKZ.*

Program ARKIW ma charakter interdyscyplinarny i ma na celu współpracę przy konstrukcji, rozwoju i testowaniu systemów informacji oraz narzędzi służących analizie architektoniczno - konserwatorskiej obiektów historycznych poprzez Internet. Jest to międzynarodowy program współpracy pomiędzy UMR MAP-GAMSAU CNRS/MCC 694 (Francja) i Instytutem HAiKZ, Wydziału Architektury Politechniki Krakowskiej.

with help from / *avec aide de* / wspierane przez*:*

Centre National de la Recherche Scientifique – CNRS (FR)

Komitet Badań Naukowych – KBN (PL)

TEMPUS - European Community Programme

Ministère des Affaires Etrangères (FR)

UMR MAP CNRS/MCC 694 (Gamsau) *

Models and simulations for architecture, urbanism et landscape

Modèles et simulations pour l'architecture, l'urbanisme et le paysage
Modele i symulacje w dziedzinach architektury, urbanistyki i architektury krajobrazu

EAML, 184 av. de Luminy, 13288 Marseille Cedex 09, tel. (++33) (04) 91.82.71.70, fax. (++33) (04) 91.82.71.71, http://www.map.archi.fr/

UMR MAP is a research team (supported by French Ministry for Culture and French National Centre for Scientific Research), addressing questions related to the fields of architecture, urbanism and computer science. It is a multidisciplinary laboratory that includes five teams, hosting architects, historians, computer scientists and geographers.
Researches performed in Gamsau laboratory directly involved in ARKIW co-operation, focus on representation in architecture, meaning the completion of knowledge representations of the domain permitting scientific investigations on architecture and urban fabrics.

L'UMR 694 MAP associe le CNRS et le Ministère de la Culture et de la Communication. Elle est constituée de cinq équipes dont les problématiques portent sur les applications de l'informatique à l'architecture. L' équipe GAMSAU - Groupe de recherche pour l'Application de Méthodes Scientifiques à l'Architecture et à l'Urbanisme associe architectes, ingénieurs, historiens, géographes, informaticien dans le cadre d'une approche résolument pluridisciplinaire et considérant l'architecture comme pratique et objet de connaissance, les travaux du laboratoire portent sur l'élaboration de modèles et d'outils de simulation en architecture. Celle-ci est considérée dans ses dimensions patrimoniales, constructives, urbaines et paysagères.

UMR MAP jest jednostką naukową związaną z CNRS i Ministerstwem Kultury i Komunikacji (Francji). Jednostka ta łączy pięć zespołów, w których współpracują ze sobą architekci, historycy, informatycy i geografowie.
Ekipa Gamsau, bezpośrednio zaangażowana we współpracę w ramach programu ARKIW, posiada kompetencje i doświadczenie w dziedzinie tworzenia i rozwoju metod oraz narzędzi badawczych służących symulacji w dziedzinie architektury i urbanistyki, fotogrametrii architektonicznej oraz budowie systemów gromadzenia i wymiany danych dotyczących dziedzictwa historycznego.

* until / jusque / do 1997 : *Gamsau - **G**roupe d'études pour l'**A**pplication des **M**éthodes **S**cientifiques à l'**A**rchitecture et à l'**U**rbanisme, URA CNRS 1247*

Institute HAiKZ WA PK*

Institute of History of Architecture and Monument Preservation

L'Institut Institut de l'Histoire de l'Architecture et de la Conservation des Monuments

Instytut Historii Architektury i Konserwacji Zabytków

ul. Kanonicza 1 , 31 - 002 Kraków, tel / fax. (++48) (012) 421-87-22, http://riad.usk.pk.edu.pl/~a-1/ , http://www.pk.edu.pl/

The Institute of History of Architecture and Monuments Preservation is one of the nine institutes federated in Faculty of Architecture, Kraków University of Technology. It has strong practical skills and knowledge of the conservation and preservation of architectural and urban heritage and long educational experience. In frames of ARKIW co-operation Institute HAiKZ takes responsibility for knowledge extraction and selection of buildings and fields of experiments.

L'Institut HAiKZ est un des neufs instituts fédérés au sein de la Faculté d'Architecture de Cracovie. Il est spécialisé dans l'enseignement et la recherche sur les domaines de l'histoire de l'architecture et de la conservation des édifices patrimoniaux. Dans le cadre de ce programme, il se charge de l'extraction des connaissances relatives aux édifices traités, de leur choix et de l'expérimentation des outils développés.

Instytut HAIKZ jest jednym z dziewięciu instytutów wchodzącym w skład Wydziału Architektury Politechniki Krakowskiej. Profil naukowo-badawczy Instytutu HAiKZ dotyczy historii architektury, historii sztuki oraz konserwacji zabytkowych zespołów architektonicznych. Wyróżnić można następujące specjalności szczegółowe: związki architektury współczesnej z wartościami historycznymi w zespołach zabytkowych, teoria i technologia konserwatorska, architektura i konserwacja obiektów i zespołów drewnianych oraz architektura XIX i XX w.
W ramach programu ARKIW Instytut HAiKZ jest odpowiedzialny za etap analizy danych oraz wybór kierunków eksperymentacji.

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Wydział Architektury Politechniki Krakowskiej

1. Co-operation agreement (1997) - initialisation

Initialisation de l'accord de coopération (1997)
Wstępne porozumienie o wspólpracy (1997)

The co-operation agreement, signed in 1997, had for main purpose the building up of scientific exchanges between the GAMSAU URA CNRS 1247 research team (future organiser of UMR MAP CNRS/MCC 697) and the Institute of History of Architecture and Monument Preservation within Faculty of Architecture of Kraków University of Technology. The co-operation aimed at:

- transfer of technologies and research methodologies,
- co-operation in diverse research activities notably in the fields of architectural conservation, architectural surveying and photogrammetry, computer applications and tools in patrimonial studies and Web-based technologies.
- exchange of researches and PhD students.

L'accord de coopération, signé en 1997, a eu pour le objective principal la naissance des échanges scientifiques entre la équipe de recherche de GAMSAU URA CNRS 1247 (futur organisateur de UMR MAP CNRS/MCC 697) et l'Institut de l'Histoire de l'Architecture et de la Conservation de Monument de la Faculté d'Architecture, dans l'Université Technologique de Cracovie.
Les objectives principales de la coopération:

- *transfert des technologies et des méthodologies de recherches,*
- *coopération dans des activités diverses de recherches notamment dans les domaines de la conservation architecturale, photogrammétrie architectural, les applications et les outils informatiques dans des études patrimonial,*
- *l'échange de chercheur et des doctorants.*

Porozumienie o współpracy, podpisywane w 1997, miało za cel główny ustanowienie zasad naukowej współpracy pomiędzy de GAMSAU URA CNRS 1247 (przyszły organizator de UMR MAP CNRS/MCC 697) i Instytutem Instytut Historii Architektury i Konserwacji Zabytków Wydziału Architektury Politechniki Krakowskiej.
Główne cele współpracy:

- transfer technologii i metodologii naukowych,
- współpraca naukowa, a w szczególności w dziedzinie konserwacji i ochrony architektury, fotogrametrii oraz wykorzystaniu technik i narzędzi komputerowych w analizie złożonych problemów dziedzictwa architektoniczno - urbanistycznego,
- wymiana naukowa (pracowników naukowych i doktorantów).
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2. Polonium n° 98138 (1998-2000) – continuation

Programme of scientific co-operation between France and Poland [*]

*Programme de coopération scientifique entre la France et la Pologne**
Polsko-francuskie działania zintegrowane *

Taking into a consideration the results obtained, in term of developments as well as the problematic of the research, the partners institutions decided to continue their co-operation.

[*] Programme Polonium (1998-2000) was mutually co-ordinated by Polish State Committee for Scientific Research, on behalf of Polish side, and by French Ministry of Foreign Affairs and Ministry of National Education, Research and Technology, on behalf of French side.
Programme Polonium (1998-2000), étais conduit conjointement par le Ministère français des Affaires Etrangères, le Ministère de l' Education Nationale, de la Recherche et de la Technologie, du côté français, et par le Comité d' Etat de la Recherche Scientifique (KBN) du côté polonais.
Program POLONIUM na lata 1998-2000 koordynowany był wspólnie: ze strony polskiej przez Komitet Badań Naukowych (KBN), a ze strony francuskiej przez Ministerstwo Spraw Zagranicznych (MAE) wraz z Ministerstwem Edukacji Narodowej, Badań i Technologii (MENRT).

Since 1998 the common program of co-operation and scientific exchanges called ARKIW has been supported through the programme of scientific co-operation between France and Poland - POLONIUM.

Au vu des résultats obtenus, tant en terme de développements que d'apports à leurs problématiques de recherche, les institutions partenaires ont décidé de poursuivre leur coopération. Depuis 199, le programme de d'échanges scientifiques et coopération ARKIW a été soutenu au travers d'un programme d'actions intégré entre la France et la Pologne - POLONIUM.

Biorąc pod uwagę uzyskane wyniki, tak pod względem rozwiązań technicznych jak i problematyki badawczej, obie współpracujące instytucje postanowiły kontynuować rozpoczętą współpracę. Od 1998 roku, wspólny program współpracy i wymiany naukowej ARKIW był wspierany w ramach polsko-francuskich działań zintegrowanych – Polonium.

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3. PICS 1150 (2000-2003) - generalisation

International Programs of Scientific Co-operation [**]

Programmes Internationaux de Coopération Scientifiques - généralisation

Międzynarodowe Programy Współpracy Naukowej- uogólnienie

After three years of co-operation, supported by Polonium funds, the partners decided to widen the scope of the problematic permitting scientific investigations on all architectural artefacts located on Krakow's main square (quoted on the UNESCO world heritage list). The co-operation project entitled: "*An information and knowledge representation system dedicated to patrimonial edifices and their architectural evolutions. An experiment on Kraków's Main Square*" was accepted to be realised in frames of PICS**, as a continuation of the ARKIW programme.

*Après trois ans de coopération, soutenus par des fonds de Polonium, les partenaires décidés élargir la portée de à l'étude problématique et le champ de l'expérimentation permettant des investigations scientifique des tous objectes architecturaux situer sur la Place Centrale de Cracovie (UNESCO héritage liste). Le projet de coopération: Un système d'information et de représentation des connaissances relatives aux édifices patrimoniaux et à leurs évolutions architecturales. Le cas de l'ensemble de la Place Centrale de Cracovie" a été acceptée pour être réalisée dans les cadres du programme PICS**, comme une suite du programme d'ARKIW.*

Po trzech latach współpracy w ramach programu Polonium, współpracujące jednostki podjęły decyzję o poszerzeniu zarówno zakresu problematycznego, jak i terenu będącego podmiotem opracowań. Zakres tematyczny objął historyczny rozwój zabudowy Rynku Głównego w Krakowie.
Projekt zatytułowany: „Systemy informacji i reprezentacji wiedzy dedykowane historycznym obiektom architektonicznymi układom urbanistycznym na przykładzie historycznego centrum Krakowa" został zaakceptowany do realizacji w ramach programu PICS**, jako kontynuacja programu ARKIW.

[**] Programme PICS (1998-2000) was mutually co-ordinated by Polish State Committee for Scientific Research, on behalf of Polish side, and by National Centre for Scientific Research (CNRS), on behalf of French side.
Programme PICS (1998-2000), étais conduit conjointement par le Centre National de la Recherche Scientifique (CNRS), et par le Comité d'Etat de la Recherche Scientifique (KBN) du côté polonais.
Program PICS (1998-2000) był wzajemnie koordynowany: ze strony polskiej przez Komitet Badań Naukowych (KBN), a ze strony francuskiej przez Narodowe Centrum Badań Naukowych (CNRS).

Objectives

The complexity and multiplicity of the questions raised in a process of a studying of architectural heritage, the ground of the research of the program ARKIW, encourage to promote new methods of investigation aiming at improvement of comprehension of architectural heritage and basing them on the development of information technologies. The objective of ARKIW programme is the experimentation of a information and knowledge management tool using Web technologies and benefiting from the strong complementarily of the partners of the project.

In the beginning the program was centred on the study of the Town Hall in Kraków. In a spirit of generalisation, the objectives were progressively widened to the instrumentation of the documentation about the architectural evolutions the historical centre of Kraków.

Around the topic of the architectural heritage and knowledge related to the patrimonial buildings, program ARKIW tackles the problems of the development of collaborative tools for Internet, of the hypotheses simulation, the data management and the survey. It proposes a set of operational tools described bellow. These results testify to the increasing interdependence of the research problems in a domain of computer science and the research problems of the domains of it's application. The relevance of the solutions depends not only on qualities of interface or a software adaptability, but also on the degree of integration of the questions raised by the domain of application.

The complementarity of the Polish and French teams permeated to built up a collection of computer based tools dedicated to the analysis, visualisation and simulation of the architectural heritage.

La complexité et la multiplicité des questions que pose le patrimoine architectural, terrain de recherche du programme interdisciplinaire ARKIW, amène à promouvoir de nouvelles méthodes d'investigation visant à favoriser sa compréhension et s'appuyant sur le développement des technologies de l'information. L'objectif central du projet ARKIW est l'expérimentation d'un outil d'information et de connaissances utilisant les technologies du Web, et tirant profit de la forte complémentarité des partenaires du projet.
Le programme ARKIW était à l'origine centré sur l'étude de l'ancien hôtel de ville de Cracovie. Il se fixe pour objectif, dans un esprit de généralisation de cette démarche, d'instrumenter, par un effort de modélisation des connaissances patrimoniales, la documentation des évolutions architecturales le centre historique de Cracovie.

Autour du thème du patrimoine architectural et des connaissances liées aux édifices patrimoniaux, le programme ARKIW aborde les problèmes du développement d'outils collaboratifs pour Internet, de la simulation d'hypothèses, de la gestion de données et du relevé. Ill propose aujourd'hui un ensemble de résultats opérationnels que nous décrivons ici. Ces résultats témoignent de l'interdépendance croissante des problématiques de recherche en informatique et de leurs domaines d'application. La pertinence de solutions logicielles dépend en effet ici non seulement des qualités de son interface ou de son adaptabilité mais aussi de l'intégration des questions posées par le domaine d'application dés l'étape de formalisation du modèle sur lequel s'appuient à la fois le raisonnement du conservateur mais aussi les traitements informatiques (gestion de données, simulations , visualisations, etc.).

La complémentarité des équipes française et polonaise nous a permis de mettre en œuvre un ensemble d'outils informatiques dédiés au patrimoine architectural.

Mnogość i złożoność problemów wiążących się z zagadnieniami dziedzictwa architektonicznego, leżącymi w centrum zainteresowań programu ARKIW, wymaga opracowania nowych metod, pomagających w pełniejszym zrozumieniu analizowanych problemów. Metody te winny, zgodnie z interdyscyplinarnym charakterem programu ARKIW, opierać się na technologiach informatycznych. Podstawowym celem programu ARKIW jest zatem eksperymentacja narzędzi pozwalających na dostęp

do informacji, zbudowanych w oparciu o wiedzę związaną z problematyką dziedzictwa architektoniczno-urbanistycznego i wykorzystujących możliwości technologii Web, opierając się na komplementarności kompetencji współpracujących zespołów.

W swoich początkach program ARKIW koncentrował się na studiach rozwoju historycznego Ratusza Krakowskiego. Z czasem zakres stawianych problemów został poszerzony. Głównym celem stała się instrumentalizacja dokumentacji architektoniczno-urbanistycznego rozwoju historycznego centrum Krakowa.

W obrębie podejmowanej problematyki opracowywane są Internetowe narzędzia służące obustronnej współpracy, systemy służące wizualizacji i symulacji hipotez rekonstrukcyjnych, systemy zarządzania danymi oraz metody wykorzystania numerycznych technik inwentaryzacyjnych. Rezultaty tych prac świadczą o rosnącej współzależności pomiędzy problemami badawczymi właściwymi dziedzinie informatyki i problemami wiążącymi się z dziedzinami, które dostarczają terenów eksperymentacji. Właściwości stosownych rozwiązań nie można mierzyć jedynie jakością interfejsu czy też możliwościami jego adaptacji, lecz brać należy pod uwagę również poziom integracji, jakość i poprawność formułowanych problemów, płynących z dziedziny implementacji (w tym przydatku z problematyką dziedzictwa architektoniczno-urbanistycznego).

Komplementarność kompetencji polskiego i francuskiego zespołu pozwoliła na definicje i konstrukcję zespołu eksperymentalnych narzędzi służących różnorodnym analizom elementów dziedzictwa architektonicznego.

Fields of experimentation
Terrains d'expérimentation / Tereny eksperymentacji

During the six years of work, the five separate fields of experimentation were isolated to develop and to question the formalisms of knowledge of representation and exchange of a data:

- the historical centre of Kraków,
- the ensemble of the Main Central Square of Kraków,
- the old town hall,
- Kramy Bogate,
- the wooden ceilings of the urban houses of Kraków.

These fields of experimentation constructed stable thematic and methodological base for successive developments (Hublot, Valideur, SOL and SOL2, VIA, DIVA, etc).

Pendant les six années de travail cinq terrains d'expérimentation ont été isolés pour mettre au point et questionner les formalismes de représentation des connaissances et d'échange de donnée:

- *le centre historique de Cracovie,*
- *l'ensemble de la place centrale de Cracovie,*
- *l'ancien Hôtel de Ville,*
- *les Etalages Riches (marche aux draps),*
- *les anciens plafonds en bois des maisons urbaines de Cracovie.*

Ils ont constituée un base thématique et méthodologique pour les successives développements (Hublot, Valideur, SOL et SOL2, VIA, DIVA, etc.).

W ciągu sześciu lat prac wyodrębniono pięć terenów eksperymentacji, które pozwoliły na przeprowadzenie różnorodnych testów wiążących się z problematyką reprezentacji wiedzy oraz organizację dostępu do heterogenicznych danych:

- historyczne centrum Krakowa ,
- zabudowa Rynku Głównego,
- Ratusz Krakowski,
- Kramy Bogate,
- drewniane stropy kamienic krakowskich.

Zakres ten określa również zasięg podstawowej bazy tematyczno-metodologicznej dla kolejnych eksperymentów prowadzonych w ramach programu (Hublot, Valideur, SOL et SOL2, VIA, DIVA, etc.).

Methodology
La méthodologie / Metodologia

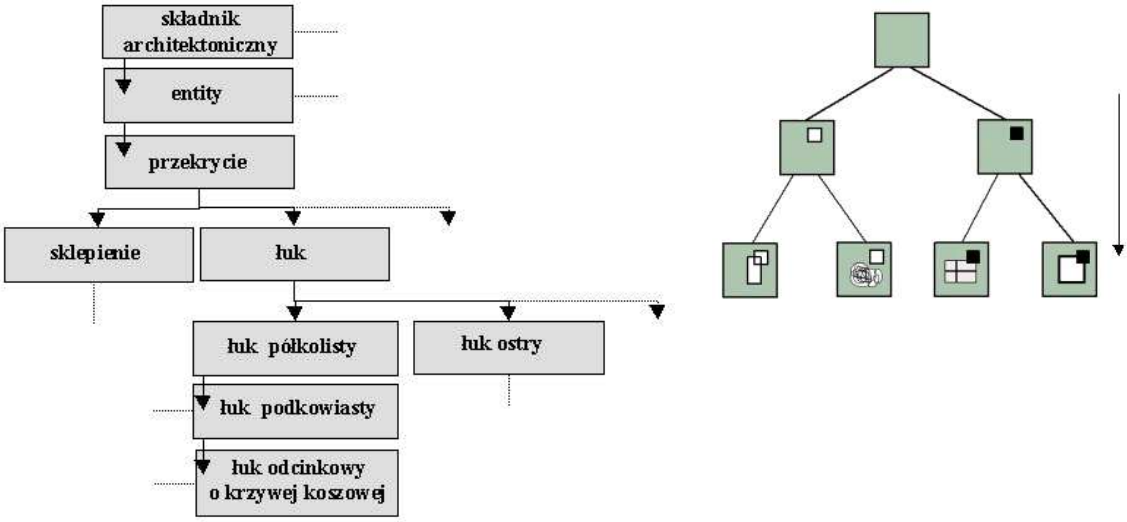
All the developments conducted in the frames ARKIW programme are based on the analysis of the architectural corpus that stands for a basis of an elaboration of the architectural model.
The architectural patrimony clearly reveals elements of permanence or of variability within the architectural language. The knowledge to be represented and handled features both primary concepts of architecture (the roofing, the opening, etc.) and their historical variations. A relevant answer to a question of how to deal with this issue is offered by the object oriented approach in computer science which enables a description concepts stemming from the phenomenon to be studied through a semantic hierarchy.

The method that is used in our work is based on a process in three stages:

- identification and organisation of the concepts,
- Representation of the instances in the form of 3D models,
- Management of a data bases containing the documentation related to the represented concepts.

Identification and organisation the objects

Identification and organisation the objects is an important phase of the work, frequently exploited within the framework of UMR MAP developments (ex. in instrumentation of the formulation of reconstructive hypotheses, since they are based on a group of predefined architectural entities). Therefore, the modelling of an architectural corpus has for an objective a precise determination of a group of univocal concepts, on which the architectural comparisons and analyses are based. These elements are identified, then organised in a hierarchy of objects (in the meaning of this word valid in Object Orientation Programming). In this knowledge representation based formalism, an domain is described as a collection of the individual concepts structured by successive refinements. The presented work encompass an informatic instrumentation and analysis of an architectural corpus.



An edifice is described as a collection of the elementary objets, which we call *an architectural entities*, organised by the mean of topological relations corresponding to the architecture language. As a consequence, each entity contains potentially a group of a graphic or non-graphic information allowing:

- to link its three-dimensional representation with a relevant collection of bibliographical references,
- to link its theoretical morphological description with a specific visualisation tool.

Tous le cas d'étude s'appuient sur une même analyse du corpus architectural servant de base à l'élaboration d'un modèle architectural sur lequel raisonner.
Le patrimoine architectural indique clairement des éléments de permanence et de la variabilité dans la langue architecturale. La connaissance à représenter et à manipulé comporte ou même temps des concepts primaires de l'architecture (ex. l'ouverture) et leurs variations historiques. Une réponse appropriée à une question de la façon de traiter cette issue est offerte par l'approche orientée objet en informatique.

Notre travail s'appuie sur un processus en trois volets :

- *Identifier et organiser les concepts à manipuler.*
- *Représenter des instances sous la forme de maquettes numériques.*
- *Gérer des bases documentaires dans lesquelles ces mêmes concepts sont présents.*

Identification et organisation d'un corpus d'objets
Cette étape importante est le biais utilisé dans le cadre des travaux de l'UMR MAP pour instrumenter, par exemple, la formulation d'hypothèses de restitution puisque celles-ci s'appuient sur un ensemble d'entités architecturales prédéfinies. La modélisation du corpus architectural a ainsi comme objectif la détermination d'un ensemble de concepts univoques sur lesquels asseoir comparaisons et analyses du bâti. Ces éléments sont identifiés puis organisés en une hiérarchie d'objets (au sens de la programmation orientée objet). Dans ce formalisme de représentation des connaissances, un domaine est décrit par un ensemble de concepts individuels structurés par raffinements successifs. Notre travail se situe ici à l'intersection d'une instrumentation informatique et d'une analyse du corpus architectural (et des sources notamment bibliographiques qui le sous tendent).

L'édifice est décrit comme une collection d'objets élémentaires que nous appelons entités architecturales organisées par le biais de relations topologiques correspondant à une transcription en terme de géométrie du vocabulaire de l'architecte. Chaque entité porte alors potentiellement un ensemble d'informations graphiques ou non graphiques permettant en particulier :

- *de coupler sa représentation tridimensionnelle avec un ensemble de références bibliographiques la concernant,*
- *de coupler sa description morphologique théorique avec un outil de visualisation spécifique.*

Wszystkie projekty należące do programu ARKIW oparte są na analizie korpusu architektonicznego, stanowiącego podstawę teoretycznego modelu architektonicznego stanowiącego ramy schematu rozumowania.
Dziedzictwo architektoniczne operuje językiem zawierającym stałe i zmienne elementy. Fragmenty wiedzy, które należy zinterpretować i opisać zawierają zarówno koncepty podstawowe (np. otwór), jak i ich zmieniające się ich historyczne odmiany (np. okno szczelinowe). Odpowiedzi na pytanie, w jaki sposób należy podchodzić do wyżej omówionych problemów, oferuje informatyka wraz z technologiami opartymi o model zorientowany obiektowo. Wybór ten pozwala na wprowadzenie zhierarchizowanego systemu organizacji podstawowych elementów architektonicznych, podlegającego prawom dziedziczenia cech, którego efektem jest coraz większa różnorodność form.

Prace opierają się o trójetapowy proces obejmujący:

- identyfikację i organizację podstawowych konceptów architektonicznych,
- reprezentację w postaci modeli numerycznych,
- organizacje i zarządzanie bazą dokumentacyjną, opisującą reprezentowane elementy.

Identyfikacja i organizacja obiektów
Etap ten dotyczy formalizmu często wykorzystywanego w pracach UMR MAP w przypadkach, w których stosowane są z góry zdefiniowane grupy elementów architektonicznych (np. w formalizacji hipotez rekonstrukcyjnych). Definicja korpusu architektonicznego ma tu za cel określenie grupy jednoznacznych elementów (konceptów), na których opierać się mają planowane analizy. Zastosowana metodologia opiera się na znajomości budowy formy architektonicznej wynikającej z morfologicznej, strukturalnej i formalnej analizy obiektu architektonicznego. W świetle tej metodologii obiekt architektoniczny rozumiany jest jako zespół podstawowych elementów architektonicznych (*entities*) powiązanych przez łączące je zasady relacji (*réseau*).
Każde *entity* zawiera potencjalnie zespół informacji graficznych i nie graficznych, które pozwalają między innymi na:

- połączenie ich trójwymiarowej reprezentacji ze zbiorem opisujących ją dokumentów (np. bibliografii),
- stworzenia metod wizualizacji teoretycznego opisu morfologicznego danego elementu dla wybranego narzędzia wizualizacyjnego.

Evolution of the technological platform

Evolution de la plateforme technologique / Zmiany platformy technologicznej

The technological choices include:

- The multi-platform developments of the freeware standard Web formats (VRML / HTML /XML /Javascript /Perl, free databases Interbase/ MySql),
- Assuring the portability of these developments,
- Providing an exploitation of developments by the potential users after the experimentation period, without particular technical or financial constraints. The particular attention was given to provide as large independence regarding the problems of versioning.
- Guarantee the possibilities of model and data further evolution in order to assure their updating when the knowledge will change.

Nos choix technologiques :

- *Développements multi-plateforme autour des formats standards pour le Web et à partir d'outils de la famille des logiciels libres. (Langages VRML/HTML/XML/Javascript/Perl, Bases de données libres Interbase/MySql).*
- *La portabilité de ces développements et leur prise en main après expérimentation par leurs destinataires, sans contraintes d'ordre technique ou financier. Il résulte également dans une plus grande indépendance vis à vis des problèmes de versionnements de logiciel qui dans la pratique restent délicats.*
- *L' évolutivité du modèle et des contenus de façon à pouvoir mettre à jour le modèle lui-même et ses instances lorsque les connaissances sur l'édifice ou l'ensemble architectural évolue*

Wybór stosowanych technologii:

- Stosowanie rozwiązań zgodnych z podstawowymi platformami technicznymi, wykorzystujących standardowe formaty Web należące do grupy programów bezpłatnych (freeware). (VRML/HTML/XML/Javascript/Perl, nieodpłatne bazy danych Interbase/MySql).
- Zapewnienie mobilności proponowanych rozwiązań (uniezależnienie możliwości ich wykorzystania od instalacji skomplikowanych programów) oraz możliwości bezpośredniego przekazania ich w ręce przyszłych użytkowników po okresie testów, bez narzucania im ograniczeń natury technologicznej czy finansowej. Wybór ten wiąże się również z wolą zapewnienia jak największej niezależności proponowanych rozwiązań od problemów wynikających z częstych zmian wersji programów, który w praktyce może powodować wiele problemów.
- Zapewnienie możliwości ciągłego uaktualniania teoretycznego modelu, obiektów tworzonych na jego podstawie (*instances*) oraz danych, tak aby mogły one ewoluować wraz ze zmieniającym się stanem wiedzy.

n° 1 – experimentation

Representation of knowledge and simulation of reconstructional hypothesis - architectural evolution of Town Hall in Kraków.

Représentation des connaissances et simulation d'hypothèses de reconstruction - évolutions architecturales de l'Hôtel de Ville de Cracovie.
Rreprezentacjia wiedzy i sumulacjia hipotez rekonstrukcyjnych na przykładzie Ratusza Krakowskiego.

fields of experimentation :
terrains d'expérimentation
tereny eksperymentacji

Town Hall in Kraków
l'Hôtel de Ville de Cracovie / Ratusz Krakowski

The subject of this case study is the Old Town Hall of Kraków and its evolution through history.

The main body of the Town Hall in Kraków was demolished in the early XIXth century and only its Gothic tower was left standing. Some relics of the main building of the Town Hall still exist under the level of Main Market Square pavement. They were examined and their detailed descriptions accompanied with hypothetical reconstructions are available. It gives the opportunities of creating reconstructional models of development of the Town Hall in different periods, according to various authors.

The successive reconstructions of our case study, The Old Town Hall, correspond to several styles and trends of the European architecture. The edifice therefore clearly reveals elements of permanence or of variability within the architectural language. The knowledge to be represented and handled features both stable concepts (the roofing, the opening, etc.) and their historical variations. A relevant answer to the issue of how to deal with this question is offered by the object oriented approach in computer science which enables a description of concepts stemming from the phenomenon to be studied through a semantic hierarchy.

Successive steps
Les étapes successives / Etapy prac

- gathering of the data (bibliographic, iconographic and cartographic materials),
- verification of the reutilization feasibility of the old negatives (Town Hall,)
- photographic campaign with an objective of valorisation (didactic goals, stereo presentation) and production of images of syntheses,
- elaboration of the leading reconstructional hypotheses,
- identification and categorisation of the architectural models,
- working out of the modelling methodology,
- modelling and simulations in Maya.

Results
Les résultats / Rezultaty

- The seminar organised by Institute HAiKZ ("*Techniki cyfrowe w procesie ochrony dziedzictwa Kultury*", 23 September 2000, Kanonicza 1, Kraków)
- A large scale public stereo projection in the heart of the town(„*In the walls of Kraków*", 23 September 2000, Rynek Główny, Kraków)
- diploma design - "*Historical evolutions of Kraków's Old Town Hall*" prepared by Christian RADI, supervised by Dir. M. Florenzano and Prof. A. Kadłuczka (Marseilles 2000)

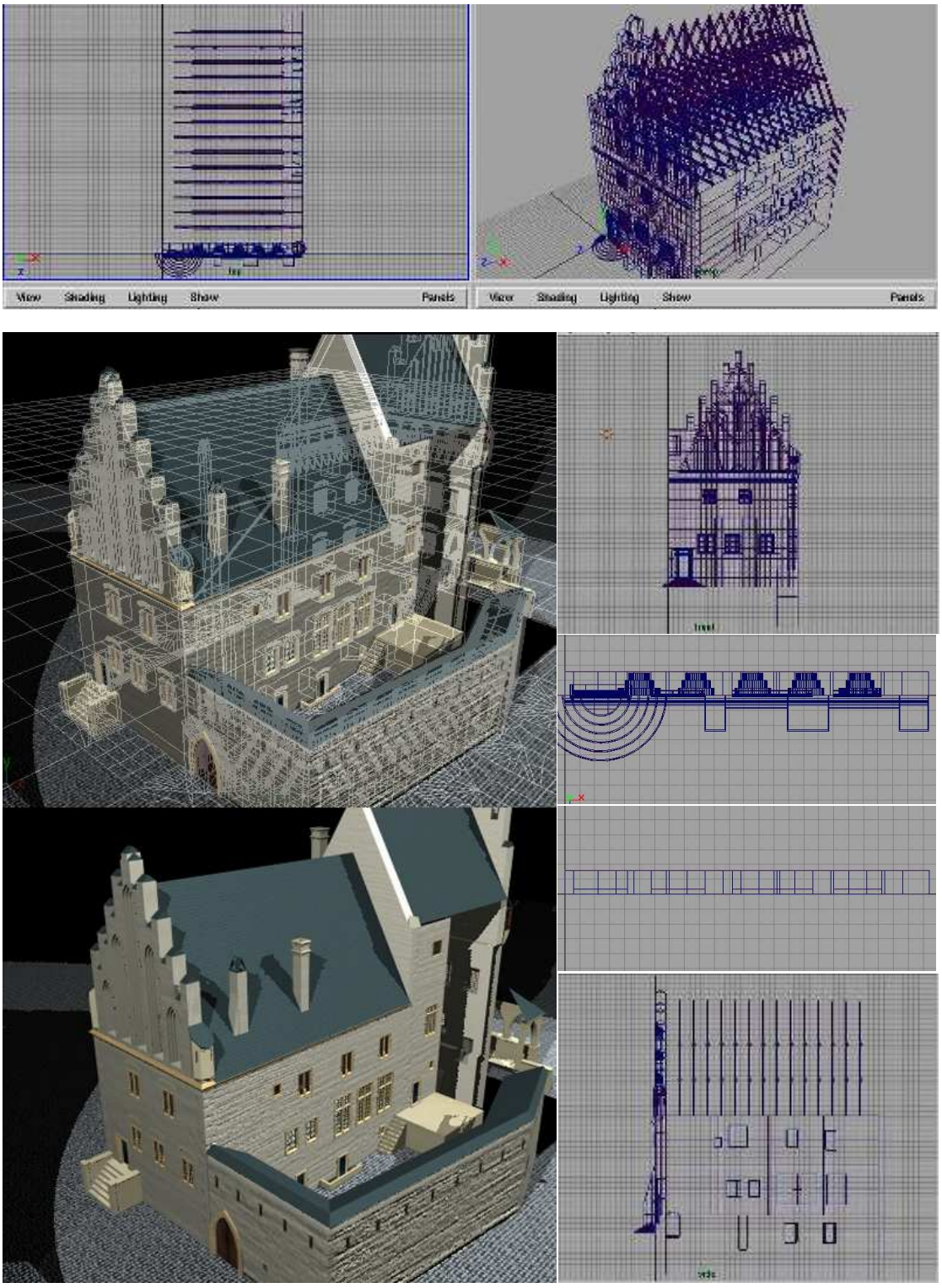
Publications related to the experiment:
Les publications liée ou sujet / Publikacje

[1.] ***„A photogrammetric survey using knowledge representation on the ARPENTEUR web-based photogrammetric workstation”***
proceedings: XVII CIPA (International Committee For Architectural Photogrammetry) International Symposium, WG3 - Simple Methods for Architectural Photogrammetry, Olinda, Brazil, October, 1999
authors: P. Drap, J.Y. Blaise, P. Grussenmeyer,

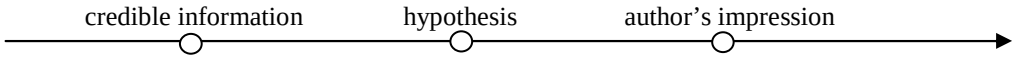
[2.] ***„Modèles et représentation à l ’échelle architecturale: une expérience à Cracovie”,***
proceedings: Rome an 2000, Cahiers de la MRSH - Caen n°33, June 2000, Caen, FR
ISSN 1250-6419, pp. 155-169
authors: J.Y. Blaise, M. Florenzano

[3.] ***„Representation de l’edifice patrimonial: echelles et usages. Une experience a Cracovie”***
Seminar of UMR MAP 694 CNRS / MCC, Touluse, FR, December 2000
authors: J.Y. Blaise/Dudek

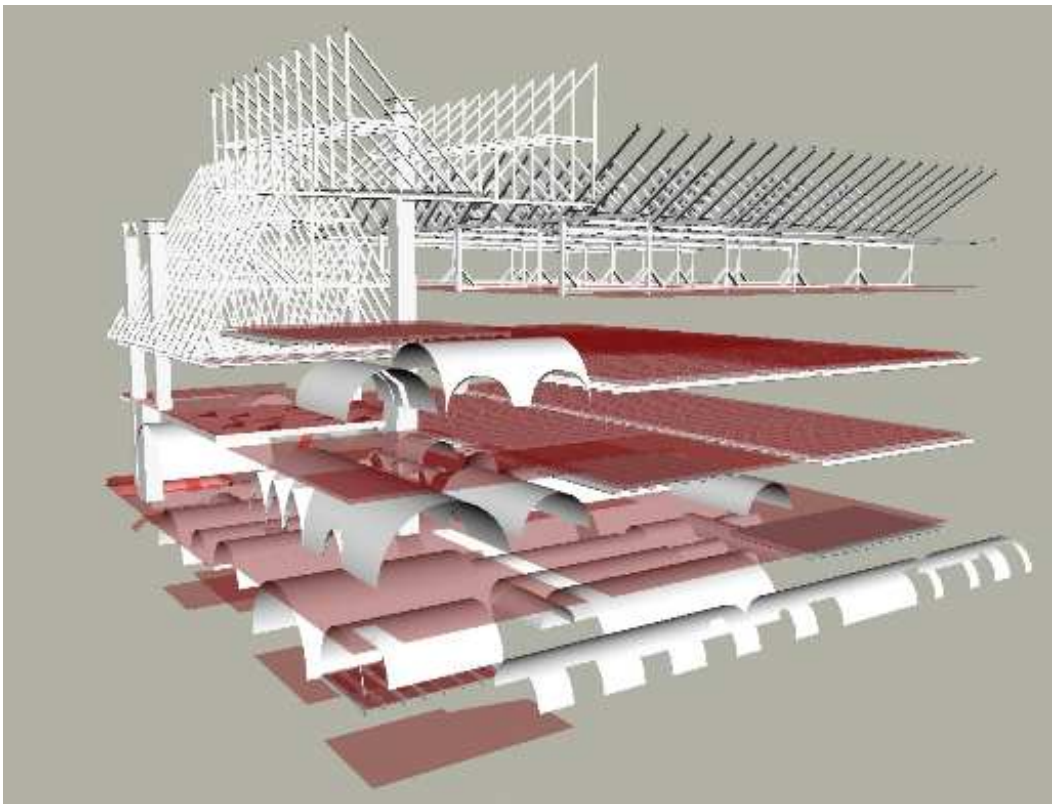
Illustrations:
Les illustrations / ilustracje

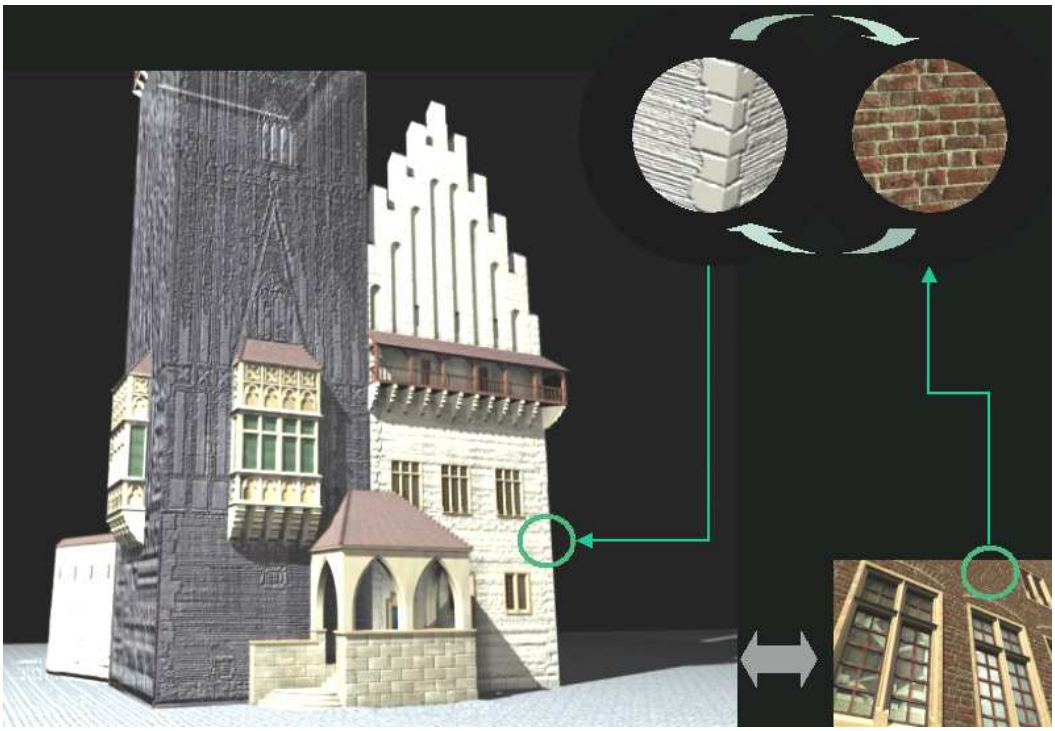


Construction of the models - study.

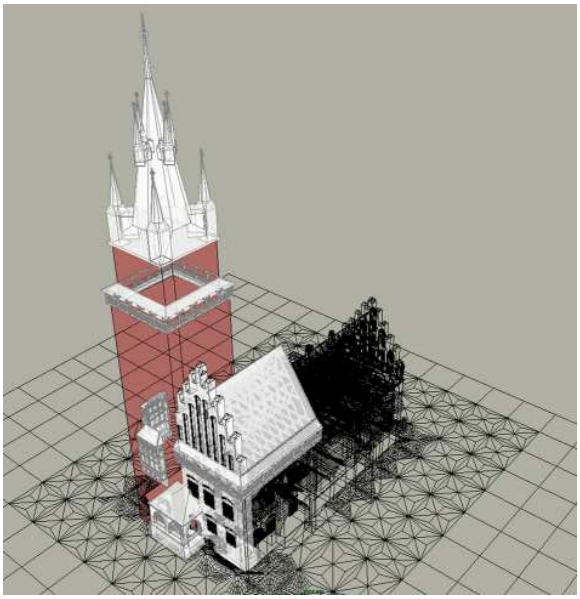


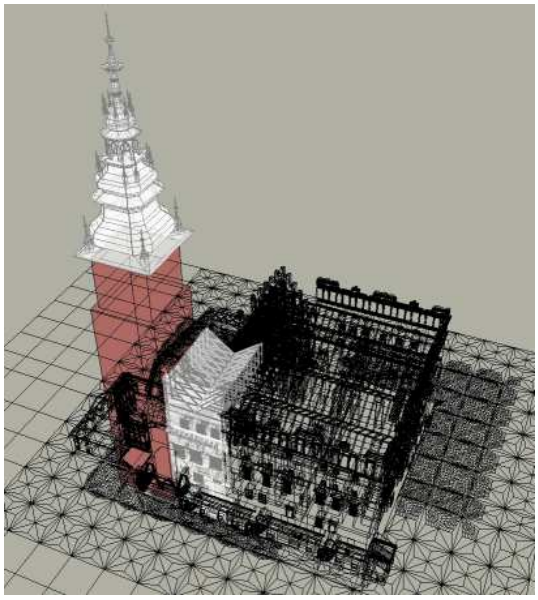
Even inside a single piece of documentation the consistency of information confidence varies.
View on the Town Hall from the North (author: . B. Stachowicz)

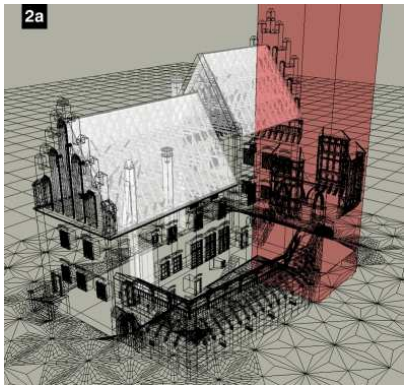


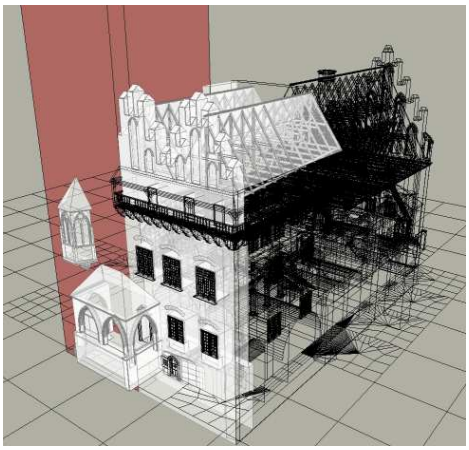


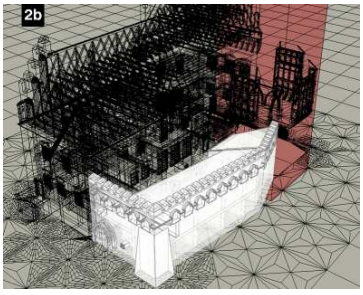
Construction of the models - study.

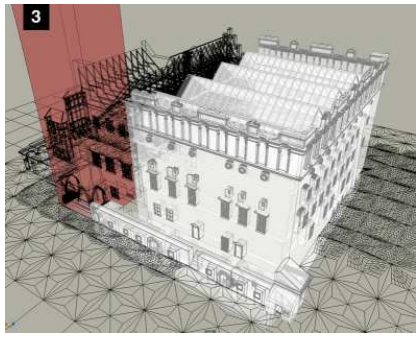


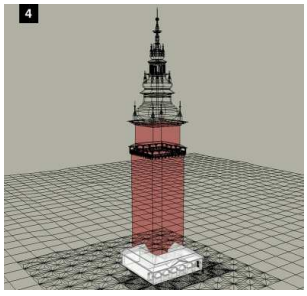








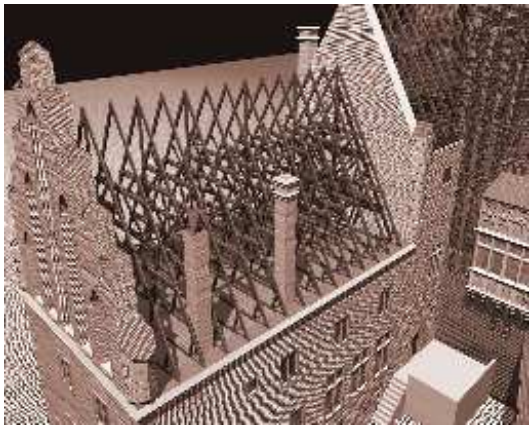


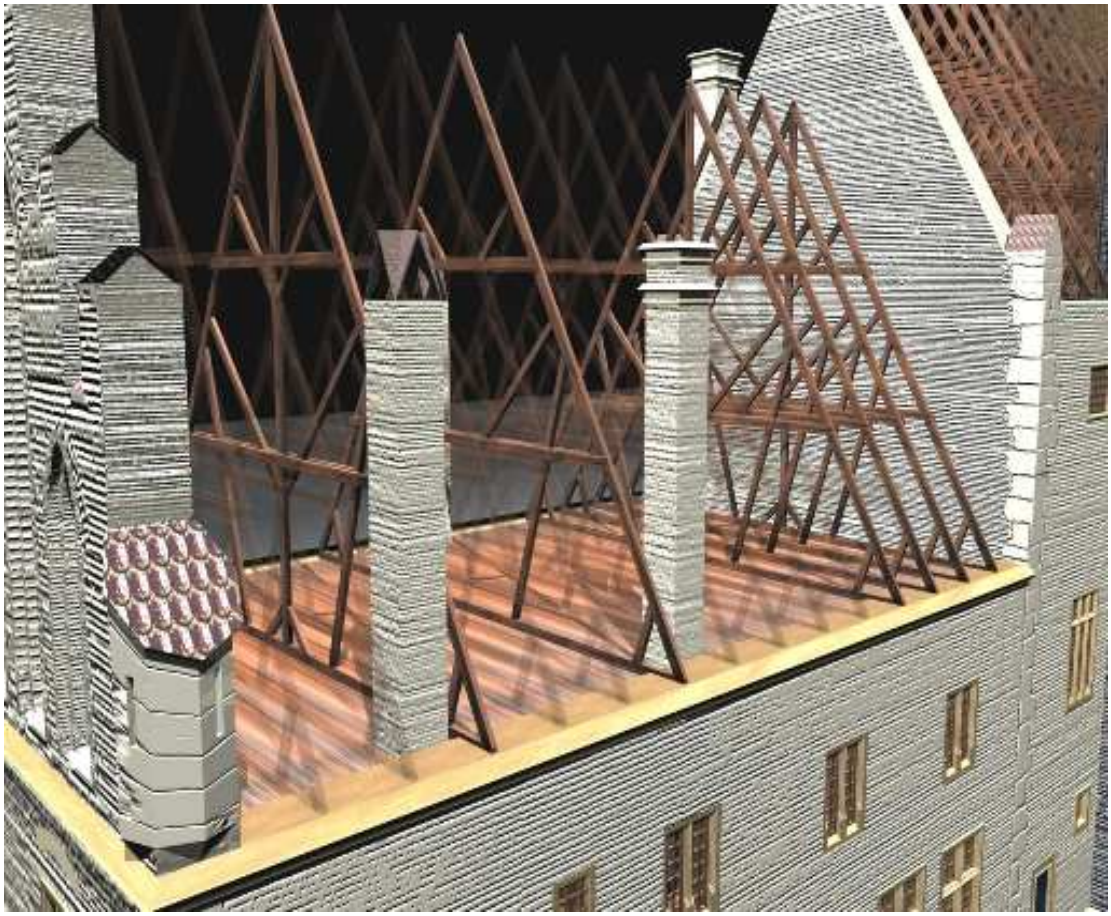


Evolution of the Town Hall. Study of various hypotheses.

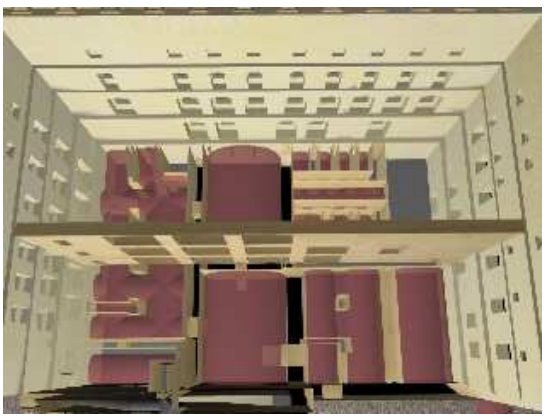
Tower of Town Hall – first evolution (hypothesis)

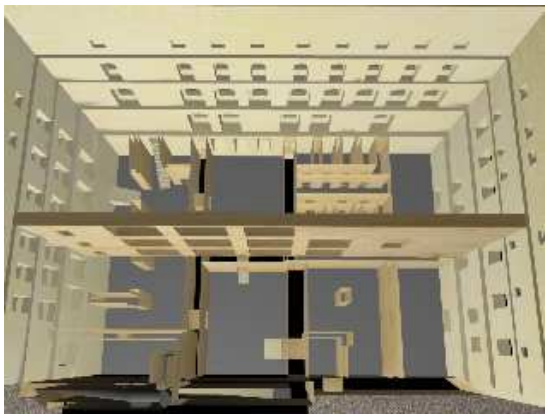
Tower of Town Hall – second evolution (documented)

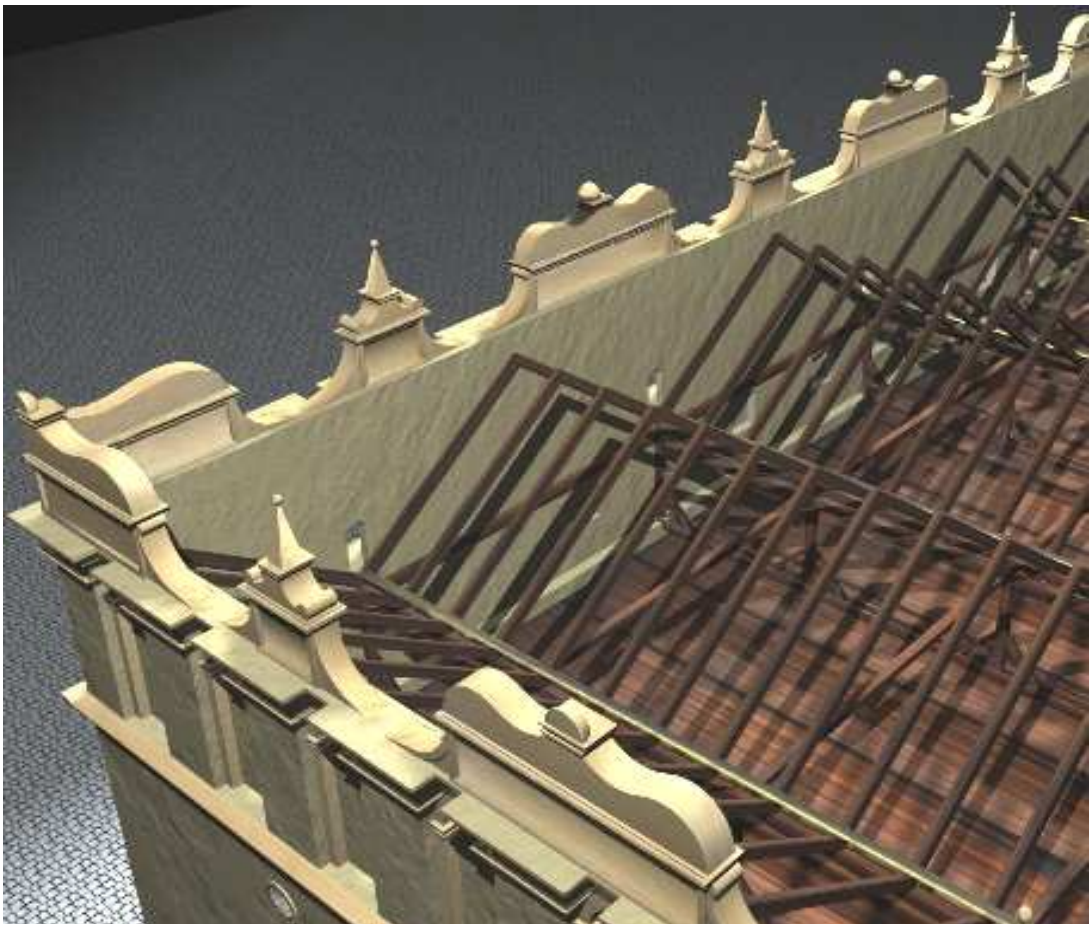




The Gothic section of the Town Hall.
The roof construction over the western block.







The Renaissance section of the Town Hall.
The basement and the roof construction over the *spichlerz*.

The Gothic Town Hall.
A view from the West

The Renaissance Town Hall.
A view from the East

n° 2 - development

Hublot – 3D modeller

Hublot - 3D modeller
Hublot - 3D modeller

fields of experimentation :
terrains d'expérimentation
tereny eksperymentacji

Kramy Bogate
Les Etalages Riches de la ville de Cracovie
Kramy Bogate Rynku Krakowskiego

The wooden ceilings of the urban houses of Kraków
Les plafonds en bois des maisons urbaines de la ville de Cracovie
Drewniane stropy kamienic krakowskich

The Hublot interface was dedicated to an on-line edition and analysis of scenes (creation of architectural entities and connection of one to another through relations corresponding to the vocabulary of the architect). This interface lets a researcher to interact with the theoretical models (create and arrange his own set of entities) through a Web browser in which textual data and VRML 2.0 (Virtual Reality Modelling Language) scenes are connected authorising:

- addition or subtraction of entities in an array (specific combination of entities and relations),
- addition of sub-arrays (combination of arrays),
- modification of entity's features (position, dimension, orientation, etc.),
- on line computing and visualisation of the results in VRML (an interactive platform-independent 3D scene definition language),
- on line computing and visualisation of the textual reports in HTML (listing the characteristics of each entity in the scene),
- connection between the two types of results (results in VRML and HTML),
- iterative action on each of these levels.

The research targeted at diverse users: researchers in computer science and disciplines related to architecture (survey, conservation, archaeology). All developments used the JAVA Web-enabled Object Oriented language. This technical choice gives a possibility to propose a collaborative platform meeting three requirements:

- distant access (definition and modification of scenes, interaction with the architectural model, access to the survey process),
- Object-oriented methodology in the formalisation of the architectural model,
- platform independence (the interface is available on all net-enabled computer systems),
- ease of use for non-computer scientists.

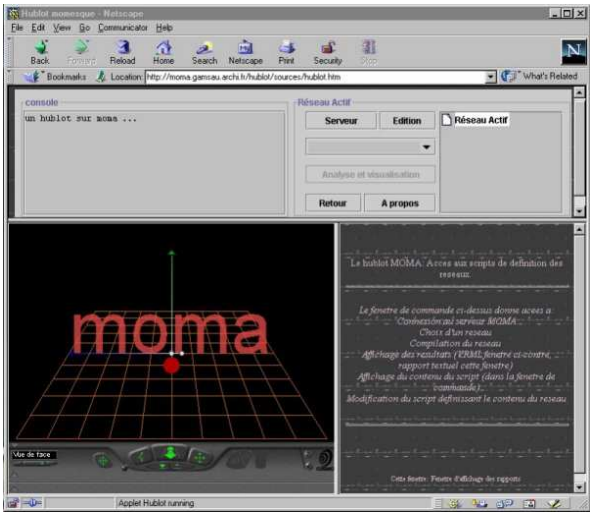
Publications related to the experiment:
Les publications liée ou sujet / Publikacje

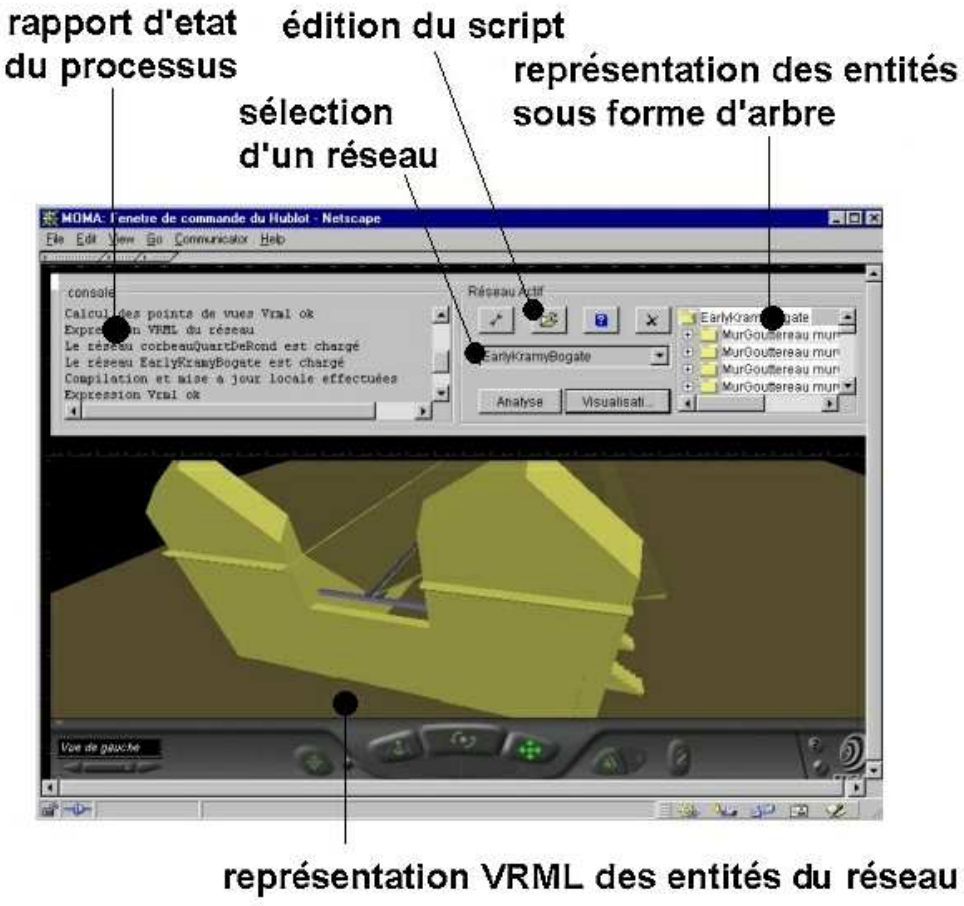
[1.] ***„JAVA collaborative interface for architectural simulations A case study on wooden ceilings of Kraków",***
proceedings: The International Conference on Conservation, section IV, Kraków, PL, November 1998
ISBN 83-7242-072-6, pp. 33-40
authors: J.Y. Blaise, I. Dudek, P. Drap

[2.] ***An architectural model compiler dedicated to archaeological hypothesis. An experiment on Krakow's Kramy Bogate "***
proceedings: HCP'99, Human Centered Processes, September 1999, Brest, FR
ENST – Bretagne, pp. 118-125.
authors: J.Y. Blaise, I. Dudek, P. Drap

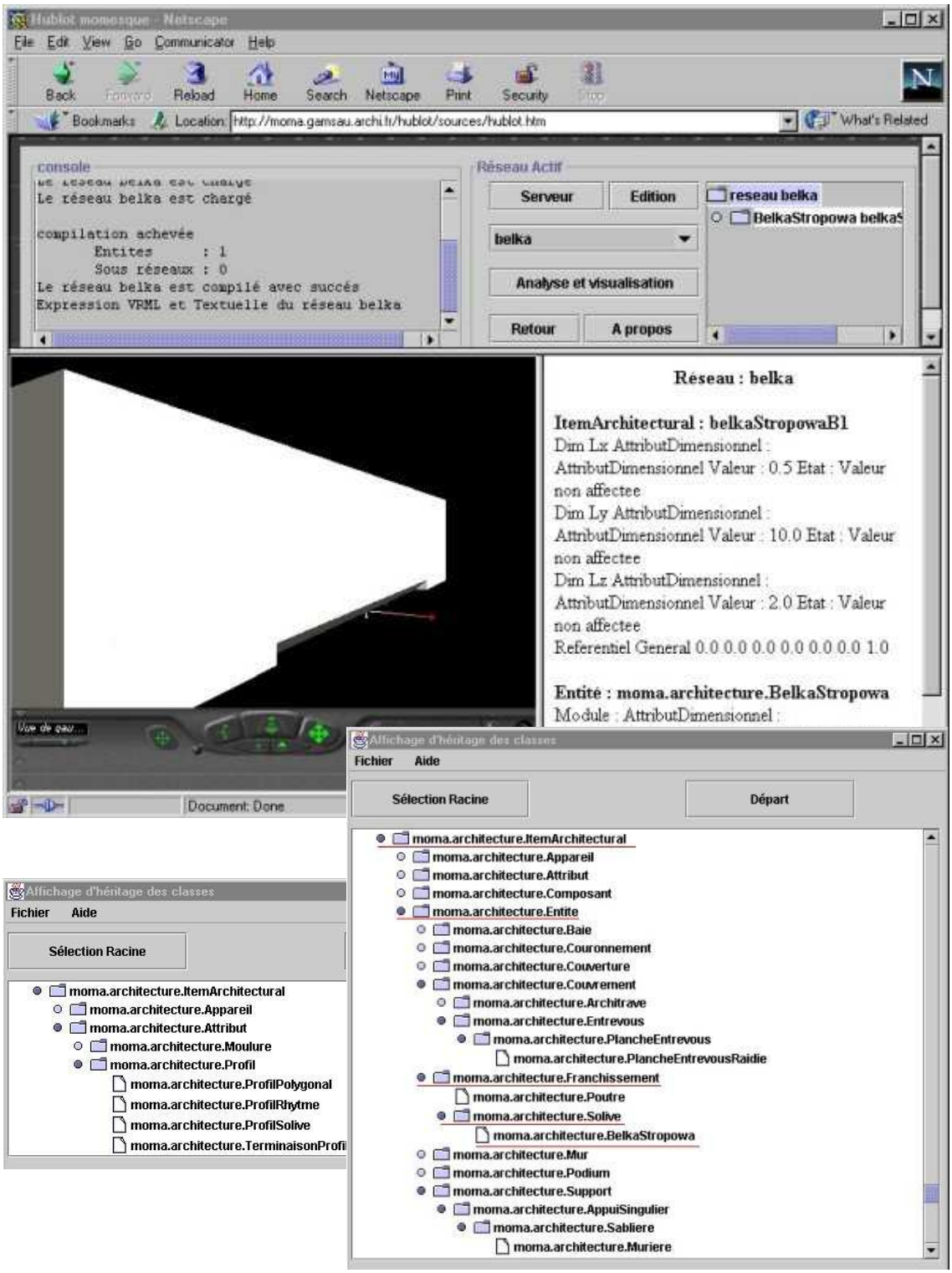
[3.] ***„Evolutions architecturales de l'Hôtel de Ville de Cracovie: un système d'information et de représentation des connaissances."***
Seminary of UMR MAP, Mai 1999, Marseilles, FR
authors: J.Y. Blaise, I. Dudek

Illustrations:
Les illustrations / ilustracje





Hublot – schema of interface



Hublot - interface

n° 3 - development

Valideur – 3D VRML modeller

Valideur – 3D VRML modeler
Valideur – 3D VRML modeler

fields of experimentation :
terrains d'expérimentation
tereny eksperymentacji

Kramy Bogate
Les Etalages Riches de la ville de Cracovie
Kramy Bogate Rynku Krakowskiego

the wooden ceilings of the urban houses of Kraków
Les plafonds en bois des maisons urbaines de la ville de Cracovie
Drewniane stropy kamienic krakowskich

the Main Square in Kraków
La Place Centrale de Cracovie
Rynek Główny w Krakowie

The development of Valideur started in spring 1999, without any intention to develop into a geometrical modeller. Its principal role was to permit analyses of the architectural heritage as a fast hypothesis visualisation tool.

The objectives of this tool were as follows:
- to authorise creation and modification of the 3D scenes on the Web,
- to authorise a link possibility (URL) for each object created in a scene (each architectural entity) permitting a query on SOL database,
- to authorise interactive creation of the scenes,
- to allow detailed representation of the architectural entities (ex. to visualise the profile and termination of a beam),
- to provide a contribution to a library of the 3D models of the Rynek,
- to propose didactic interactive modules on the wooden ceilings.

Valideur uses parametrically defined architectural entities in order to create complex VRML scenes. Each architectural entity present in the theoretical model can be added to a scene. A collection of the interrelated entities (a net) is represented in the form of an interactive VRML scene.
A text or 3D based interface give an access to the morphological or graphical (specific to the graphic representation) attributes of each entity and to an URL address of the objet under consideration that authorise the distant or local connection to various documents.

The results
Les résultats / Rezultaty

- A part of the stereo slides presented during a large scale public projection that took a place in September 2000 in Kraków were produced using Valideur.
- Valideur was a modeller used to prepare and analyse the hypothetical reconstructions of Kramy Bogate presented in doctoral thesis of I. Dudek.

Publications related to the experiment:
Les publications liée ou sujet / Publikacje

[1.] ***„IT applications for architectural intervention and documentation in monuments' ensembles”,***
proceedings: The International Conference on Conservation, section, November 1999, Kraków, PL
authors: J.Y. Blaise, I. Dudek

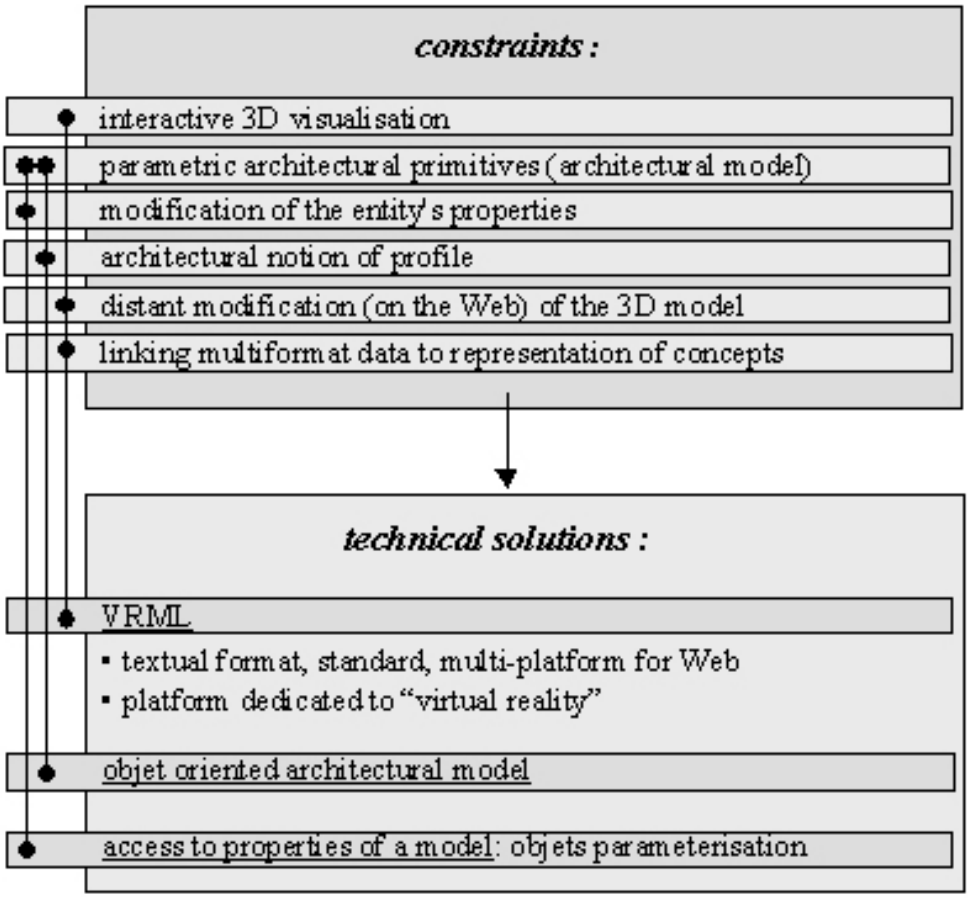
[2.] ***„Architektoniczno-konserwatorska rekonstrukcja Kramów Bogatych Rynku Głównego w Krakowie przy użyciu technik komputerowych"***
doctoral thesis at Faculty of Architecture, Kraków University of Technology, Mai 2000, Kraków
author: Iwona Dudek

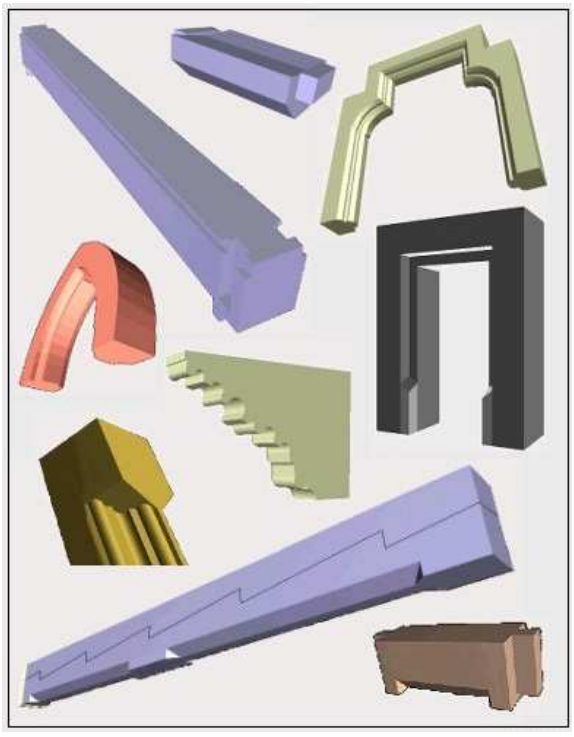
[3.] ***„Modèles et représentation à l 'échelle architecturale: une expérience à Cracovie",***
proceedings: Rome an 2000, Cahiers de la MRSH - Caen n°33, June 2000, Caen, FR
ISSN 1250-6419, pp. 155-169
authors: J.Y. Blaise, M. Florenzano

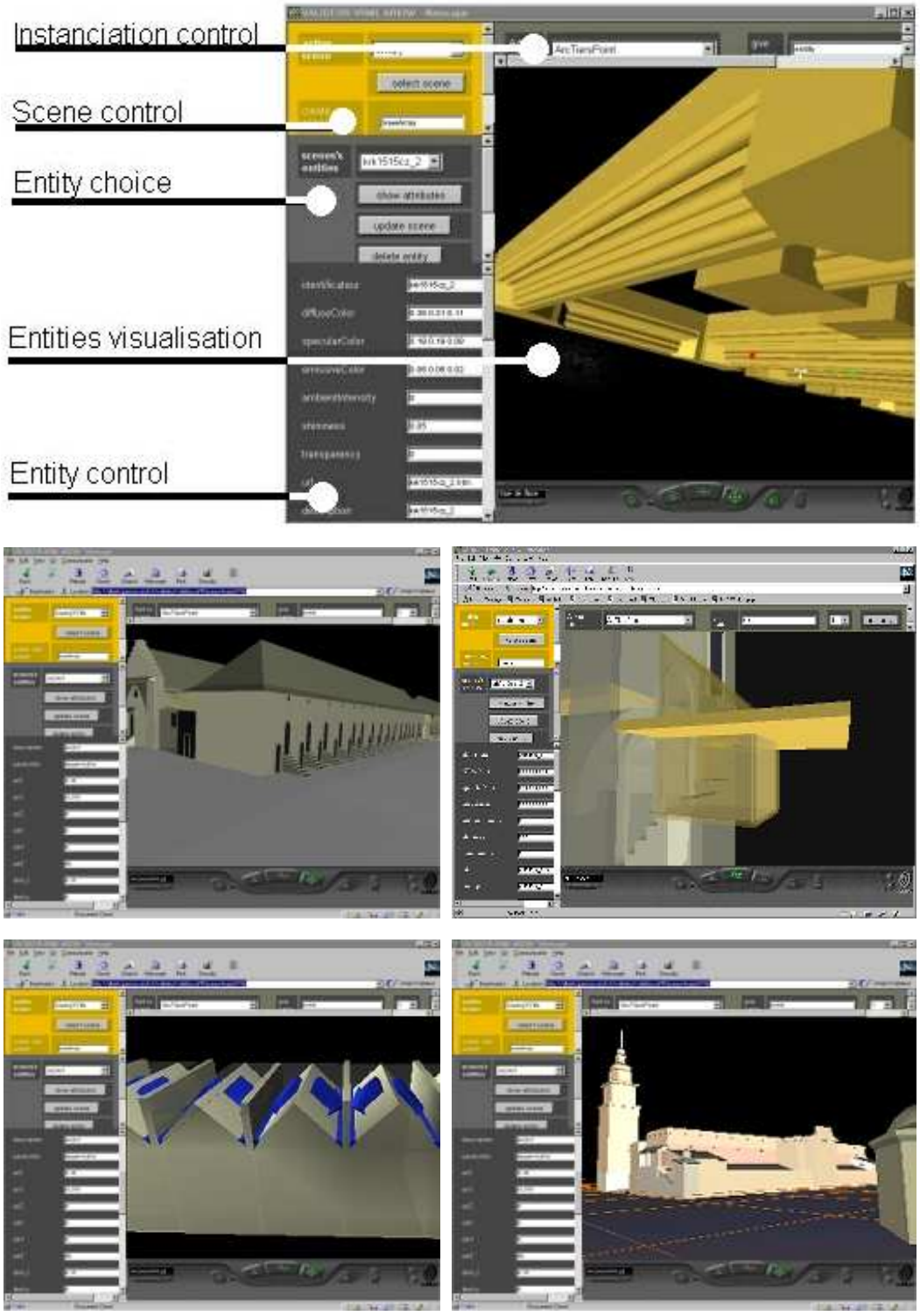
[4.] ***„Outils numériques et représentation de l'architecture patrimoniale",***
Culture et Recherche, n°81, MRT (Mission de la Recherche et de la Technologie du Ministère de la Culture et de la Communication), December 2000
author: J.Y. Blaise

[5.] ***„Interpretative modelling as a tool in the investigation of the architectural heritage: information and visualisation issues "***
proceedings: VIIP 2001(Visualisation, Image and Image Processing), Marbella, Spain, September 2001
ACTA Press, ISBN 0-88986-309-1, pp. 48-54
authors: J.Y. Blaise, I. Dudek

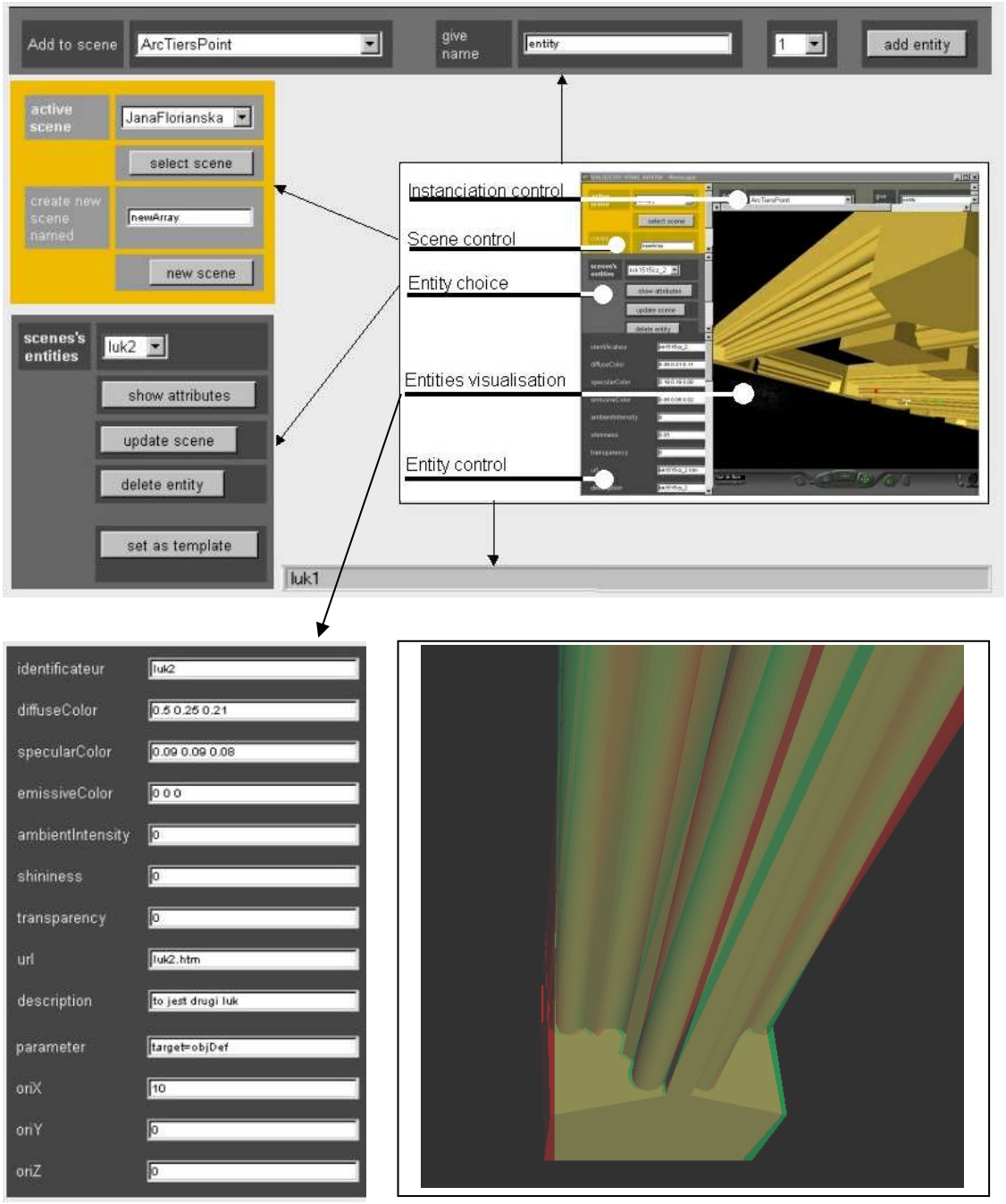
Illustrations:
Les illustrations / ilustracje





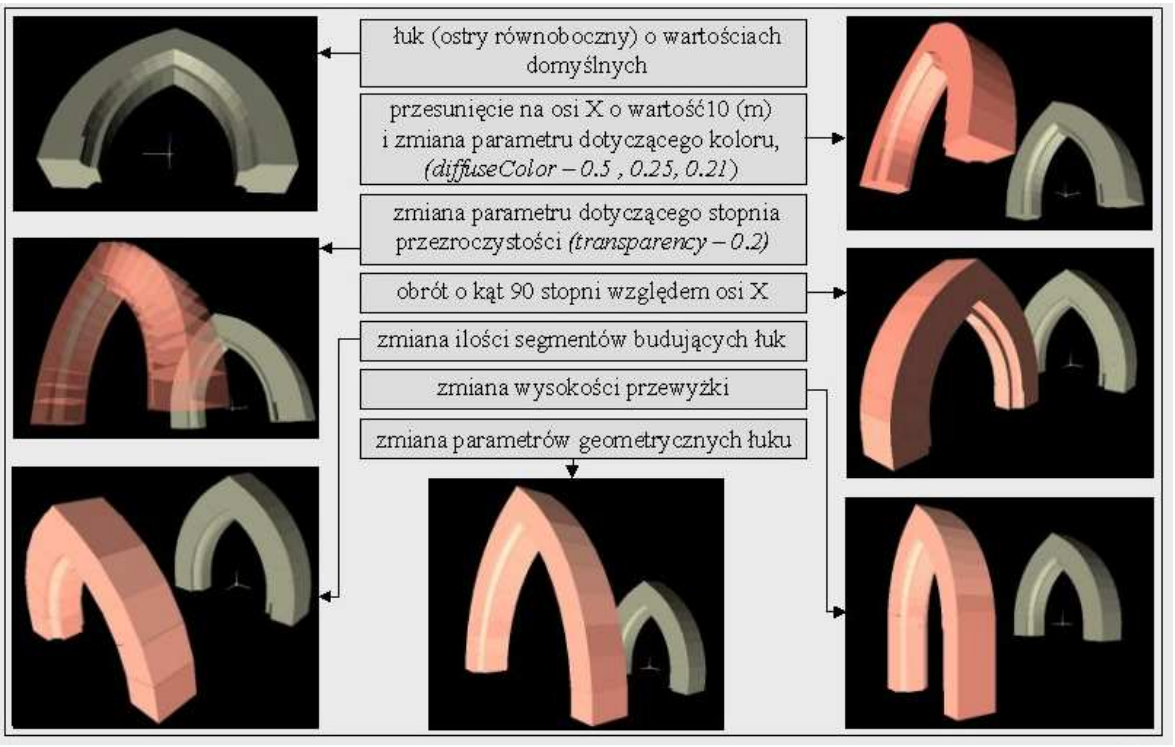


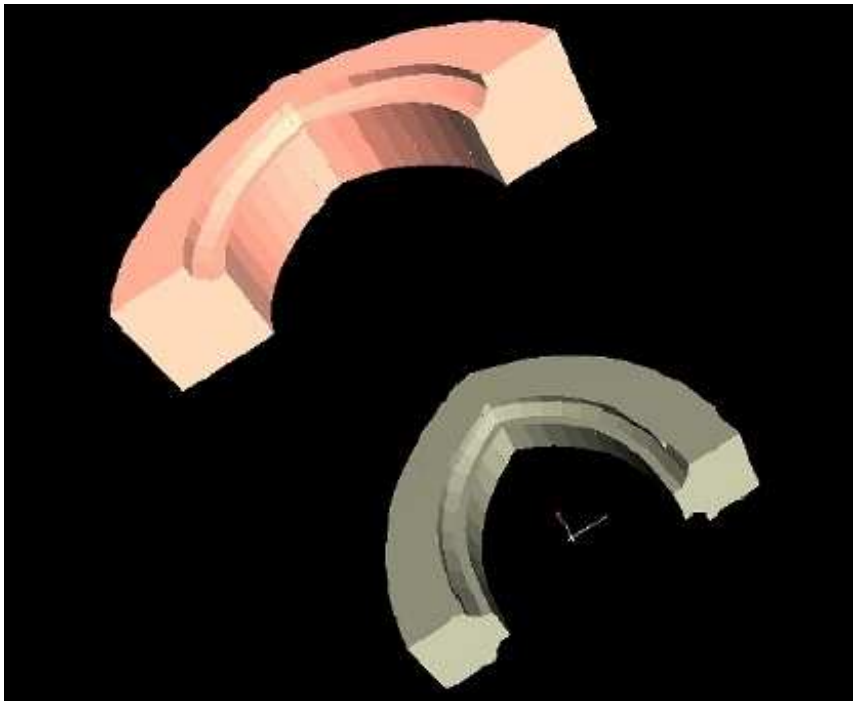
Valideur – user interface



(anaglyph)

Valideur – user interface, schema
Parametric definition of the objects





Valideur. Parametric defined features – possibilities of manipulation

n° 4 - experimentation and development

SOL: Sources On line - bibliographic, iconographic and cartographic catalogue

SOL: Sources On line - bibliographique, iconographic et cartographique catalogue
SOL: Sources On line - Multimedialny katalog materiałów bibliograficznych, ikonograficznych oraz planów dla Rynku Krakowskiego

fields of experimentation :
terrains d'expérimentation
tereny eksperymentacji

The Main Square in Kraków
La Place Centrale de Cracovie / Rynek Główny w Krakowie

This development is a multidisciplinary, platform independent information tool dedicated to education and research. It deals with the historic urban fabric of the Main Square in Kraków. Nineteen elements of 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 Main Square in Kraków.

The early development has been initiated as a basic on-line documentation tool and can be defined as a „self-growing" information source since its updating interface was open on the net to any computer connected to Internet. It is a reference search tool in which criteria resulting from the analysis of each source are added to traditional bibliographic and iconographic 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 .

The referred documents are texts, illustrations, photographs or plans. Each document is described in a conventional way (author, editor, etc.). Besides that SOL uses the thematic bias approach that takes 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 of a multi-aspect search. Example of some biases: urban fabric, historical period, orientation, media type, thematic group, location in public libraries and archives, building-specific problems (ex. Town Hall's clock,), information about authors.

In other words apart from a conventional source description each SOL document :

- has a link to one or several architectural or urban objects (described in the document),
- has a link to one or several libraries in which it is available,
- is indexed using description specifying historical period(s) and thematic bias (ex.) ,
- a point of view which indicates the position and the direction of view (for illustrations),
- has an URL address allowing to link a complementary Web document.

A document referred in the data base can be research either through a graphic interface (2D, 3D) or more through a text-based interface. SOL has two particularities: a Web graphic search interface and a Web graphic update interface.

The SOL system technical background is a relational DBMS software interfaced for the Web through Perl object modules developed for the program. 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.

Observations and conclusions
Les observations et les conclusions / Obserwacje i Wnioski

- The choice of a Web-centred development, in the search and updating interface as well as in the representation module provides platform independence and distant access to the database enabling successive contributions of students or researchers.
- The multi-aspect content-based search is possible only if it was preceded by a step of content analysis of the source data introduced to a database.
- Since a content-based search relevancy relies on the researcher's analysis of sources, such a tool can prove useful only if it mirrors a constant evolution of the sources. An updating Web-based interface may be therefore proposed in order to allow distant interventions on the database itself.
- Various types of search interfaces (text-based, plane-based, 3D model) give different possibilities of queries. They may be used us a complementary interfacing methods and should not be considered us equivalent.
- In the SOL management system we used a mono-scale 3D representation mode that allows to interface the database of documentation. Although in this project the use of a mono-scale representation mode can be justify by relatively modest area of investigations, limited to the zone of Market Square (200m X 200m), we have faced some problems related to lack of a correlation between the documents to interface and the architectural forms that have been represented. The experience of SOL has clearly demonstrated that in the case of the urban architecture the mono-scale representation mode does not correspond to a diversity of available information (data) and proved the indispensability of multi-scale representation. Our conclusion is that in case of urban architecture the documentation management systems should filter the data through the habitual filter used by geographers and architects, that is called a scale.

Publications related to the experiment:
Les publications liée ou sujet / Publikacje

[1.] ***„Evolutions architecturales de l'Hôtel de Ville de Cracovie: un système d'information et de représentation des connaissances."***
Seminary of UMR MAP, Mai 1999, Marseilles, FR
authors: J.Y. Blaise, I. Dudek,

[2.] ***„SOL: Spatial and historical web-based interface for On Line architectural documentation of Kraków's Rynek Główny",***
proceedings: 17th Conference of eCAADe, Turning to 2000, Liverpool, UK, September 1999
ISBN 0-9523687-5-7, pp. 700-707
authors: J.Y. Blaise, I. Dudek,

[3.] ***„IT applications for architectural intervention and documentation in monuments' ensembles",***
proceedings: The International Conference on Conservation, section, November 1999, Kraków, PL
authors: J.Y. Blaise, I. Dudek,

[4.] ***„Modèles et représentation à l 'échelle architecturale: une expérience à Cracovie",***
proceedings: Rome an 2000, Cahiers de la MRSH - Caen n°33, June 2000, Caen, FR
ISSN 1250-6419, pp. 155-169
authors: J.Y. Blaise, M. Florenzano

[5.] ***„SOL- un outil de gestion de données bibliographiques sur le Web"***
Seminar of UMR MAP 694 CNRS / MCC, Touluse, FR, December 2000
authors: J.Y. Blaise, I. Dudek,

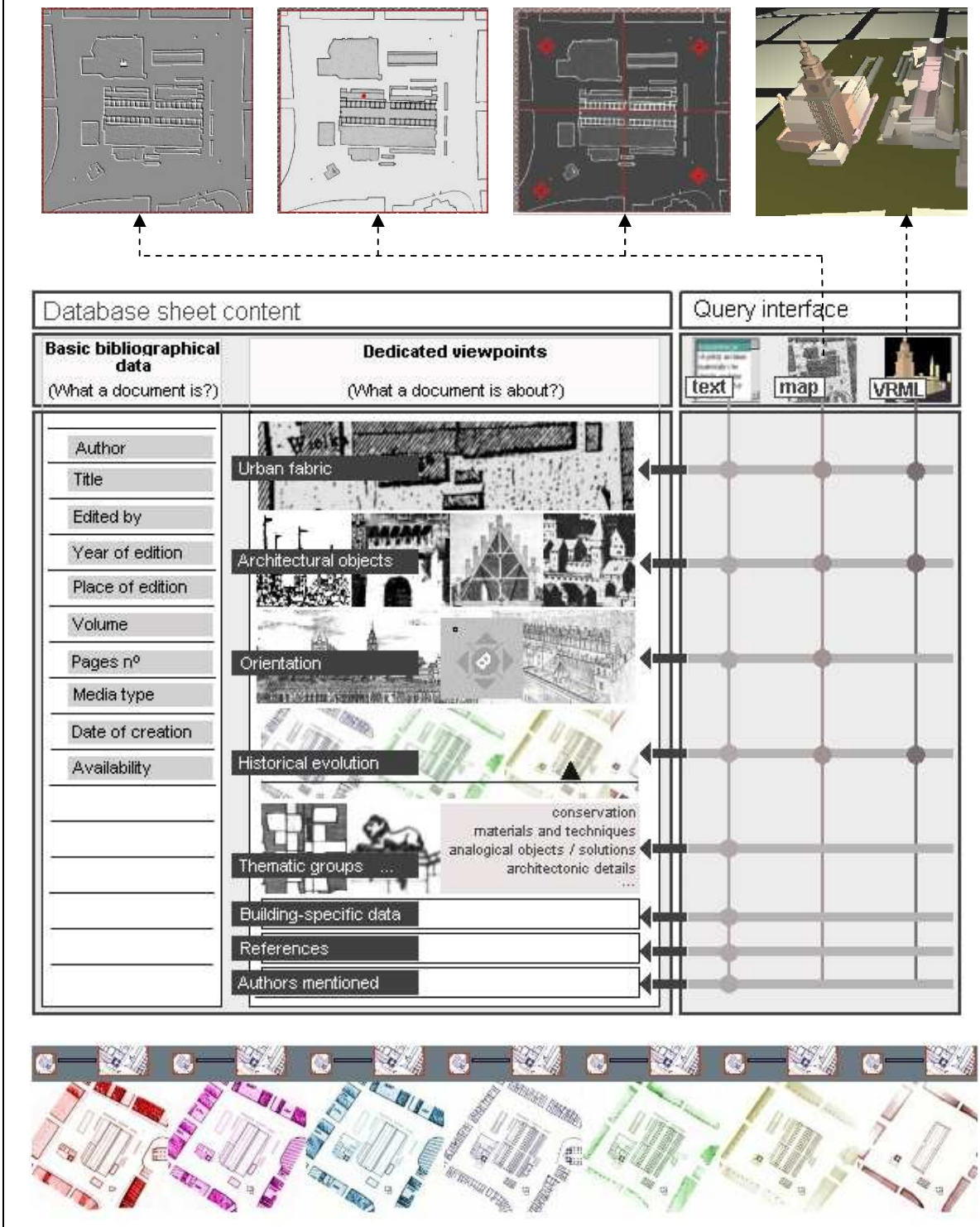
[6.] ***„Representation de l'edifice patrimonial: echelles et usages. Une experience a Cracovie."***
Seminar of UMR MAP 694 CNRS / MCC, Touluse, FR, December 2000
author: J.Y. Blaise,

[7.] ***„Outils numériques et représentation de l'architecture patrimoniale",***
Culture et Recherche, n°81, MRT (Mission de la Recherche et de la Technologie du Ministère de la Culture et de la Communication), December 2000
author: J.Y. Blaise**,**

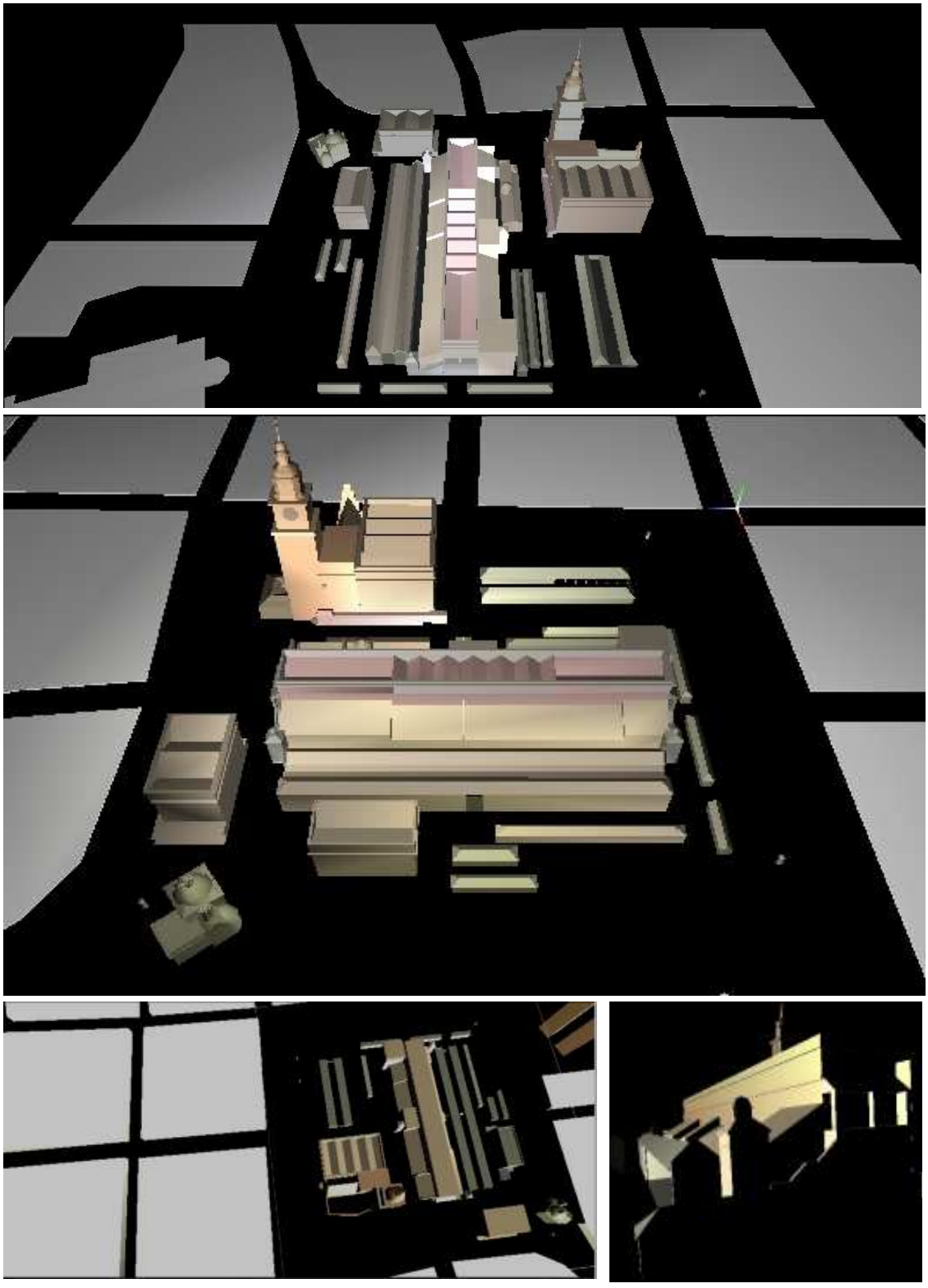
[8.] ***„Interpretative modelling as a tool in the investigation of the architectural heritage: information and visualisation issues "***
proceedings: VIIP 2001(Visualisation, Image and Image Processing), Marbella, Spain, September 2001
ACTA Press, ISBN 0-88986-309-1, pp. 48-54
authors: J.Y. Blaise, I. Dudek,

[9.] ***„Exploiting the architectural heritage's documentation: a case study on data analysis and visualisation"*** proceedings: I-Know 03 Conference on Knowledge Management, Graz, Austria, July 2003
Journal Of Universal Computer Science, ISSN 0948-695x, pp. 128-134
authors: J.Y. Blaise, I. Dudek,

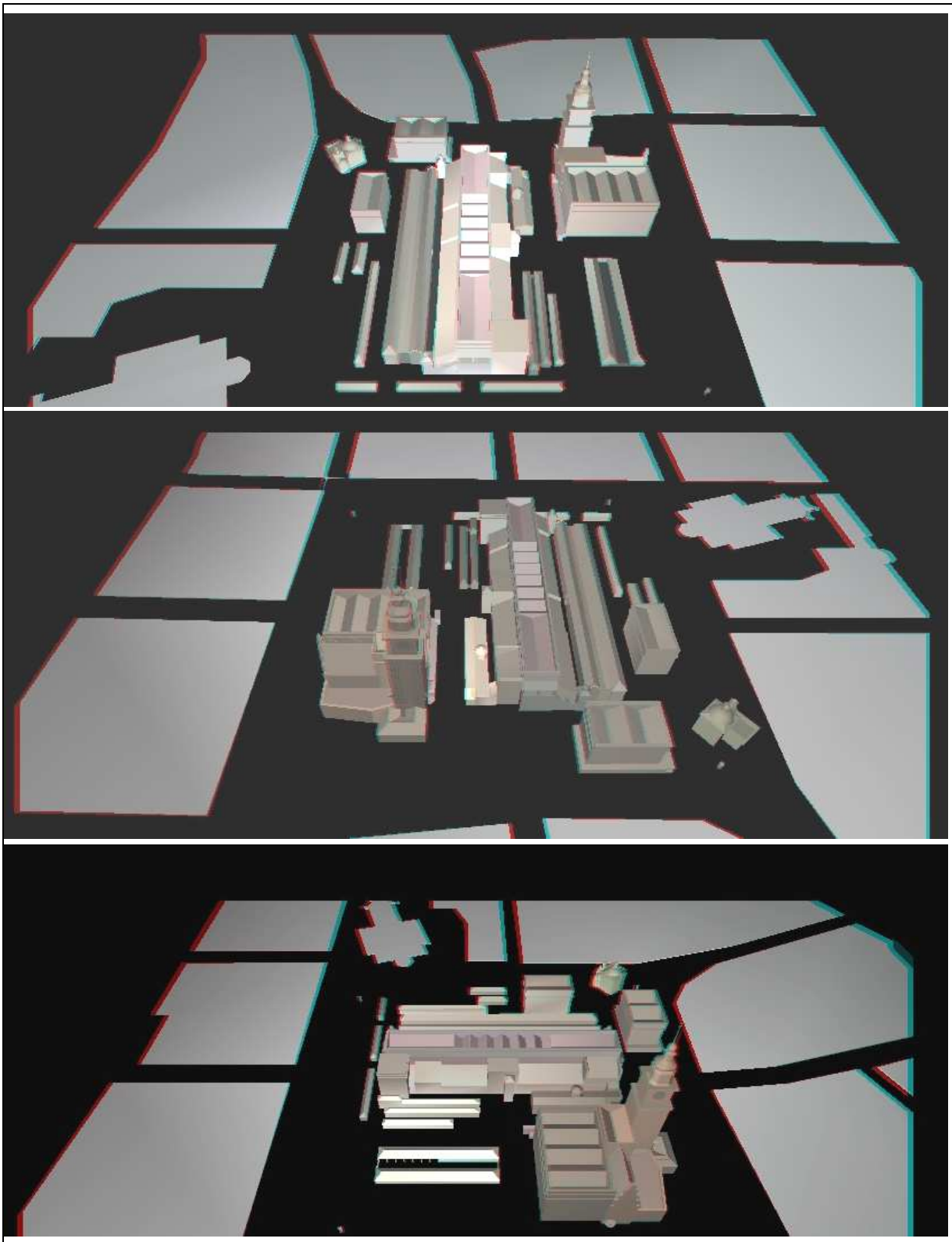
Illustrations:
Les illustrations / ilustracje



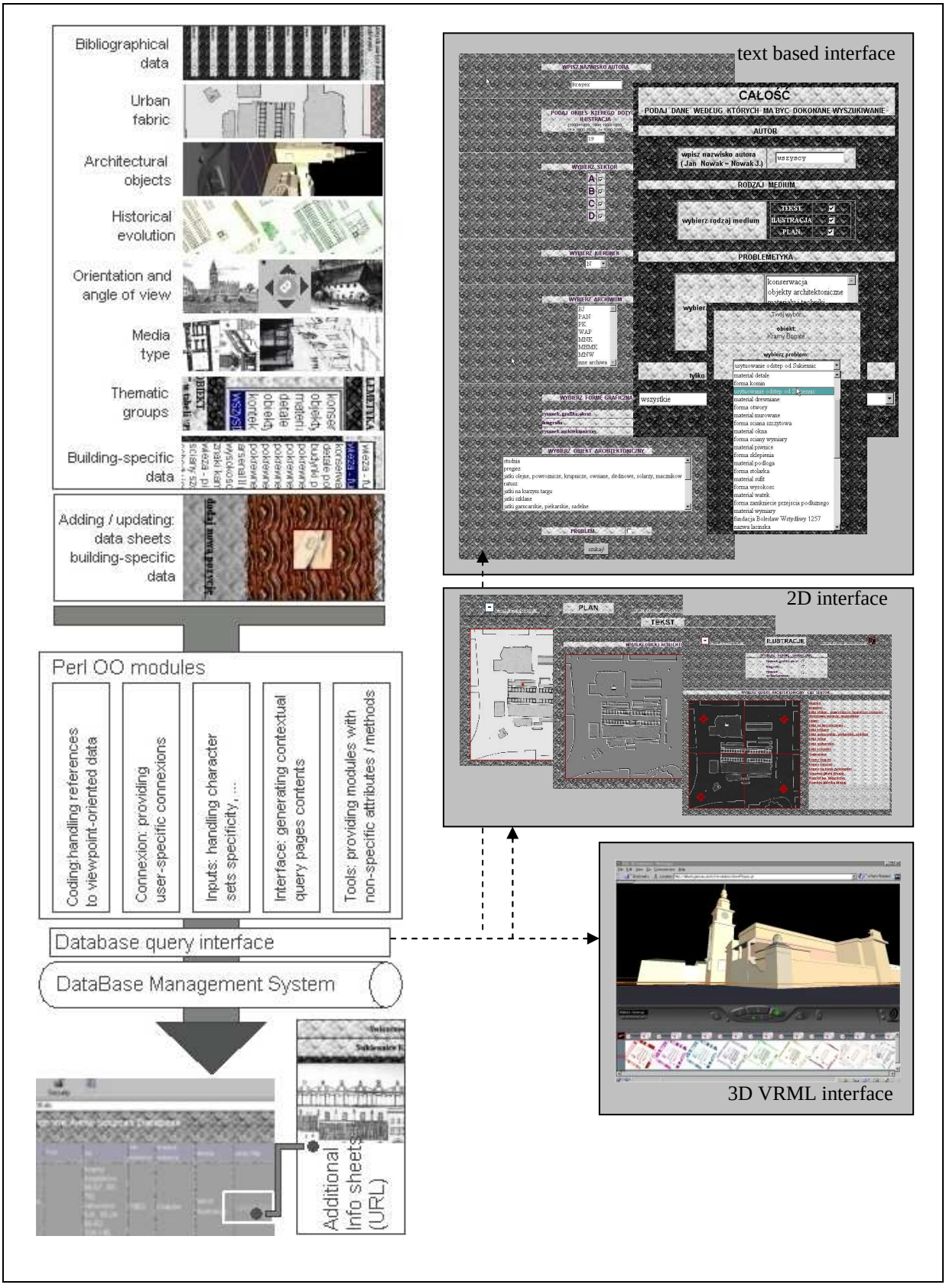
SOL - Database content and query modes

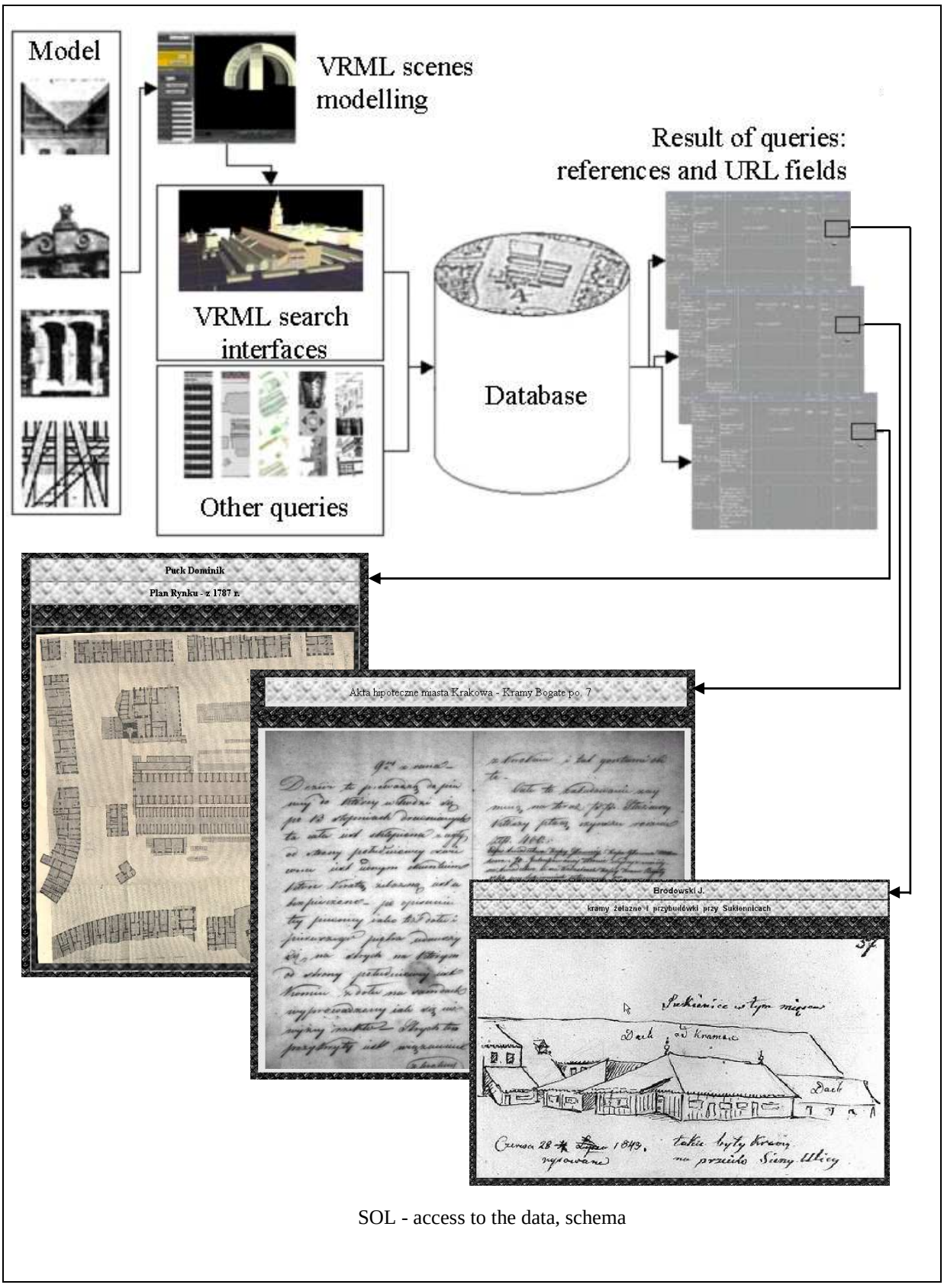


3D scenes that serve as the SOL interface



3D scenes that serve as the SOL interface - anaglyphs


Bibliographical data
Urban fabric
Architectural objects
Historical evolution
Orientation and angle of view
Media type
Thematic groups
Building-specific data
Adding / updating: data sheets building-specific data
text based interface
2D interface
3D VRML interface
Perl OO modules
Coding: handling references to viewpoint-oriented data
Connexion: providing user-specific connexions
Inputs: handling character sets specificity, ...
Interface: generating contextual query pages contents
Tools: providing modules with non-specific attributes / methods
Database query interface
DataBase Management System
Additional Info sheets (URL)



SOL - access to the data, schema

n° 5 - experimentation

TYPIS: typology of the wooden ceilings

TYPIS: TYpologies d'anciens Plafonds en boIS
TYPIS: typologia drewnianych stropów

fields of experimentation :
terrains d'expérimentation
tereny eksperymentacji

The wooden ceilings of the urban houses of Kraków
Les plafonds en bois des maisons urbaines de la ville de Cracovie
Drewniane stropy kamienic krakowskich

The corpus of the wooden ceilings of the urban houses of Kraków was a subject of an experimentation aiming at generation of a Web based representation and simulation tool for conservators, researchers and university teachers.

The main objective of this experimentation was to bring out a computer platform that would let researchers to manipulate theoretical architectural models, used to simulate a hypothesis. The relevance of this approach relies on the *ability* of a computer-based system to convey within the simulation process the whole information it detains (historical, architectural, morphological, etc.).

The analysis of the corpus of elements involved in the construction of wooden ceilings had as an objective an identification of the ensemble of concepts that would permit conservators and researchers an on-line creation and manipulation of the hypotheses of reconstruction. The knowledge to be represented and handled features both stable concepts (ex. a beam) and their historical variations.

The elements tat had been identified were afterwards organised using a principle of hierarchy of the objects. The conducted investigations were based on the thorough analysis proposed by Jan Tajchman in „*Stropy drewniane w Polsce. Propozycja systematyki*", edited by Ośrodek Dokumentacji Zabytków, Warszawa 1989. This reference work presents a clear classification of the different types of ceilings together with their a description of the elements intervening in their construction. Our task was therefore limited to an analysis of the data in order to classify elements of the corpus either as entities or as attributes.

Successive steps
Les étapes successives / Etapy prac

- gathering of bibliographic and iconographic materials,
- data analysis,
- analysis of the architectural corpus,
- identification of the concepts and definition of the relations between them,
- implementation,
- visualisation tests using Hublot,
- visualisations tests in Valideur,
- elaboration of interactive scenes (educational purposes).

Publications related to the experiment:
Les publications liée ou sujet / Publikacje

[1.] ***„JAVA collaborative interface for architectural simulations A case study on wooden ceilings of Kraków",***
proceedings: The International Conference on Conservation, section IV, Kraków, PL, November 1998
ISBN 83-7242-072-6, pp. 33-40
authors: J.Y. Blaise, I. Dudek, P. Drap,

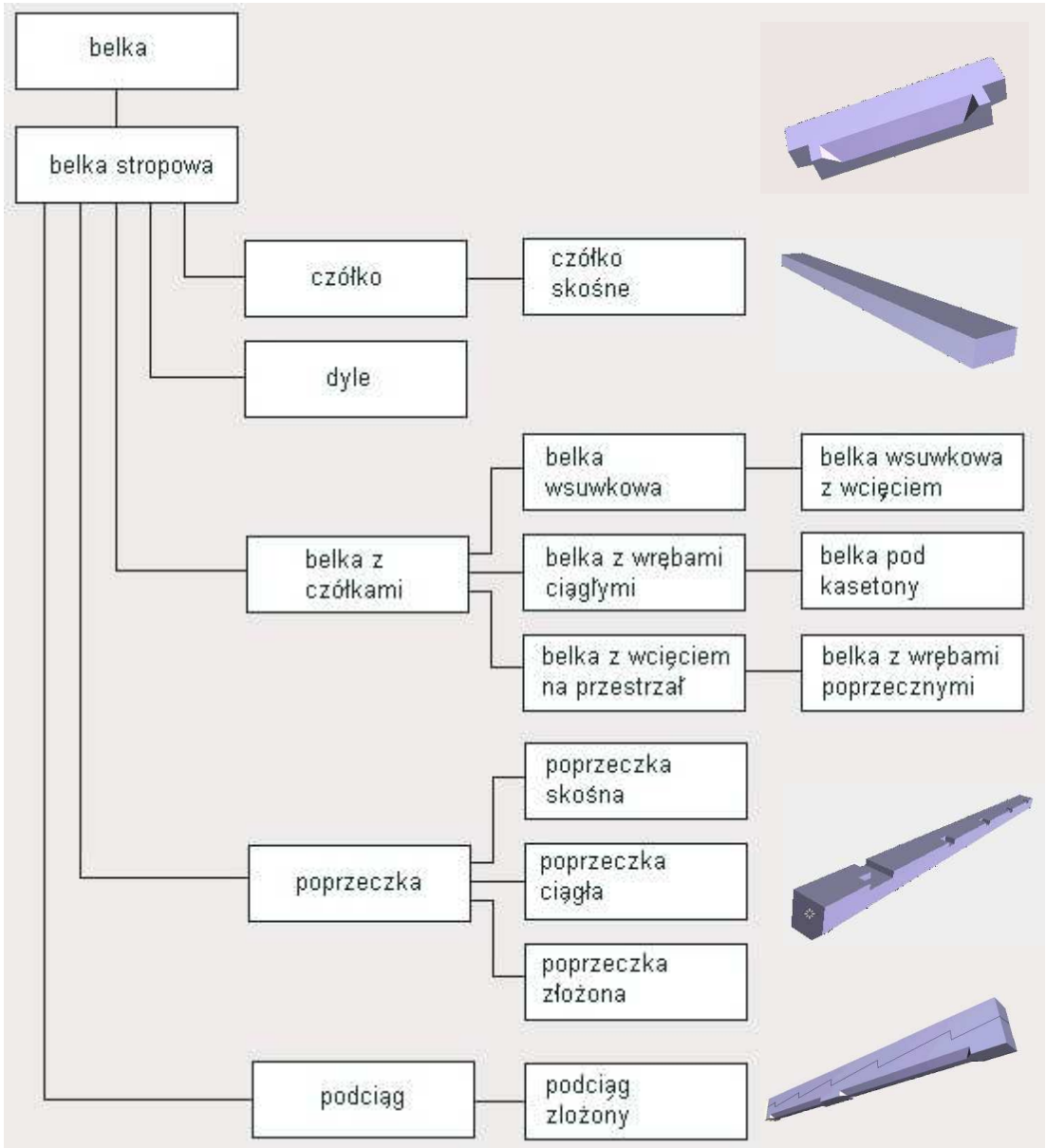
[2.] ***„Evolutions architecturales de l'Hôtel de Ville de Cracovie: un système d'information et de représentation des connaissances."***
Seminary of UMR MAP, Mai 1999, Marseilles, FR
authors: J.Y. Blaise, I. Dudek,

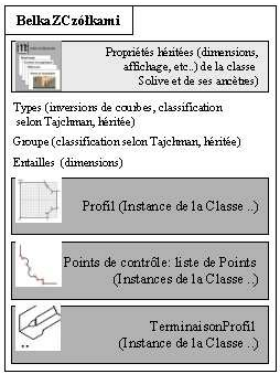
[3.] ***„Representation de l'edifice patrimonial: echelles et usages. Une experience a Cracovie."***
Seminar of UMR MAP 694 CNRS / MCC, Touluse, FR, December 2000
author: J.Y. Blaise,

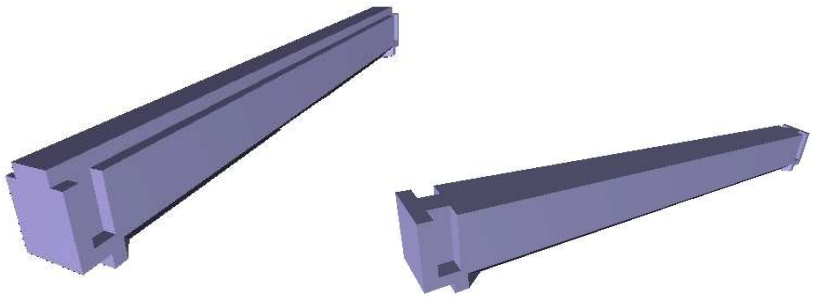
[4.] ***„Interpretative modelling as a tool in the investigation of the architectural heritage: information and visualisation issues "***
proceedings: VIIP 2001(Visualisation, Image and Image Processing), Marbella, Spain, September 2001
ACTA Press, ISBN 0-88986-309-1, pp. 48-54
authors: J.Y. Blaise, I. Dudek,

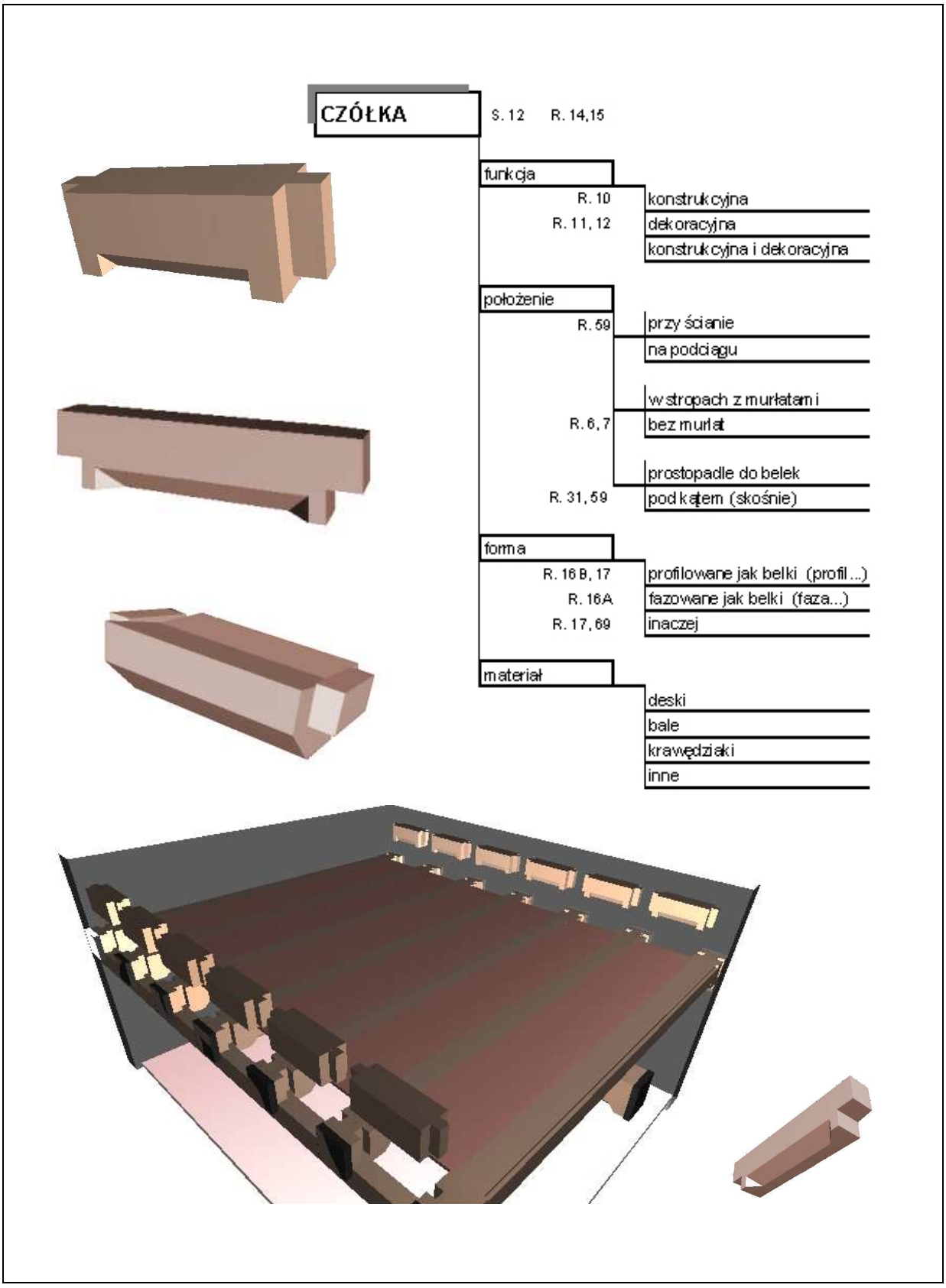
[5.] ***„Règles d'identification et méthodes de visualisation d'objets architecturaux"***
proceedings: 4èmes journées d'Extraction et de Gestion des Connaissances (EGC'2004), Clermont Ferrand, FR, January 2004
ISBN: 2.85428.633.2, Vol. II, pp. 573-584
authors: J.Y. Blaise, I. Dudek,

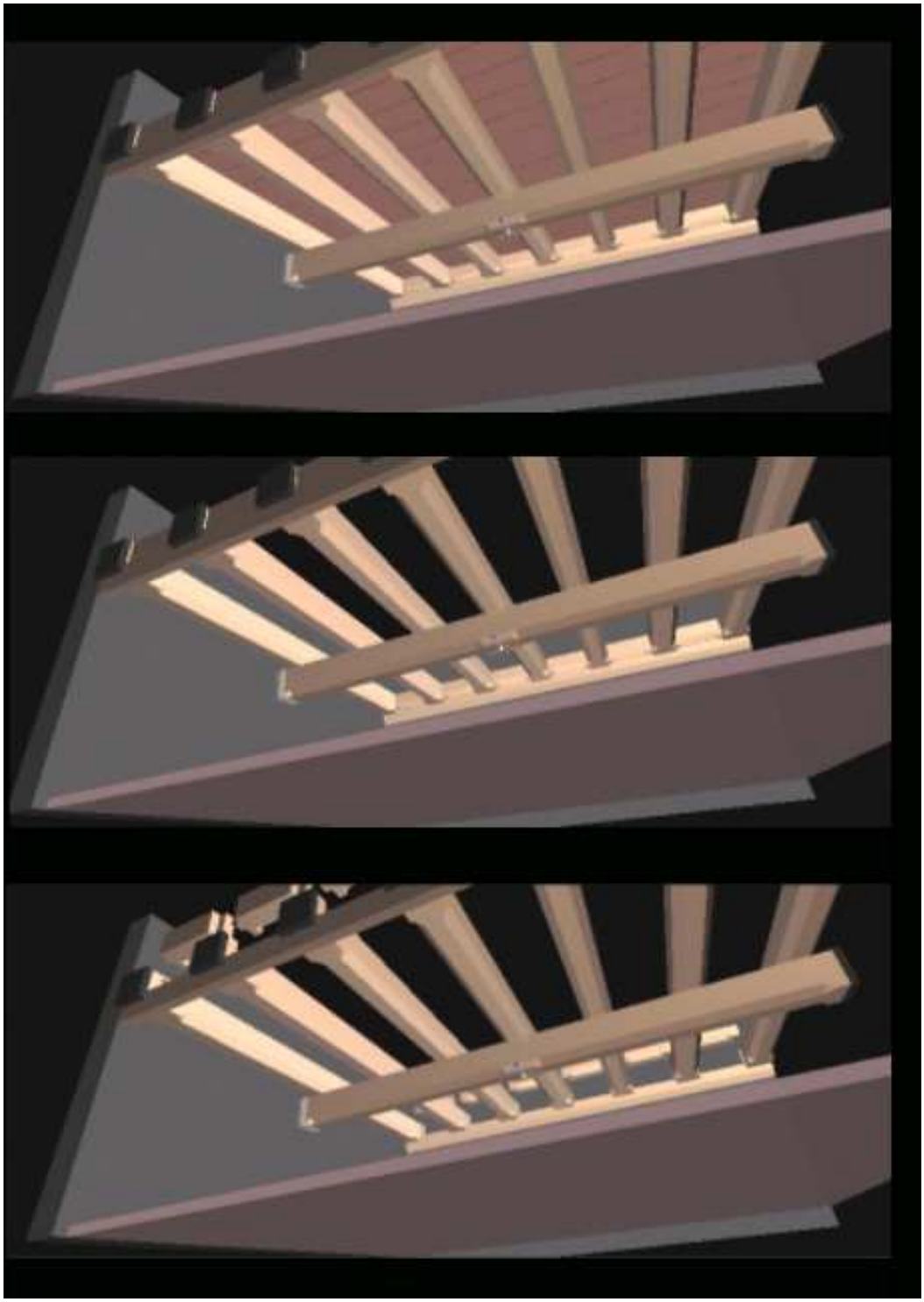
Illustrations:
Les illustrations / ilustracje



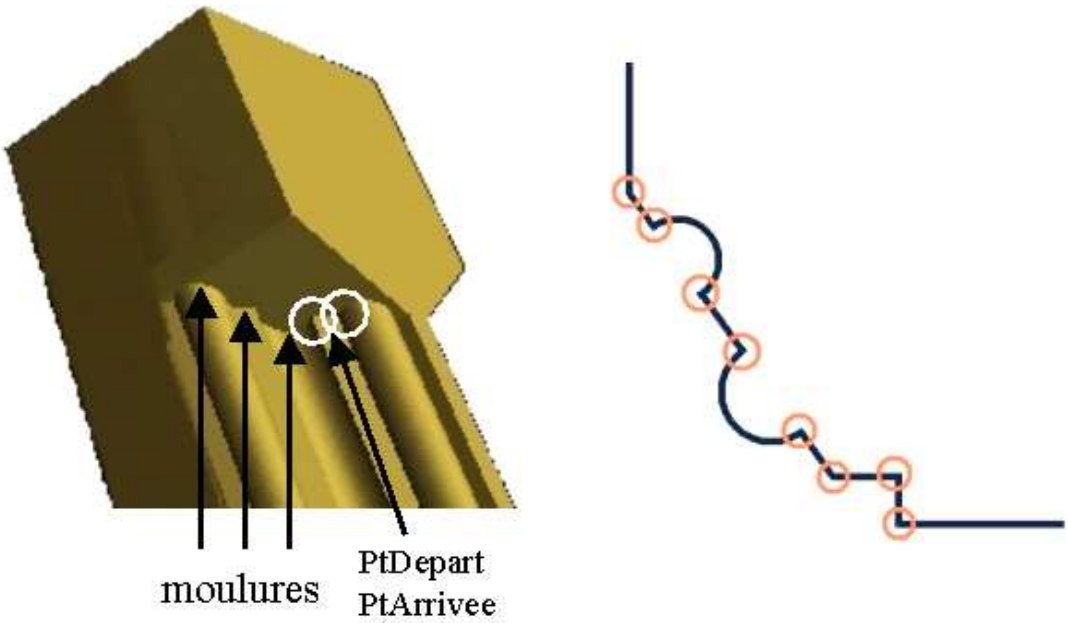


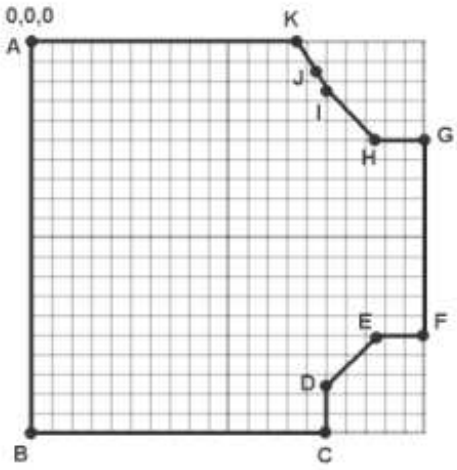



CZÓŁKA
S. 12
R. 14,15
funkcja
R. 10
konstrukcyjna
R. 11, 12
dekoracyjna
konstrukcyjna i dekoracyjna
położenie
R. 59
przy ścianie
na podciągu
w stropach z murłatami
R. 6, 7
bez murłat
prostopadle do belek
R. 31, 59
pod kątem (skośnie)
forma
R. 16 B, 17
profilowane jak belki (profil...)
R. 16A
fazowane jak belki (faza...)
R. 17, 69
inaczej
materiał
deski
bale
krawędziaki
inne



Interactive scenes (VRML)





Schema of a profile definition method

n° 6 - experimentation

Hypotheses visualisation - example of Kramy Bogate (Kraków)

Visualisation d'hypothèses - exemple des Etalages Riches de la ville de Cracovie
Wizualizacja hipotez rekonstrukcyjnych na przykładzie Kramów Bogatych w Krakowie

fields of experimentation :
terrains d'expérimentation
tereny eksperymentacji

Kramy Bogate
Les Etalages Riches de la ville de Cracovie
Kramy Bogate Rynku Krakowskiego

One of the fields of experimentation proposed in ARKIW programme are Kramy Bogate in Kraków.

During more than five centuries Kramy Bogate filled the considerably big space of the citie's trade centre – nowadays Rynek Główny. Founded in the XIII century as a place dedicated to a cloth trade, they survived wars and fires to be demolished in sixties of the XIX century. Their cellars still exist under the actual level of the Market Square. Divers historical documents (old maps, paintings, drawings, inventory descriptions, photographs, etc.) that describe that object are preserved. From these data we can learn quite precisely the main shape of the object, its situation and general size.

With a use of numerical techniques a set of theoretical reconstructive hypotheses examining possible formal, functional and constructional transformations of the object was created and analysed.

Successive steps
Les étapes successives / Etapy prac

- gathering of bibliographic, iconographic and cartographic materials,
- identification of the architectural concepts,
- elaboration of the representation modes,
- implementation,
- visualisation tests using Hublot,
- visualisations tests in Valideur.

Observations and conclusions
Les observations et les conclusions / Obserwacje i Wnioski

- Visualisation of reconstructive hypotheses calls for a tool that allows a cyclic verification process in which intellectual analysis of data and information, visualisation and visual estimation of models are interrelated.
- Visualisation tool dedicated to construction of hypotheses should be constructed with a special regard to research methodology. Commercially available software does not support visual scientific investigation.

The results
Les résultats / Rezultaty

- doctoral thesis - „*Computer techniques for an architect-conservator. An application to reconstructions of Kraków's Main Square's Kramy Bogate*", prepared by Iwona DUDEK, supervised by Prof. A. Kadłuczka, (Kraków 2000), (see Actions and results p. xxx)

Publications related to the experiment:
Les publications liée ou sujet / Publikacje

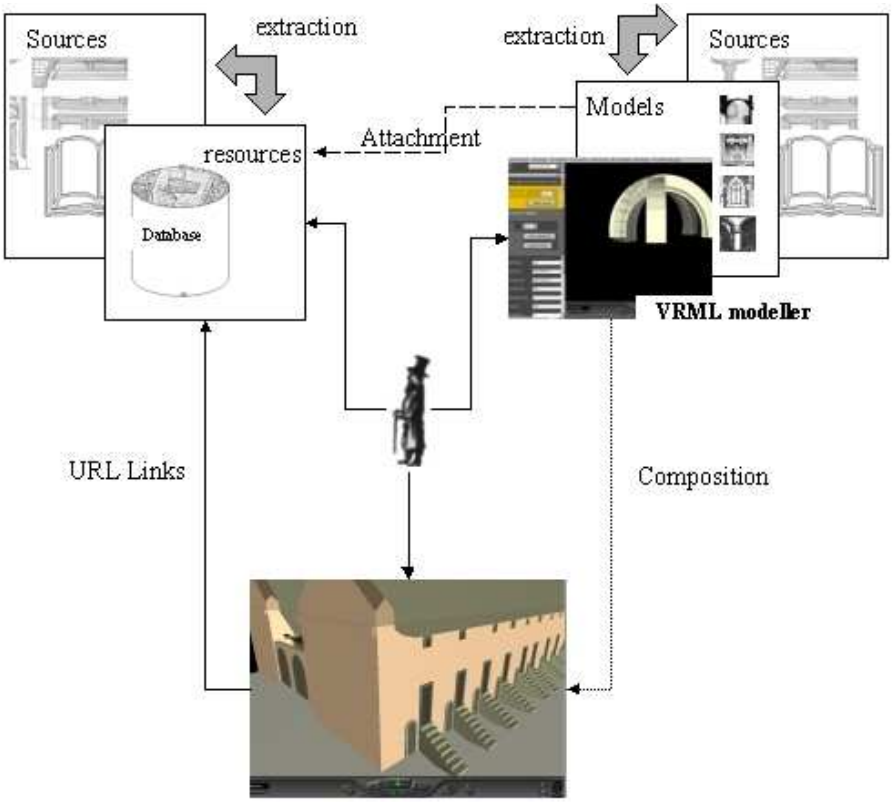
[1.] ***An architectural model compiler dedicated to archaeological hypothesis. An experiment on Krakow's Kramy Bogate "***
proceedings: HCP'99, Human Centered Processes, September 1999, Brest, FR
ENST – Bretagne, pp. 118-125.
authors: J.Y. Blaise, I. Dudek, P. Drap

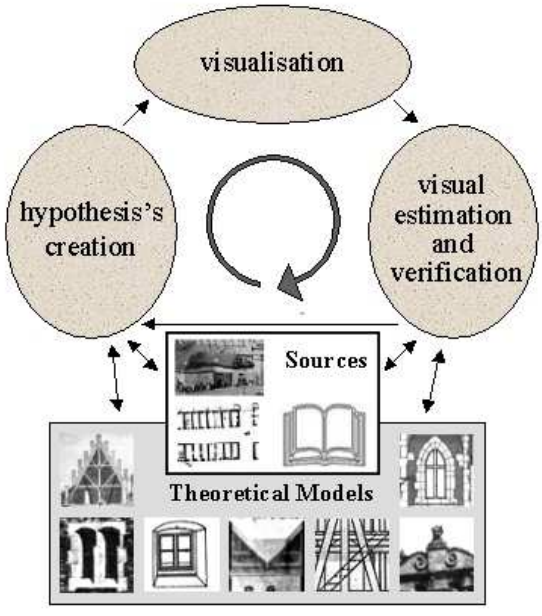
[2.] ***„Architektoniczno-konserwatorska rekonstrukcja Kramów Bogatych Rynku Głównego w Krakowie przy użyciu technik komputerowych"***
doctoral thesis at Faculty of Architecture, Kraków University of Technology, Mai 2000, Kraków
author: Iwona Dudek

[3.] ***„Representation de l'edifice patrimonial: echelles et usages. Une experience a Cracovie."***
Seminar of UMR MAP 694 CNRS / MCC, Touluse, FR, December 2000
author: J.Y. Blaise

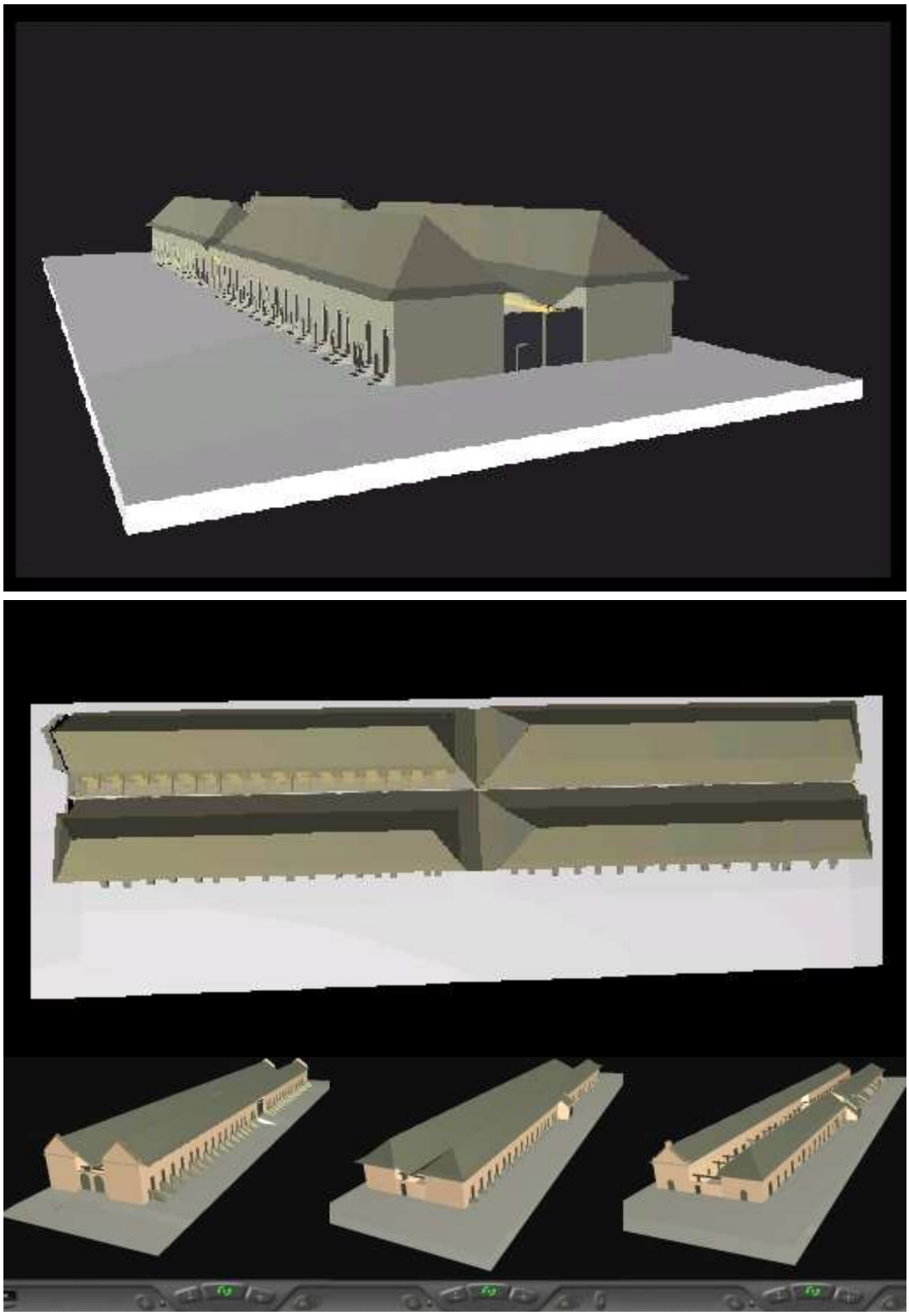
[4.] ***„Exploiting the architectural heritage's documentation: a case study on data analysis and visualisation"*** proceedings: I-Know 03 Conference on Knowledge Management, Graz, Austria, July 2003
Journal Of Universal Computer Science, ISSN 0948-695x, pp. 128-134
authors: J.Y. Blaise, I. Dudek

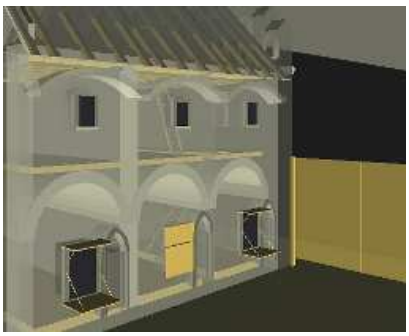
Illustrations:
Les illustrations / ilustracje

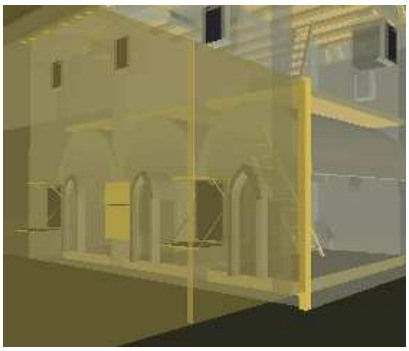


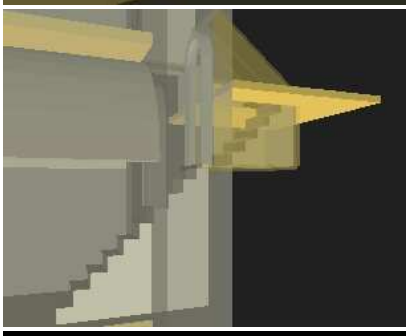


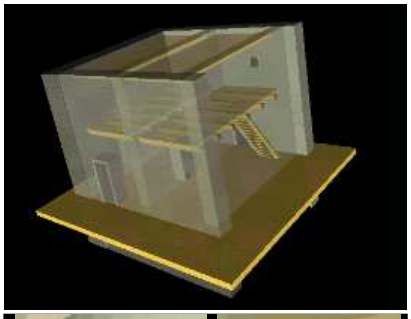
A cyclic verification process in visualisation of reconstructive hypothesis

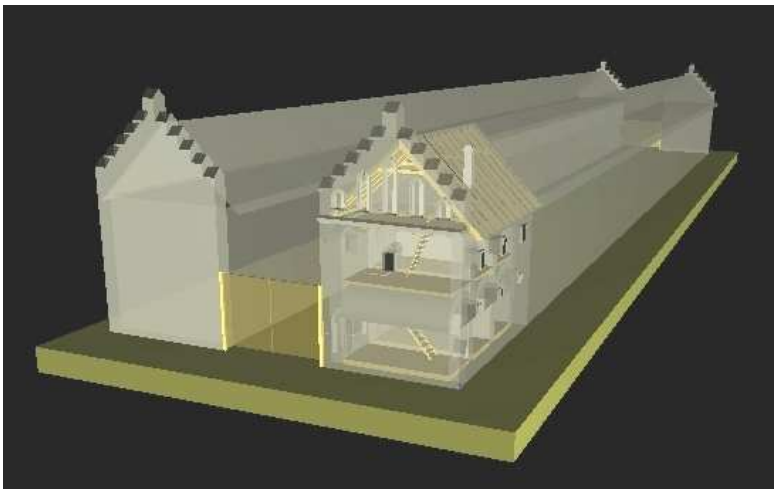


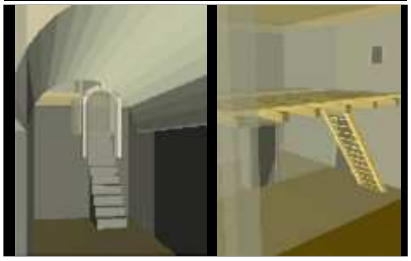


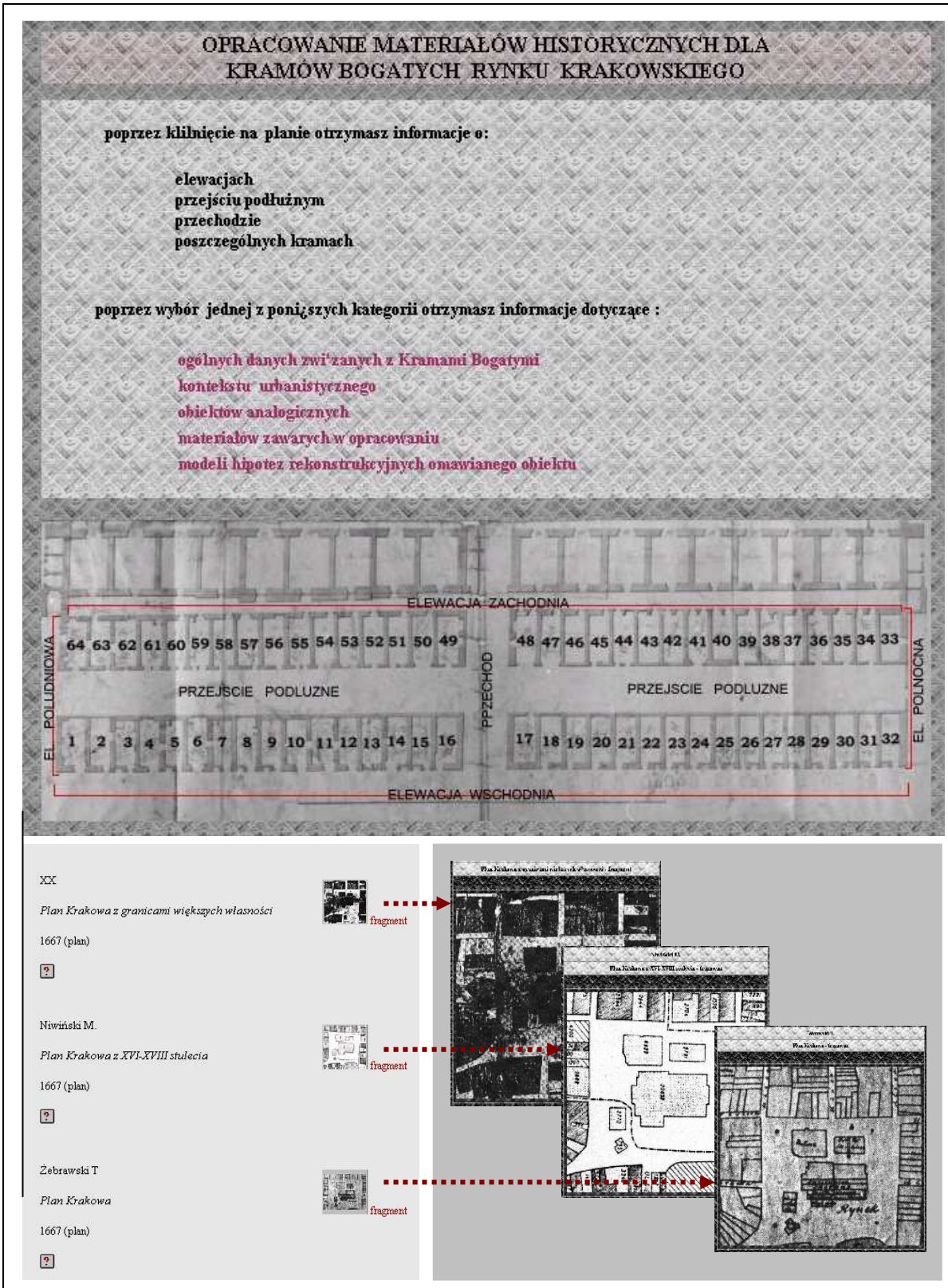


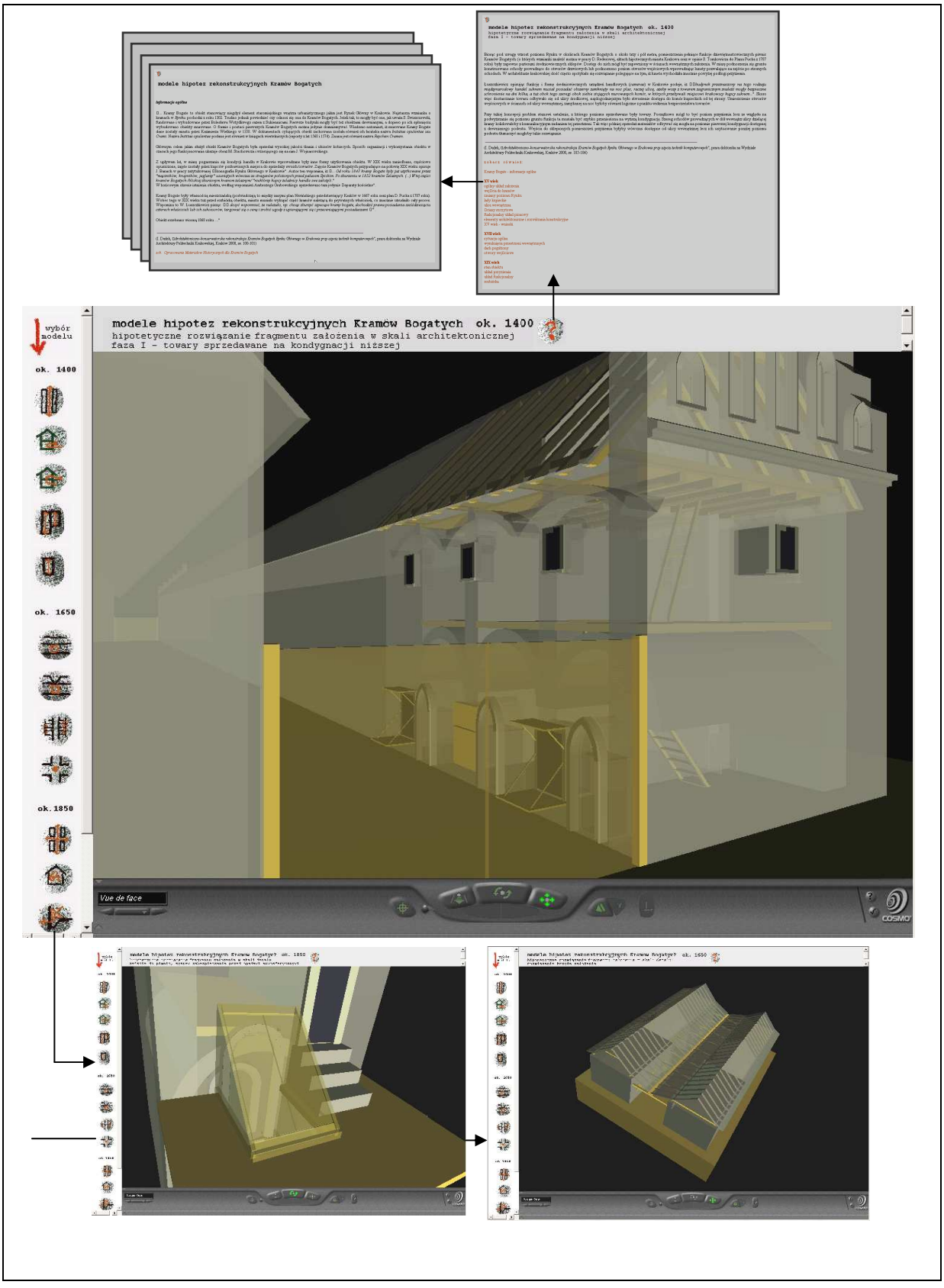


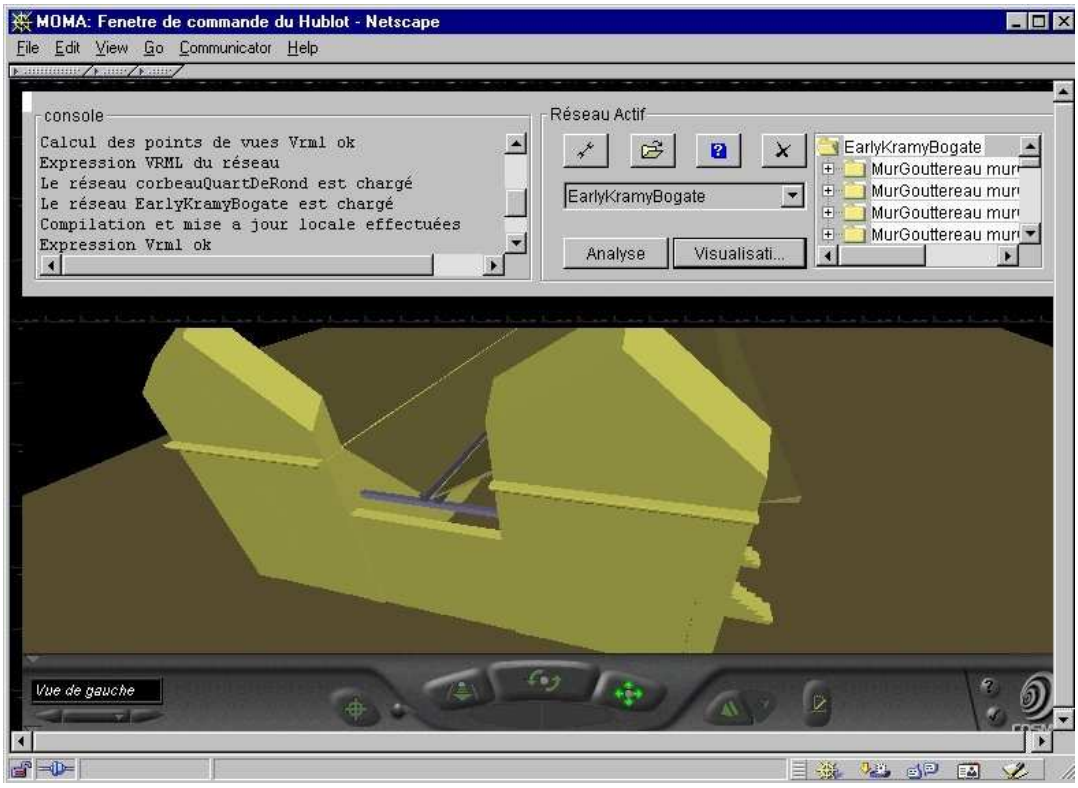


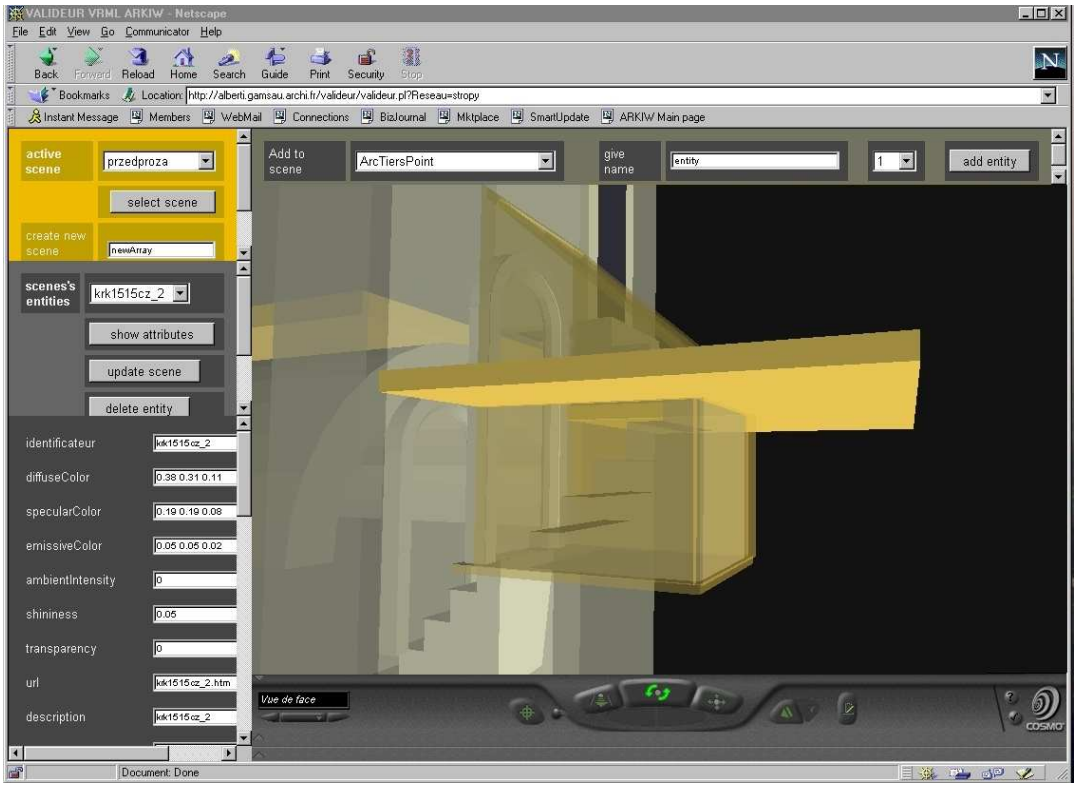





OPRACOWANIE MATERIAŁÓW HISTORYCZNYCH DLA
KRAMÓW BOGATYCH RYNKU KRAKOWSKIEGO
poprzez klilnięcie na planie otrzymasz informacje o:
elewacjach
przejściu podłużnym
przechodzie
poszczególnych kramach
poprzez wybór jednej z poni¿szych kategorii otrzymasz informacje dotyczące :
ogólnych danych zwi'zanych z Kramami Bogatymi
kontekstu urbanistycznego
obiektów analogicznych
materiałów zawarych w opracowaniu
modeli hipotez rekonstrukcyjnych omawianego obiektu
ELEWACJA ZACHODNIA
64 63 62 61 60 59 58 57 56 55 54 53 52 51 50 49
48 47 46 45 44 43 42 41 40 39 38 37 36 35 34 33
EL POLUDNIOWA
PRZEJSCIE PODLUZNE
PRZECHOD
PRZEJSCIE PODLUZNE
EL POLNOCNA
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
ELEWACJA WSCHODNIA
XX
Plan Krakowa z granicami większych własności
1667 (plan)
fragment
Niwiński M.
Plan Krakowa z XVI-XVIII stulecia
1667 (plan)
fragment
Żebrawski T
Plan Krakowa
1667 (plan)
fragment


modele hipotez rekonstrukcyjnych Kramów Bogatych
modele hipotez rekonstrukcyjnych Kramów Bogatych ok. 1400
hipotetyczne rozwiązanie fragmentu założenia w skali architektonicznej
faza I - towary sprzedawane na kondygnacji niższej
wybór modelu
ok. 1400
ok. 1650
ok. 1850
Vue de face
COSMO


MOMA: Fenetre de commande du Hublot - Netscape
File Edit View Go Communicator Help
console
Calcul des points de vues Vrml ok
Expression VRML du réseau
Le réseau corbeauQuartDeRond est chargé
Le réseau EarlyKramyBogate est chargé
Compilation et mise a jour locale effectuées
Expression Vrml ok
Réseau Actif
EarlyKramyBogate
Analyse
Visualisati...
Vue de gauche


VALIDEUR VRML ARKIW - Netscape
File Edit View Go Communicator Help
Back Forward Reload Home Search Guide Print Security Stop
Bookmarks Location: http://alberti.gamsau.archi.fr/valideur/valideur.pl?Reseau=stropy
Instant Message Members WebMail Connections BizJournal Mktplace SmartUpdate ARKIW Main page
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description
Add to scene
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entity
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Vue de face
Document: Done

n° 7 - experimentation and development

DIVA: The architectural methodological dictionary

DIVA:DIctionnaire méthodologique pour le Vocabulaire Architectural
DIVA: metodologiczny słownik architektoniczny

fields of experimentation :
terrains d'expérimentation
tereny eksperymentacji

The vocabulary related to ARKIW's fields of experimentation
Le vocabulaire lié aux terrains de l'expérimentation du programme ARKIW
Słownictwo związane z aktualnymi terenami eksperymentacji

The definition of a common and precise vocabulary used to name architectural concepts and objects has appeared of fundamental importance in the early stages of our co-operation. That is why an the first experimental methodological dictionary was implemented. The items taken into consideration in this experimental Web dictionary were limited to elements of the architectural vocabulary related to the successive study cases. Its objective was to allow a common unambiguous description of the elements of the corpus used in a process of hypothesis formalisation.
The Web-based implementation of DIVA database permitted investigations by a word and categories, allowing to search for the Polish, English and French translations of a word introduced in one of these three languages. At this moment it contained about 900 terms and their translations (accompanied by the bibliographical references).
The development of DIVA started using a relational database platform.

In 2001 the conception of DIVA was revived. Research of terms was largely facilitated by of implementation of methodological approach, based on a work of J.M Pérouse de Montclos, and introduction of graphic elements, that can act as a relevant and efficient intermediate between various understandings of architecture.
A relational database was replaced by XML files.

In 2003 DIVA experimentation was carried out using resources on roman sites in Tunisia and France, and the terminology connected to this type of architecture.
At this time DIVA Web application based on XML-related technologies was experimented on a limited number of terms (describing roman architecture) and documentary sources that illustrated them. Terms are given a definition sheet that covers between 4 and 6 languages. Each term is illustrated by visual documentary sources encompassing various archaeological sites. Web-based 3D graphics are used to query the system (along with traditional text-based forms).
Graphics were used as a mean to query a set of visual resources connected to a particular edifice but also a set of terms the visual resources illustrate. They permit as to browse the dictionary and the resources. They are a mean to gather around the shape of the architecture a set of resources that are thereby localised in time and space.

We use two types of data sheets (formalised in XML): vocabulary entries and visual resources entries.

Vocabulary entries contain a user-chosen number of definitions in various languages and a user-chosen number of translations. Both definitions and translations are given bibliographic references. *Visual resources* entries contain Dublin-Core based documentary elements but also a section that entitled "architectural reference". In this section the resource is identified as an illustration of one or several terms, and as figuring one particular piece of architecture.

Catalogues can then be built out of our two sets of entries that use the terminology as a link between the set of entries connected to particular pieces of architecture, materialised in position P of site S of

city T, and the set of term descriptions (example: the catalogue of all resources showing Corinthian capitals, or the catalogue of all resources showing the cella of temple T).

The key points:

° *Definition of terms*: each term is described in a problem solving, multimedia documents enabled approach that lets for domain oriented querying of the system as well as user-friendly low level interfaces.

° *Instances of the concepts are given for comparisons* (localisation / dating of concepts illustrations throughout Europe) in response to requirements stated by practitioners as well as teachers cum researchers (a catalogue of instances of the term given along with the term or concept definition).

The results
Les résultats / Rezultaty

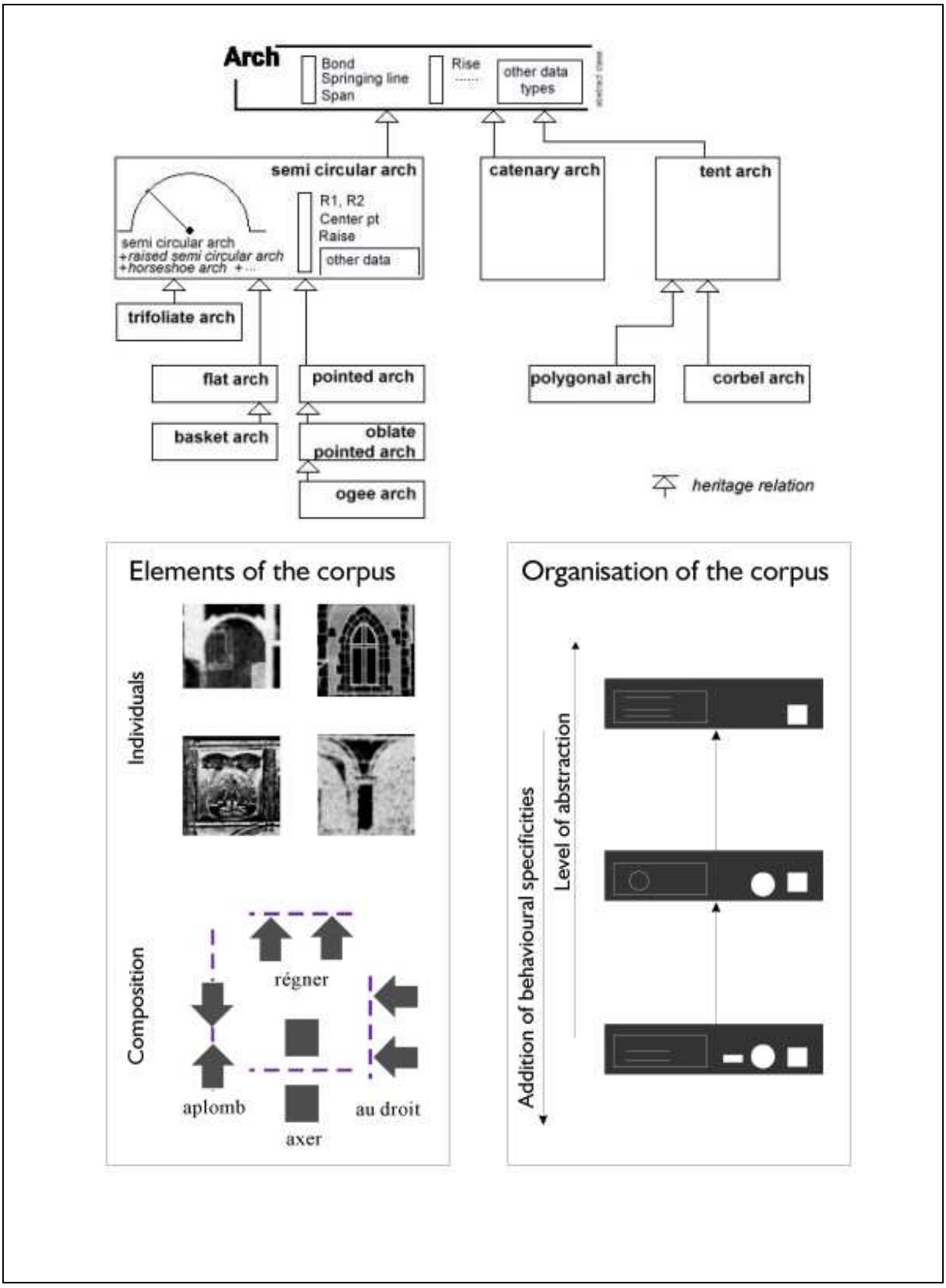
° Some recent developments of DIVA was continued in frames of programme STRABON (the XML based tool with the version of SDX).

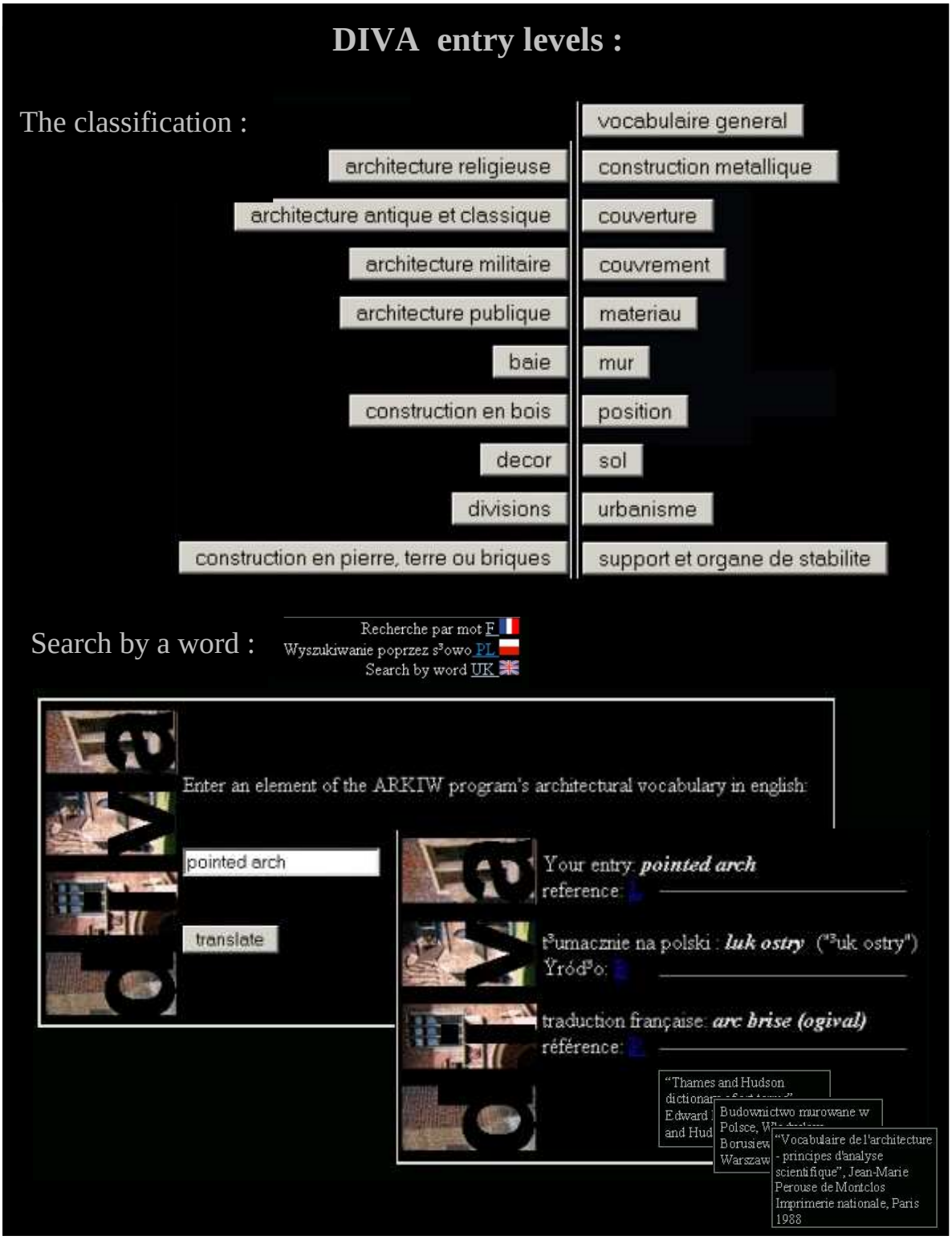
Publications related to the experiment:
Les publications liée ou sujet / Publikacje

[1.] ***„Collaborative network tools for the architectural analysis in conservation research”,***
proceedings: CYBER-REAL DESIGN, International Conference, Białystok, PL, April 1998
ISBN 83-905377-2-9, pp. 75-84
authors: J.Y. Blaise, J.Czubiński, I. Dudek,

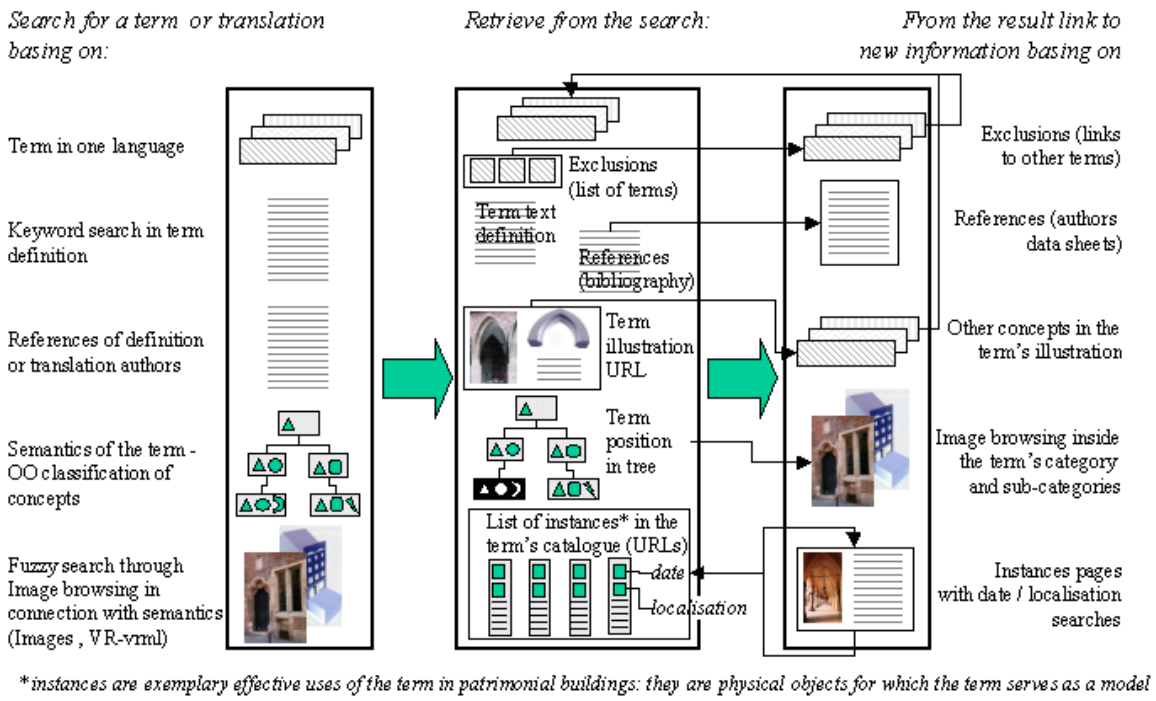
[2.] ***„Evolutions architecturales de l'Hôtel de Ville de Cracovie: un système d'information et de représentation des connaissances.”***
Seminary of UMR MAP, Mai 1999, Marseilles, FR
authors: J.Y. Blaise, I. Dudek,

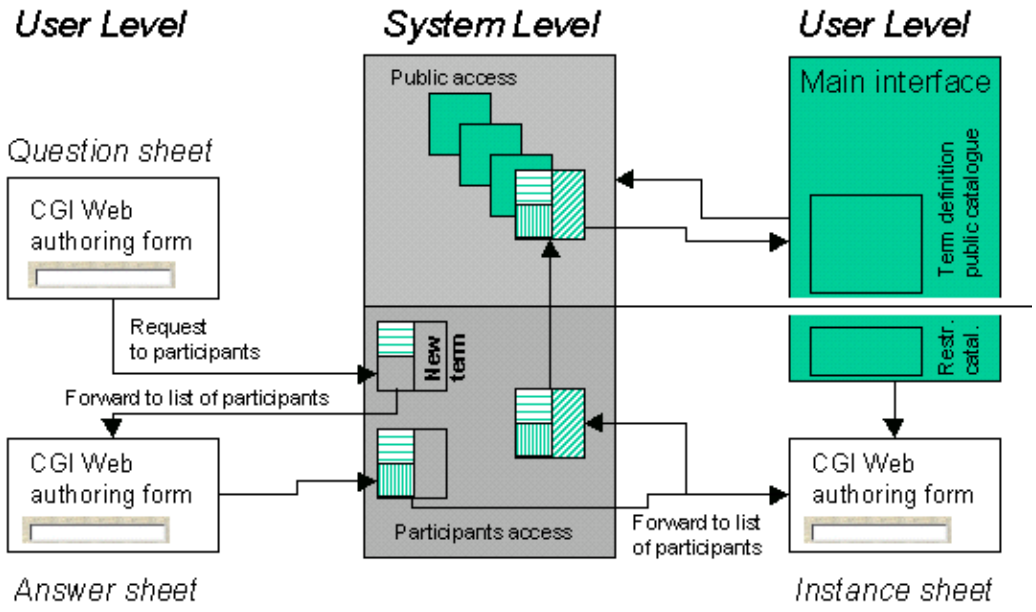
Illustrations:
Les illustrations / ilustracje





Elements of DIVA (1) interface





Schemas of DIVA developement

no 8 - experimentation and development

VIA / SOL2 - Knowledge management and visualisation platform for the architectural heritage

VIA / SOL2 - Plateforme de visualisation d' informations et des connaissances pour le patrimoine architecturale

VIA / SOL2 - Narzędzia do celów wizualizacyji informacji i reprezentacji wiedzy z zakresu z dziedzictwa architektonicznego

fields of experimentation :
terrains d'expérimentation
tereny eksperymentacji

The historical centre of Kraków
Le centre historique de Cracovie / Historyczne centrum Krakowa

Architectural heritage is a research area in which the word "visualisation" is often given a misleading interpretation, this of a synonym of "virtual reconstruction". We favour another interpretation of the word by thinking of visualisations as a graphical disposals used as visual interfaces for architectural documentation. 3D models of edifices sites are considered as interpretations of a knowledge that can be efficient in retrieving information (i.e., documentation) about architectural evolutions.

The methodology used by historians of architecture and conservators in order to analyse evolutions of an architectural object is based on the interpretation and comparison of various types of documentation. Therefore the idea that different pieces of documentation are in relation to architectural elements, is a natural (although often unspoken) part of their work methodology. One key goal of our research is to capture, capitalise and visualise the actual basis of this methodology – relations between an architectural artefact and the wide range of documents that refer to it.

The goals of VIA and SOL2 developments introduce several stepforwards:

° The definition of alternative scales for architectural concepts in order to better support the documentation's variety.

° The implementation of visual interfaces that not only allow a user to query from a 3D model but also to retrieve from his query a 3D model calculated online and featuring the only concepts corresponding to his search.

° The implementation of "justifiers" that are used in order to visualise through colour coding an evaluation of the accuracy of each architectural object's documentation.

° The support for variations through time of each architectural object with preserving its identity (variations of shape, position, etc..)

Our experiences are focused on evolution of historical centre of Kraków. We reference various historical documents connected to the urban fabric of Kraków' s Old Town and problems related to history of architecture and conservation. In line with Stenvert[1], documents are described in two ways:

° standard data identification describing what the document is (author, edition, type of media, technique, etc..) as used by the libraries, museums, etc.

° interpretation of data-content (morphology typology, etc.), used especially in art and architectural historical studies.

The documentation that we describe is stored in various collections (libraries, museums, archives, etc.). We propose a (Web-based) distributed architecture in which we only refer to pieces of

[1] Stenvert R.: "*Constructing the past: computer-assisted Architectural-Historical Research*", doctoral thesis, University of Utrecht/ Utrecht (1991)

information that are detained by various institutions. We do not deliver digitised copies of documents, but localise them in terms of :

- In which library(ies) can they be found?
- To which architectural objects do they refer?

Starting point:

In the study of historical architecture, the representation is in the same time a way of thinking and a method of communication. Therefore the types of representation that one uses depends on the information one wants to provide.

Starting with this observation we started works on elaboration of a information system dedicated to analysis of the knowledge on architectural and urban development in order to provide a better understanding of the objects and of relevant pieces of knowledge. The system enclose four interrelated elements:

- theoretical model,
- data analysis (information on the data content),
- data description (author, localisation ,etc.),
- dynamic representations.

Interpretative visualisation

In our approach a 3d model is not supposed to show an object but what is known about it, in other words what is represented is an interpretation of a knowledge about an architectural object in a given moment of its evolution. The interpretation has as an objective to help in better understanding of a state of a knowledge and to indicate what is already known and what still remains unknown. Consequently, we consider as vital to avoid showing more that is known.

The data that are used in analyses of an architectural evolution of an object are often considered as approximate and indefinite, that is why we employ an *interpretative visualisation* (that uses a language of symbols). The representation reveals only what is important in a context of a particular question, showing *what* the object is, but not *how* it is.

This type of representation exploits the semantic graphic codes in order to:

- underline inconsistency in the documentation or its analysis,
- to indicate the level of incompleteness concerning the investigation,
- to provide an updated visualisation of our knowledge on an object.

3D scenes

3D scenes are dynamically created as an answer to a query and show what we know, as well as they represent what we ignore. The concepts are given an appearance stemming from our knowledge. The graphic codes used in 3D scenes interpret the content of the data base (VIA).

The scenes can be constructed for a chosen moment in time (ex. the year 1578) or show the overall evolution of an object (timeline scenes where an interactive cursor of a VRML scene permits to choose a required date). Each identified evolution of an object is characterised not only by a particular morphology, but also by its localisation (that can change in time – on x, y, or z) as well as a specific typological information.

We have focused on the urban structure scale, corresponding roughly to the city's exteriors. More than six hundred evolutions have been identified, and with them the corresponding documentation. They cover a period of eight hundred years, with big differences in the number of evolutions between the various objects studied.

3D model and heterogeneous data

Each scene is displayed with client-side interaction disposals, that let a user to choose which database should be queried or what document type is available on the object.

Each object is displayed natively with a translucency that indicates the dating precision, and with a colour that indicates whether the morphology proposed is this of the object at the date of the scene or whether it is a copy of a previous or later evolution of the object, thereby underlining needs for further investigation. Once the scene is displayed, other possibilities are left for the user, (ex. the highlighting of objects in relation to types of documents as described in the documentation database - archaeological plan, 'historical plan, stratygraphic plan, digital sources, archival text, historical investigations, architectural investigations, archaeological drawing, photographs, artistic representation, 3D artefacts, etc.).

A 3D scene can be also constructed in relation to a particular document.

Developments
VIA / SOL2 technological choice does not stress one technology but investigates a possible combination of formalisms : OO modelling, XML Schemas, Interactive VR modelling basing on open standards, VR scenes / e-databases interfacing. The choices we introduce can probably be better understood in the light of the followed guidelines:

- Autonomy of 3D models and textual results with regards to the application that gave birth to them.
- Interactive visualisation of 3D models on the Web.
- 3D models stored in a format that can be manipulated with a standard programming language.
- 3D models used as graphical interfaces connecting the user either to an RDBMS or to other 3Dmodels and any other textual data.
- Use of existing RDBMS structure for the documentation itself.

Successive steps
Les étapes successives / Etapy prac

- gathering of bibliographic and iconographic sources,
- elaboration of the system of scales corresponding to a diversity of documentation content,
- identification, organisation and implementation of concept groups (for each of a defined scale),
- identification of typological characteristics for each concept group (of each scale),
- definition of databases and XML files structure,
- data analyses and interpretation,
- definition and implementation of 3D client-side interaction disposals,
- definition and implementation of relations between 3D scene and group of databases.
- definition and implementation of graphical semantic codes.
- definition and implementation of group of parametric proto-models.
- VRML ->SVG

Observations and conclusions
Les observations et les conclusions / Obserwacje i Wnioski

- In studies on the architectural heritage, data management raises non-trivial interfaces issues, notably due to the mass, diversity, complexity and heterogeneity of the contents. 3D representation at various scales (from the city to individuals objects), since it localises information spatially, and links it to a given morphological being, appears as one of the possible answers. It seems besides well fitted to meet the needs of a discipline, the architectural heritage, where such questions as data uncertainty in reconstructions or re-use of objects are present.
- 3D models of the architectural shapes are a natural and efficient filter for data visualisation and retrieval. A central improvement in the actual practice is the fact that architectural data finds its natural media, shapes, whereas it has traditionally up to now been centred on documentary descriptions (authors, editors, keywords, etc.). Therefore it seems legitimate to say that 3D

representations should and can be the efficient filters on the set of data architects, conservators or archaeologists handle.

- On the documentation side, benefits of such development include the possibility given to reuse existing data sets, the possibility to visualise what a particular document is about (edifices quoted in it), the possibility to compare levels of information between various sectors or objects types inside the territory observed.
- On the virtual reconstruction side, the defend approach helps the architects to build scenes using their own concepts, rather than the concepts of geometry. It allows an author of the reconstruction to build an object on which he/she has doubts and to represent along with a morphology the doubt itself. It also fosters the emergence of a new vision of 3D models, a vision that says a 3D model can be a sustainable research tool if it reaches the readability of a geographical map.
- The experience with VIA / SOL2 system has revealed is its capacity to help us in putting the finger on questions that remain to be raised, or that are only partly addressed. The provided 3D scenes help the researcher in clearly and synthetically visualise a state of knowledge on the city's evolution, and can be considered as key tools both in terms of what they we know and in terms of what they say we don't know. This research work clearly positions visualisation in the application domain as an interpretation, with an ambition not for realism but for the better documentation readability and access.
- The conducted research demonstrates that it is possible to greatly enrich the usefulness of 3D representations provided that some attention is put to the semantics behind the rendering. This question opens a research area that needs more involvement. At the actual state of advancement presented works provide an operational framework for the capitalisation (through database and XML formalisms) of this interpretation phase during which researchers establish meanings of raw data, and that derives from the reading of sources possible scenarios of morphological evolutions. Although the documentation analysis step is a costly one, it is a vital one in this particular application domain.

  Although such approach is clearly costly in time, but it does provide services in terms of readability and updatability that we think greatly enrich the usefulness of 3D representations in the architectural heritage.
- Moreover, a number of questions remain to develop, notably:

  On the concept modelling phase, generic morphological definitions could be developed that would be shared by various objects , in a way applying the XML paradigm in a yet-to come Architectural Modelling Language.

  On the graphics readability issue, it is clear that we need to further investigate this question probably by examining solutions tried out among wider scientific community.
- VIA/SOL2 contribution should be considered as a first step in efforts of using 3D modelling in the semantic visualisation of interrelated spatio-temporal data sets on archival information.

The results
Les résultats / Rezultaty

- The international workshop organised by UMR MAP 694 ("*Scientific Visualisation Issues in the field of the Architecture heritage: Can architectural objects be used as semantic 3D Interfaces ?"*, 25-26 April 2003, Marseille)
- Exploitation of the methodology worked out in a VIA / SOL2 project in frames of the European programme STRABON.

Publications related to the experiment:
Les publications liée ou sujet / Publikacje

[1.] ***„3D Models as Visual Interfaces for Documenting the Architectural Heritage: The Defensive System of Kraków „***
proceedings: VIIP 2002, Benalmadena, Spain, September 2002
ACTA Press, ISBN 0-88986-354-3, pp. 746-751
authors: J.Y. Blaise, I. Dudek

[2.] ***„ On how to link patrimonial information and 3D simulations: a methodology for enhanced exploitation and visualisation of architectural documentation, experimented on Kraków's historical centre"***
proceedings: UNESCO World Heritage Virtual Congress, October-November 2002
authors: A. Kadłuczka, M. Łukacz, Z. Wikłacz., M. Florenzano, I. Dudek, J.Y. Blaise

[3.] ***„ 3D models as visual interfaces for Internet: an application to a multimedia documentation on architectural evolutions"***
proceedings: ICCVG 02, Zakopane, PL, November 2002
ISBN 83-9176830-9, pp. 250-256
authors: J.Y. Blaise, I. Dudek

[4.] ***„ New experimentation of a generic framework for architectural heritage data visualisation"***
proceedings: WSCG, Plzen, Czech Republic, February 2003
Journal of WSCG vol 11 n°1, ISSN 1213-6972, pp. 109-117
authors: J.Y. Blaise, I. Dudek

[5.] ***„ On the relevance of 3D shapes for use as interfaces to architectural heritage data"***
proceedings: HCI 2003 Conference (Human Centered Interfaces), Crete, Greece, June 2003
ISBN 0-8058-4932-7, pp. 1228-1232
authors: J.Y. Blaise, I. Dudek, P. Bénistant

[6.] ***„Exploiting the architectural heritage's documentation: a case study on data analysis and visualisation"*** proceedings: I-Know 03, Graz, Austria, July 2003
Journal Of Universal Computer Science, ISSN 0948-695x, pp. 128-134
authors: J.Y. Blaise, I. Dudek

[7.] ***„Maquettes 3D et informations patrimoniales; nouveaux rôles, nouveaux enjeux",***
on line publication: CNRS, Department Sciences de l'Homme et de la Société, 2003,
http://www.cnrs.fr/SHS/recherche/liste_articles.php
authors: J.Y. Blaise, I. Dudek

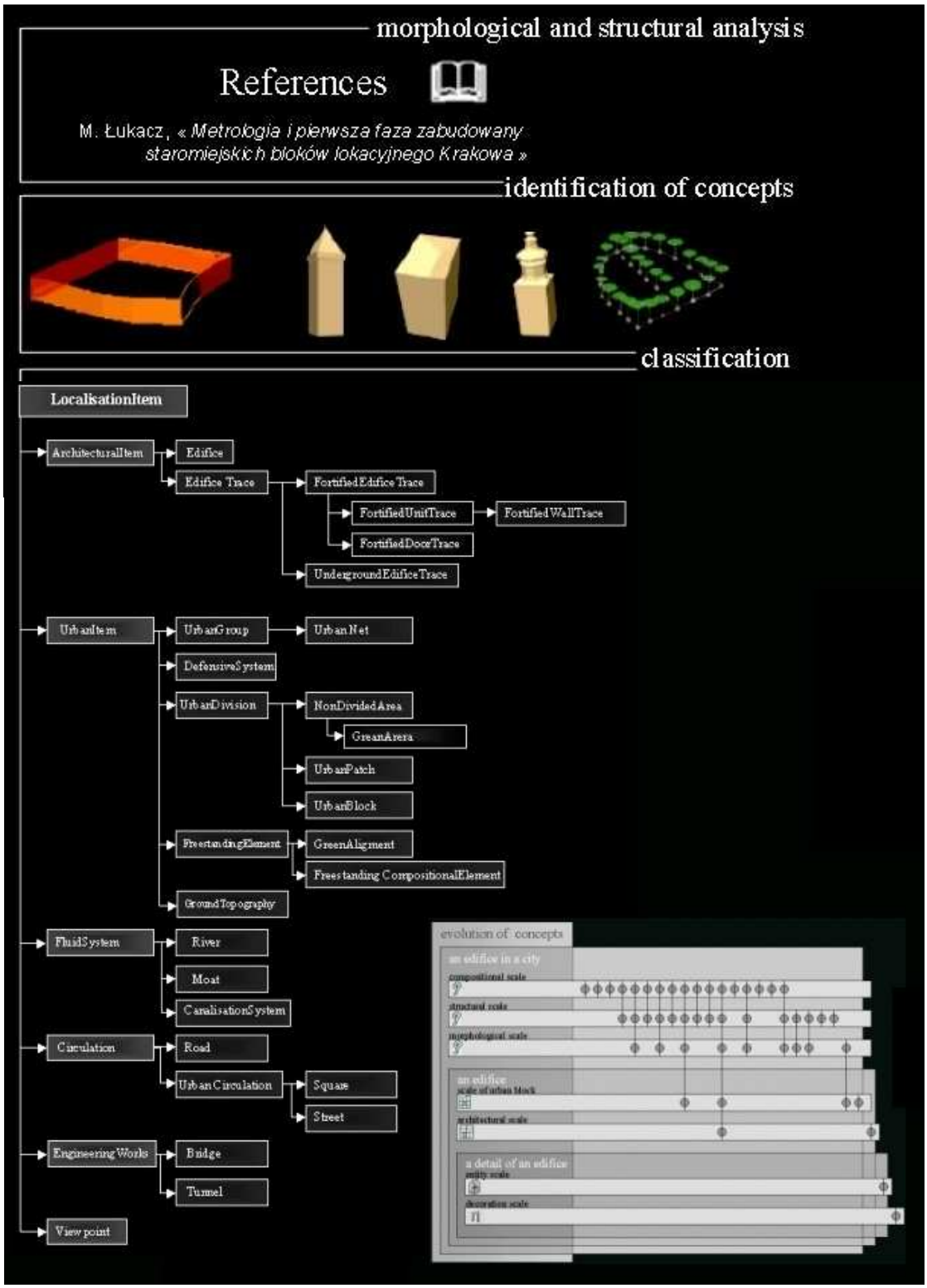
[8.] ***„ Access, interpretation and visualisation of heritage data using the architectural morphology: experimenting emerging interfaces on a case study."***
proceedings: ICHIM 03, Paris, Ecole du Louvre, FR, September 2003.
authors: J.Y. Blaise, I. Dudek

[9.] ***„Problèmes de représentation dans le contexte de connaissances évolutives."***
Seminar of UMR MAP 694 CNRS / MCC, *Saline Royale*, Arc et Senans, FR, December 2003
authors: J.Y. Blaise, I. Dudek

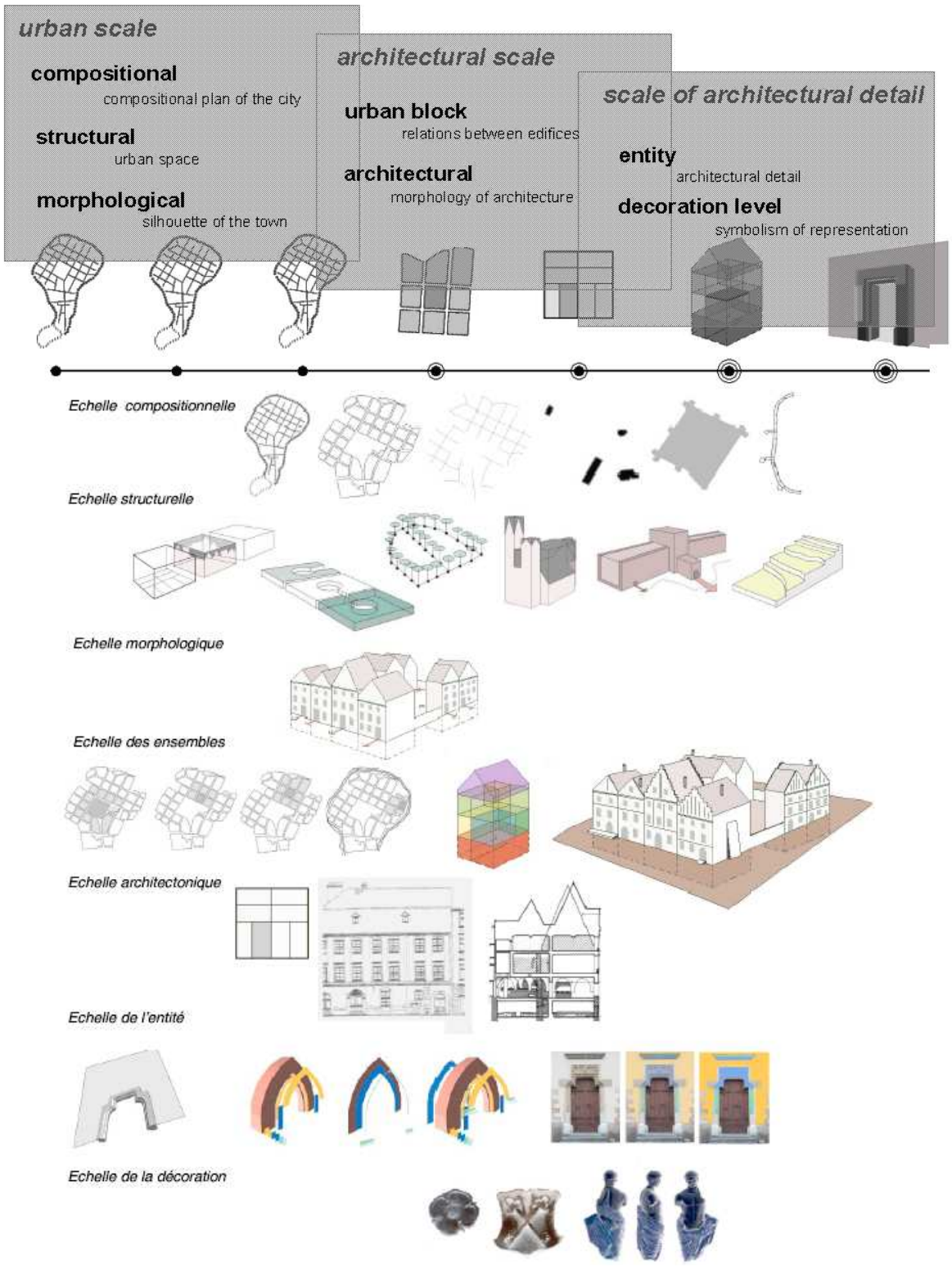
[10.] ***„Règles d'identification et méthodes de visualisation d'objets architecturaux"***
proceedings: EGC'2004, Clermont Ferrand, FR, January 2004
ISBN: 2.85428.633.2, Vol. II, pp. 573-584
authors: J.Y. Blaise, I. Dudek

[11.] ***„Online 2D/3D graphic interfaces using XML "repurposable" heritage contents"***
proceedings: WSCG 2004, Plzen, Czech Republic, February 2004
ISBN: 80-903100-5-2, Vol. I, pp. 39-46
authors: P. Bénistant, A. Durand, J.Y. Blaise, I. Dudek

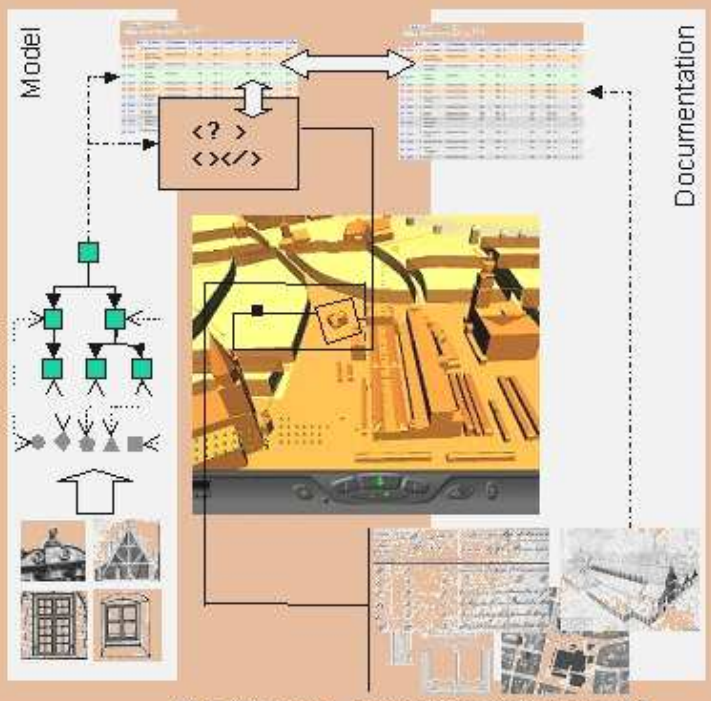
Illustrations:
Les illustrations / ilustracje



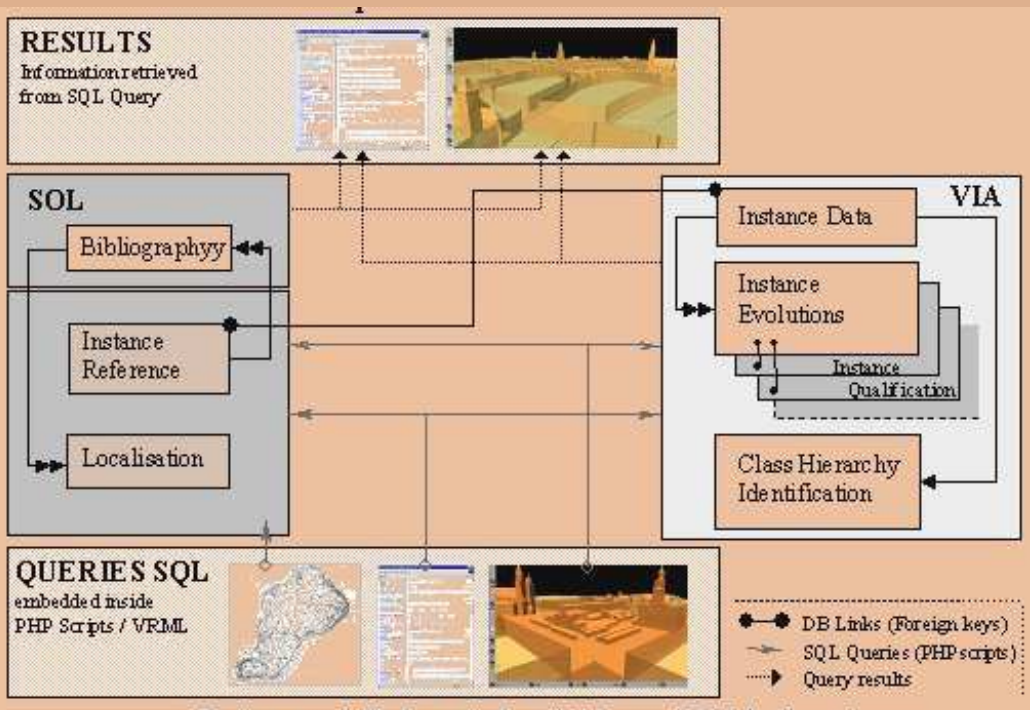
Identification and organisation of concepts - schema.



The system of seven scales corresponding to a diversity of documentation content



The 3D scene, connecting instances of a theoretical architectural model to sets of documents

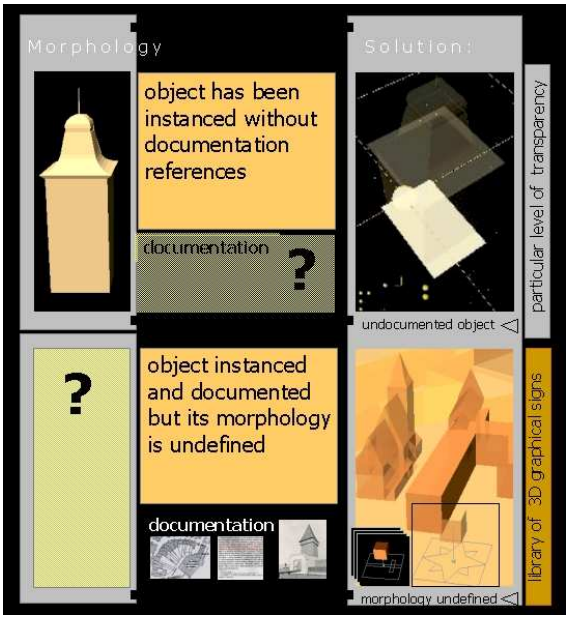


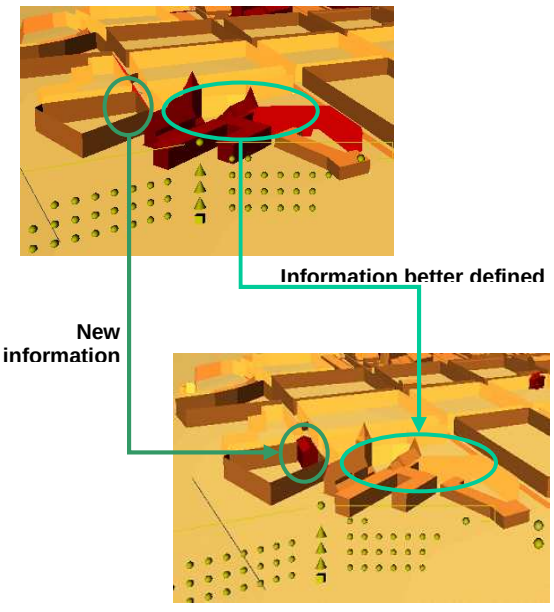
Roles and links of the SOL and VIA databases

Visualise shapes that in all cases are hypothetical
Propose visual markings of the object represented in a 3D scene that correspond to the hypothesis' evaluation.

Stress the lack of information by a visual sign in the 3D scene

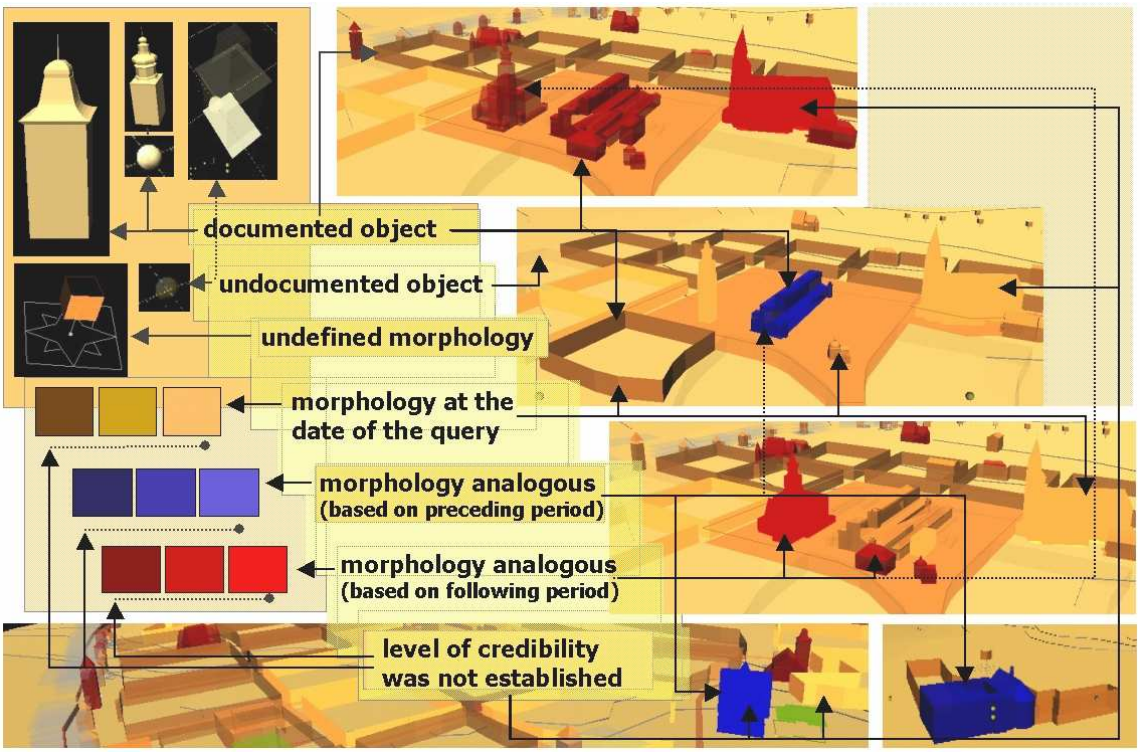
3D scenes show what we know, as well as they represent what we ignore: concepts are given an appearance stemming from our current state of knowledge.

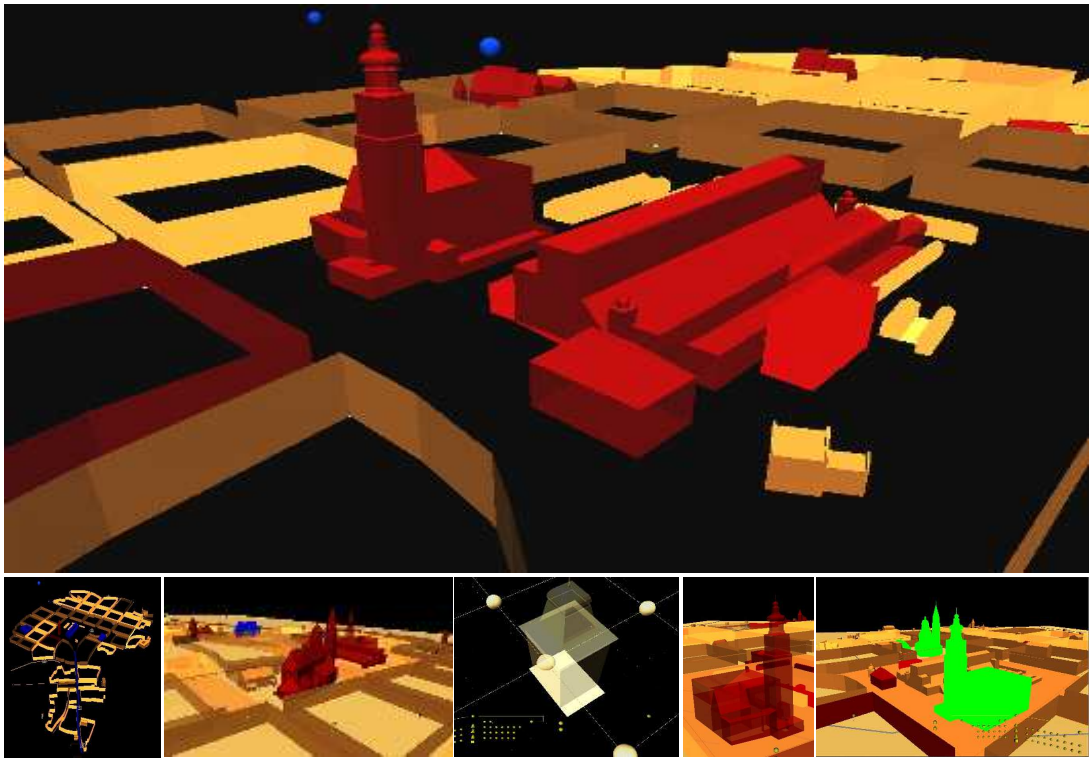




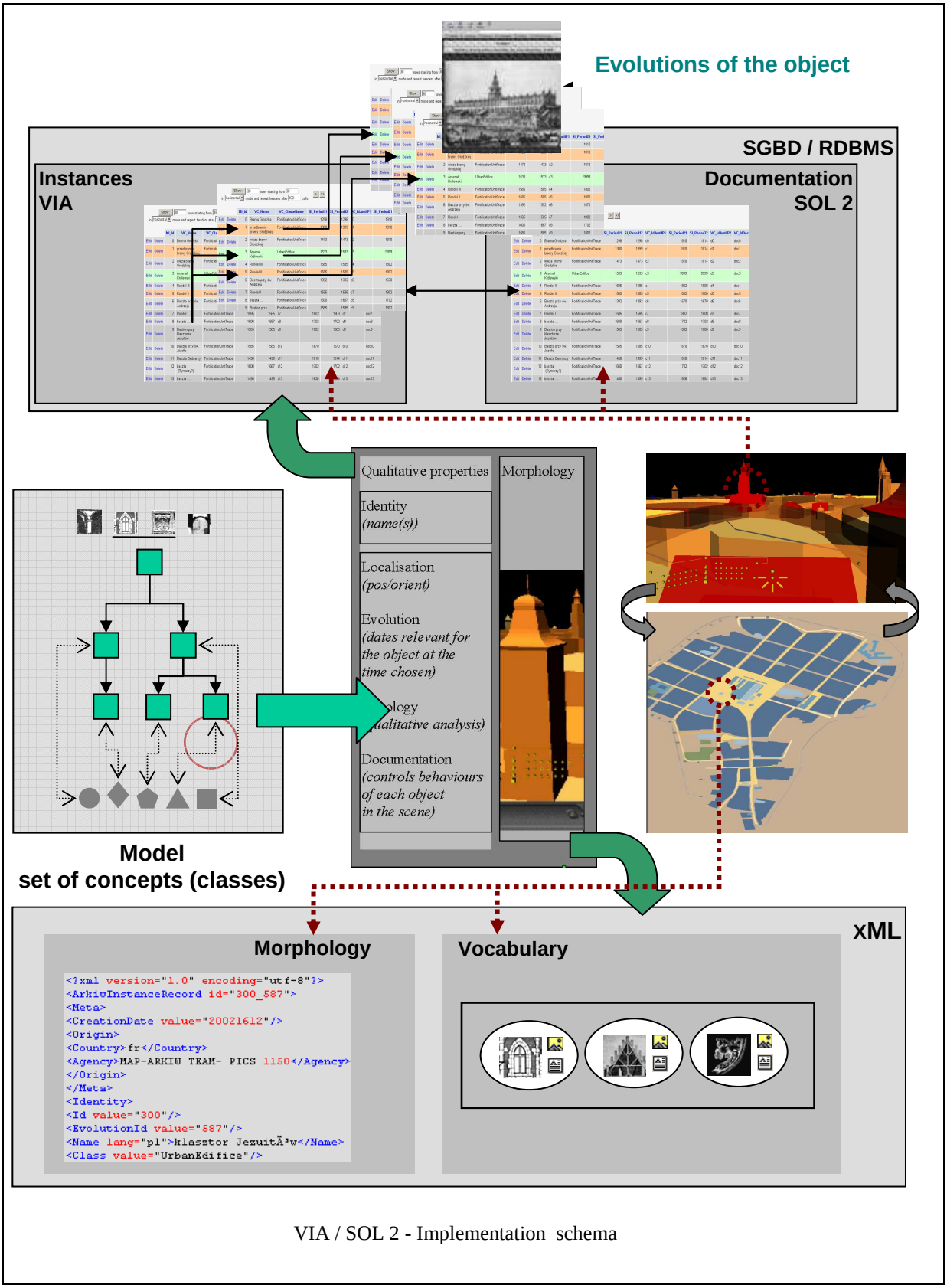
VIA - semantic graphic codes:

- underline inconsistency in the documentation or its analysis,
- indicate the level of incompleteness concerning the investigation,
- provide an updated visualisation of our knowledge on an object.

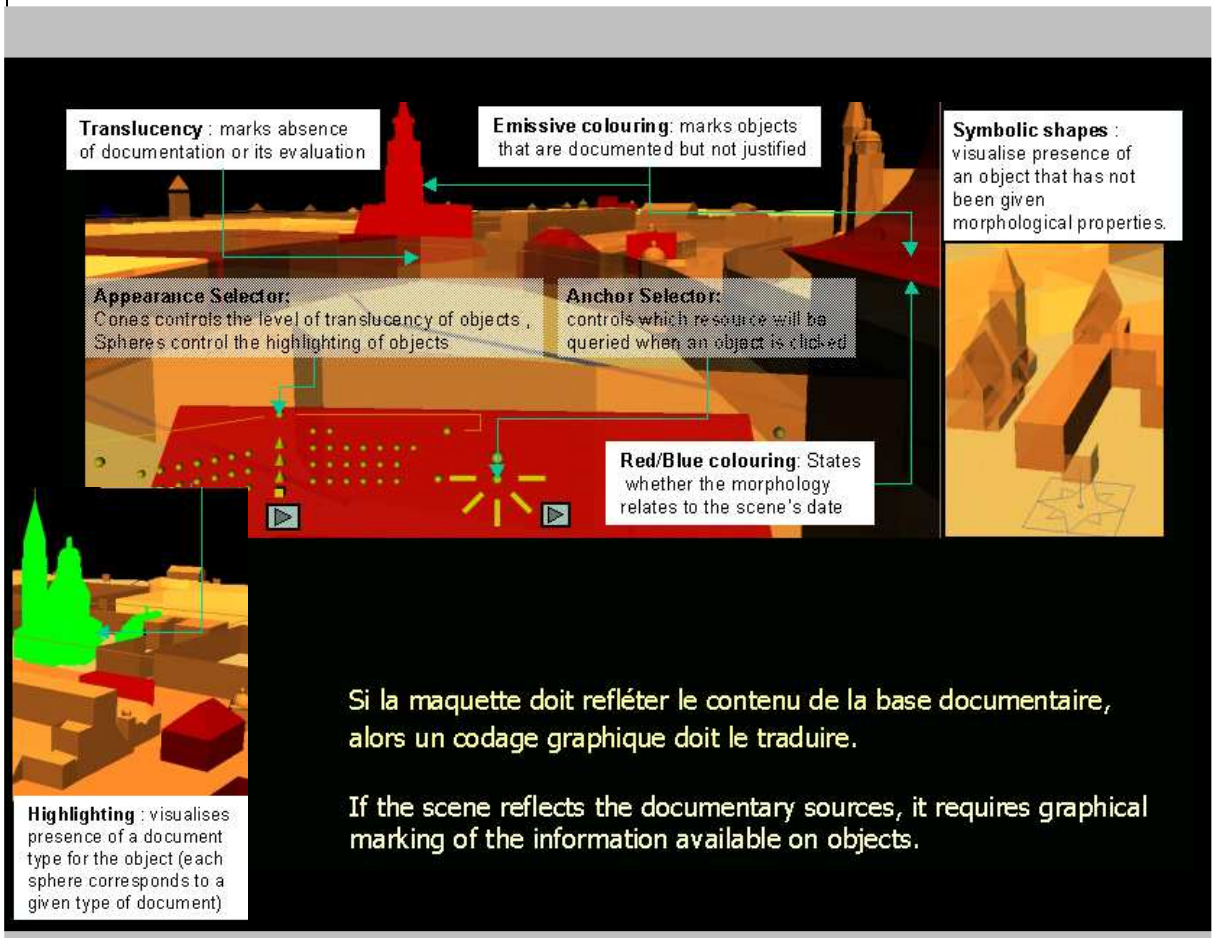


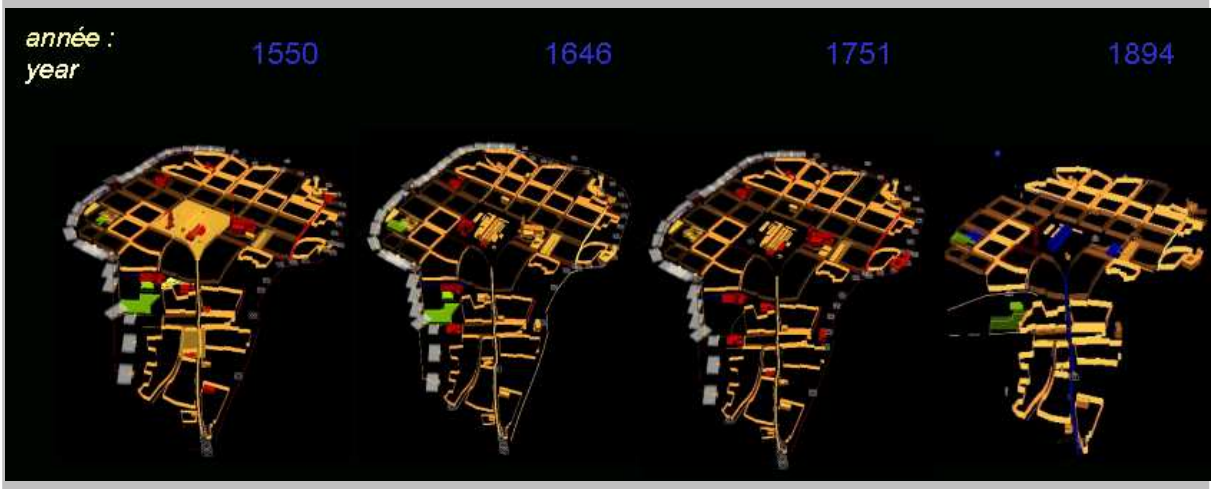


VIA - semantic colour codes

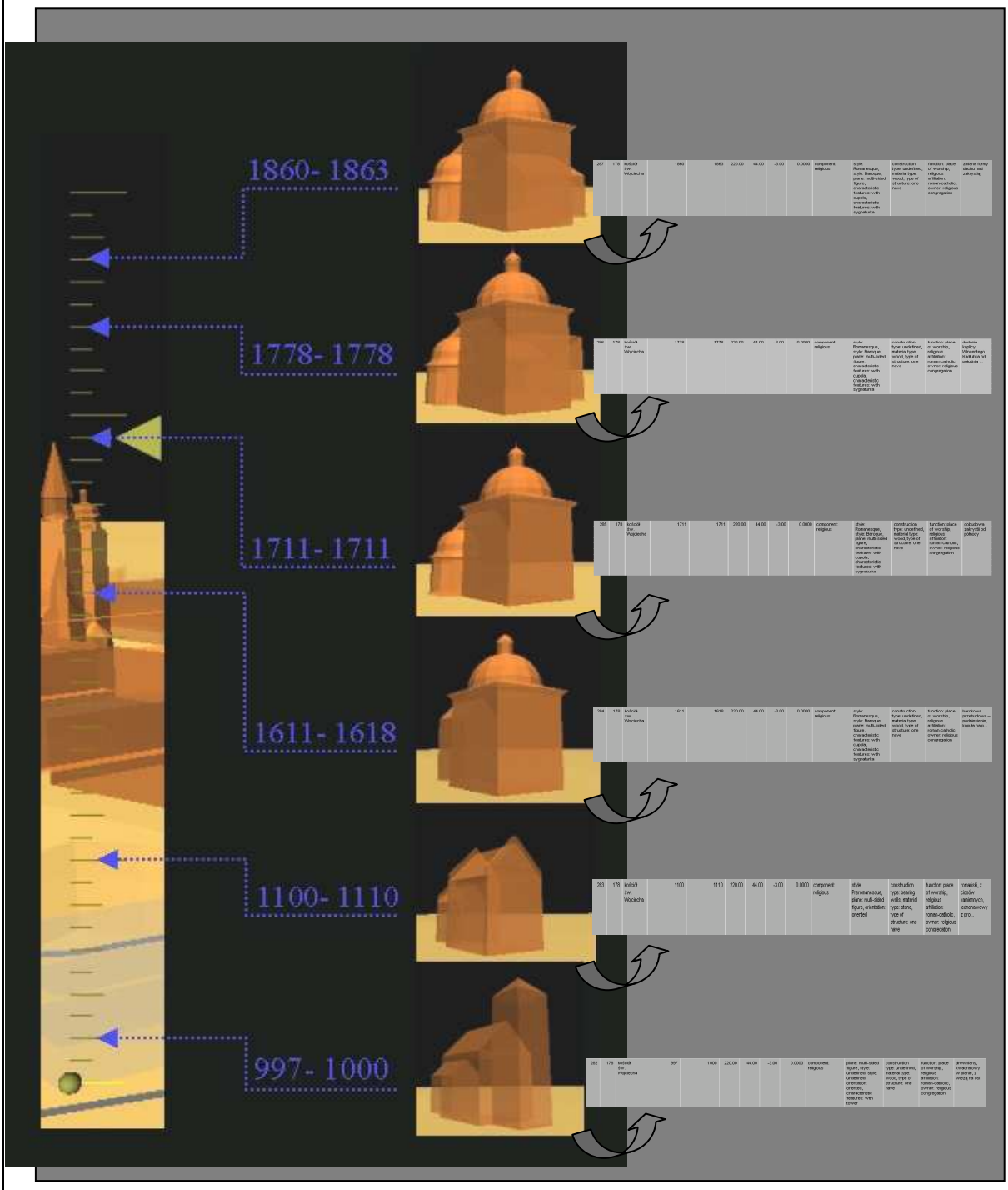


VIA / SOL 2 - Implementation schema

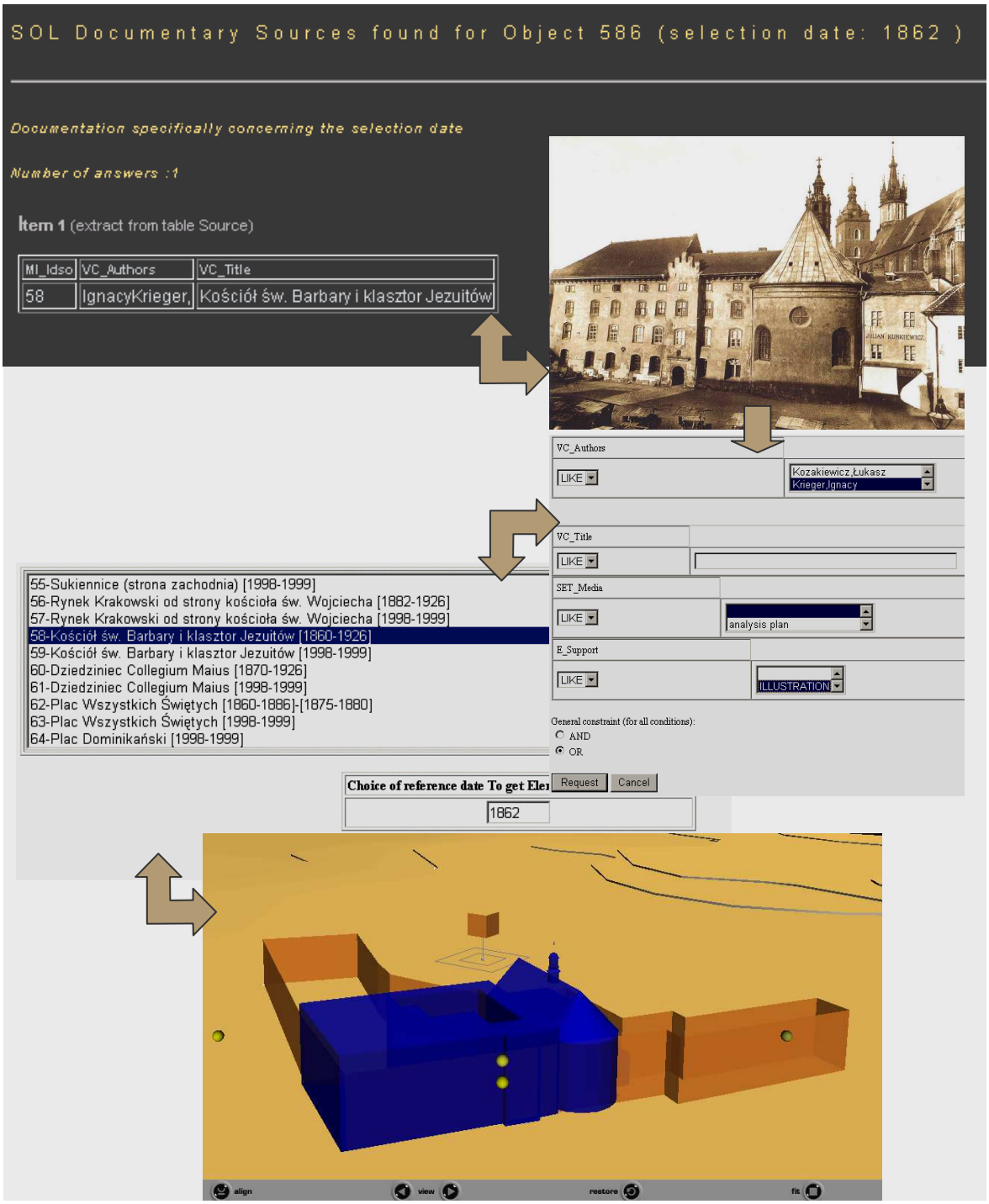




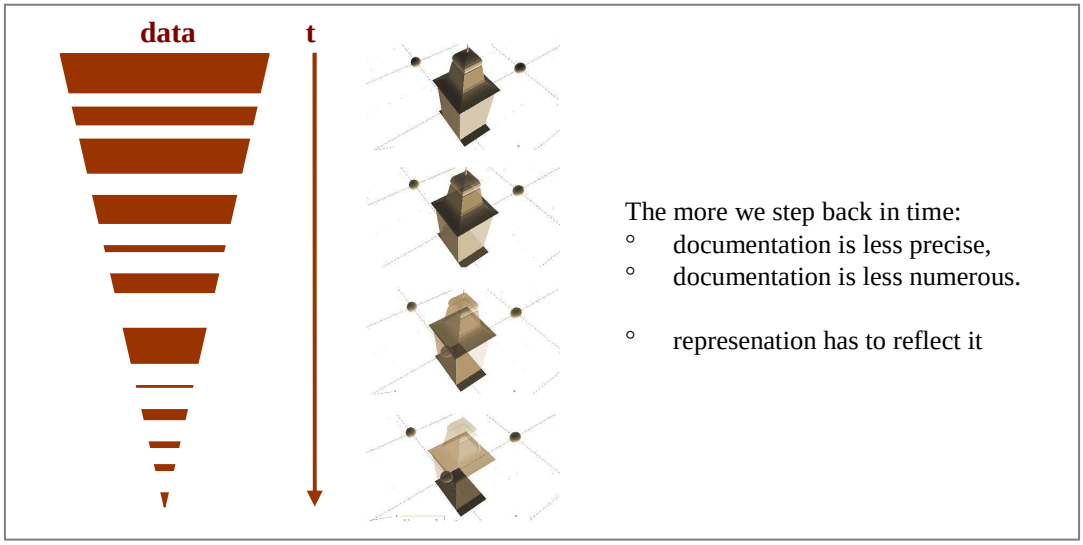
Client-side interaction disposals.
3D models created dynamically.



Timeline scenes - schema.
Handling architectural evolutions - St. Adalbert church , Kraków

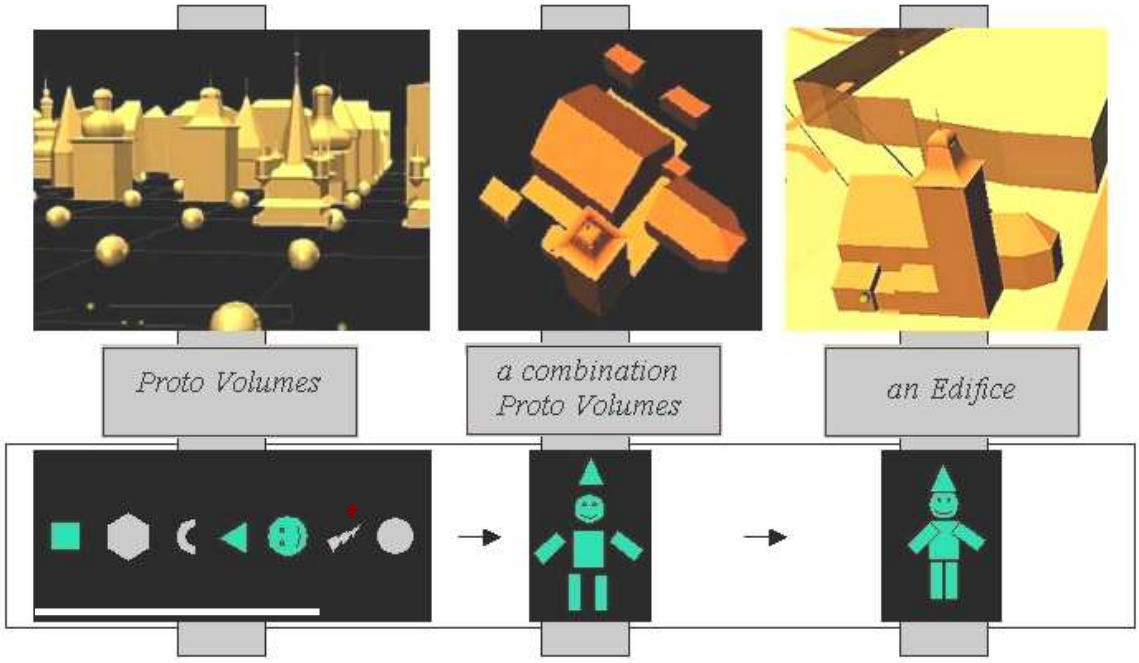


For a specific document, for example a photograph, a user specifies the author of the photograph, the title of the picture and the date of the period shown on the photograph. The corresponding 3D scene is calculated as the answer to the query. The 3D scene allows then a search for the additional documents related to objects that are present in the scene (= visible on the picture !), texts for example.

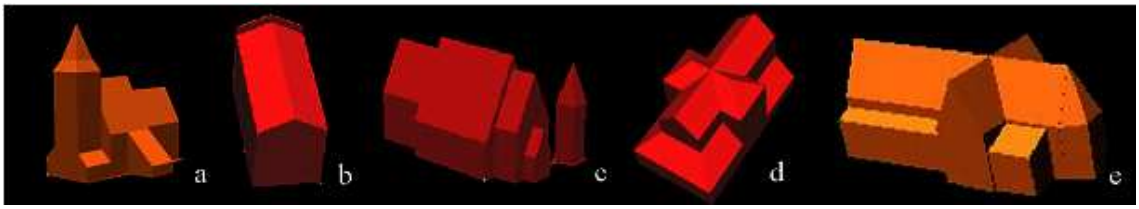


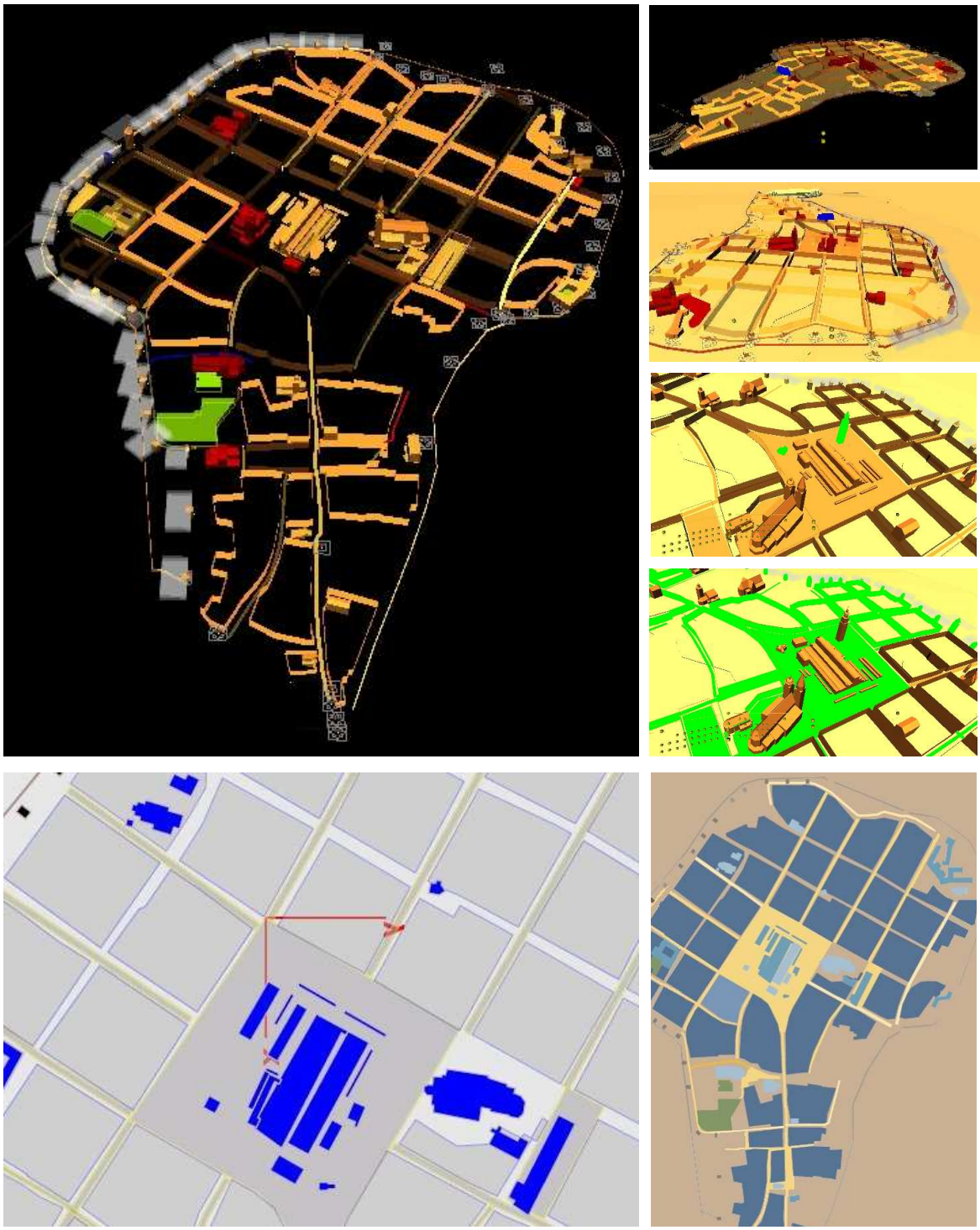
The more we step back in time:
- documentation is less precise,
- documentation is less numerous.

- represenation has to reflect it

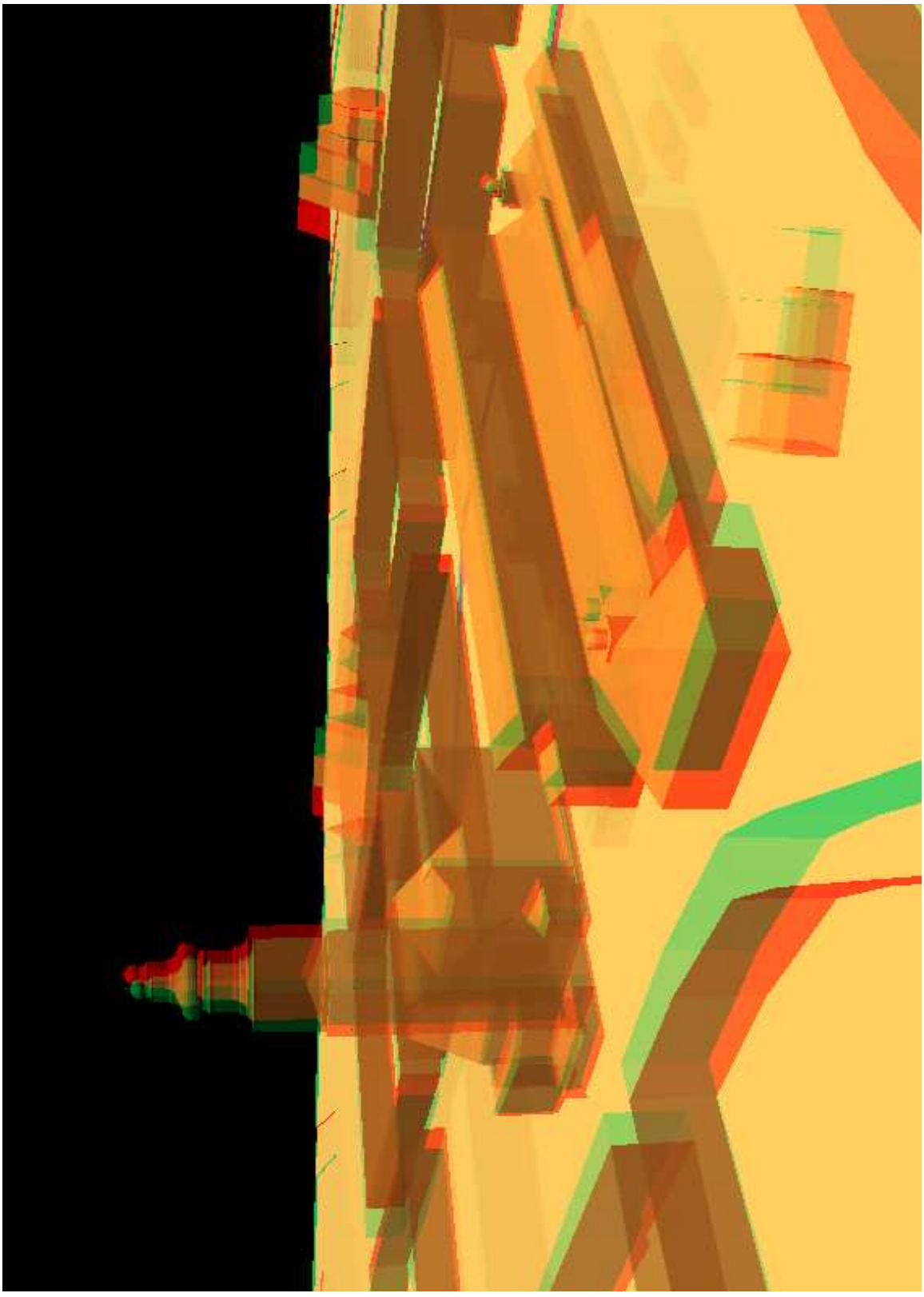


At structural scale, each edifice is described as a combination of elementary volumes for each of which an instance of the VRML PROTO is nested in the edifice's section of the VRML file. An edifice can contain an unlimited number of elementary volumes, helping to cope with a reasonable level of morphological complexity. Each elementary volume is positioned and oriented independently of the others inside the edifice's local co-ordinate system, but it bears the same appearance control mechanism as the an Edifice as a whole.

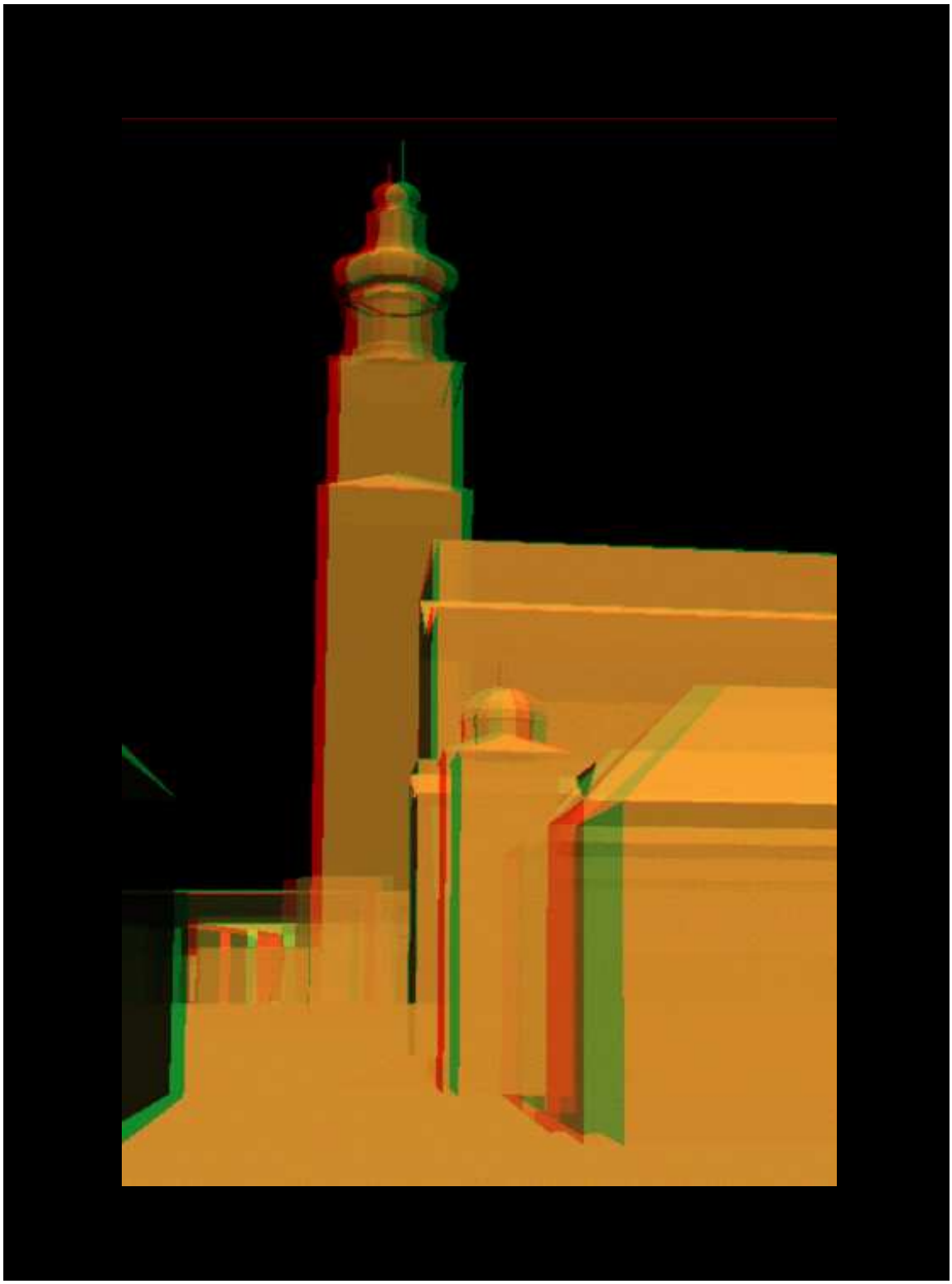




XML one input / several outputs paradigm



VIA – Market Square in Kraków, VRML scene - anaglyph



VIA – Market Square in Kraków, VRML scene - anaglyph

http://alberti.gamsau.archi.fr/diasKrakow/slide1.htm

Seminar and public presentation of the results of co-operation - 23 September 2000, Kraków

On 23rd of September 2000, in the frames of the European Days of Cultural Patrimony the Institute HAiKZ organised the seminar entitled "Computer techniques in a process of preservation of Cultural Patrimony"*. In the same day a large scale public stereo projection presenting the results of co-operation took place in the heart of the town (Rynek Główny).

„*In the walls of Kraków*"

The polarised images projected on a metalised flat-faced screen could be seen in relief with a use of special glasses.

The presentation objective was to both show the recent research results and promote the city's nowadays architectural edifices. Presented slides organised in four thematic stories, consisted of computer models (virtual reconstructions of buildings) and pictures of architectural details.

„*Trzy wymiary historii*", (autor: LKO), Gazeta Wyborcza, Gazeta w Krakowie, 25 września 2000, NR 224 (3176)

Each thematic group focuses on a particular aspect of the architectural heritage:

- urban scale development,
- architectural scale,
- civil and religious ornamentation,
- interiors and lifestyle.

The contents of the three thematic short stories included in the main loops are detailed in the following table.

urban scale development		
City location	Evolution of the urban fabric of the Main Square	Architectural consequences of the ground's raising of level

architectural scale		
Architectural evolution of the Town Hall	Problem of Attics in Kraków	Materials and techniques

civil and religious ornamentation		
A stylistic survey of architectural details	Elements of religious ornamentation	Statuary

interiors and lifestyle		
An explanatory survey of wooden ceilings typology	Evolution of urban houses	Architectural evolution of Kramy Bogate

* Techniki cyfrowe w procesie ochrony dziedzictwa Kultury
Techniques numérique dans un processus de la conservation du patrimoine culturel

http://arkiw.gamsau.archi.fr/VIA/via.htm

VIA workshop - 25-26 April 2003, Marseilles

UMR CNRS/MCC 694 MAP organised an international workshop entitled: *Scientific Visualisation Issues in the field of the Architecture heritage: Can architectural objects be used as semantic 3D Interfaces?*[*]

Purpose

The workshop addressed issues raised by researchers from both computer science and architectural heritage disciplines working on the use of 3D representations of edifices as a media. It acted as a forum for researchers and practitioners interested in connecting the fields of architecture (with a particular focus on conservation and documentation problems) and computer science (with a particular focus on applications of web technologies). It was thought to create an opportunity to present and observe experiences and results, as well as to stress needs and lacks of existing methodologies and/or technological solutions. The workshop is initiated the FACE net Web tools that aim at supporting easier exchanges of information between people interested in the workshop's interdisciplinary theme.

Theme & Scope

Numerous researches conducted at the intersection of our disciplines have proved that using 3D models as interfaces to information on the built heritage is a relevant objective. But they have also stressed lacks and limitations of information handling methodologies and technological answers available today. With the development of Web architectures in 3D modelling, it can be extremely fruitful for people involved in the studying of architecture to exchange ideas and experiences on new technological solutions. Where in the field of linguistics, hypertexts are seen as communication, 3D architectural objects can play the same role for edifices. Understanding the formal language of architecture, and finding a relevant representation for it, i.e. avatars in a virtual environment, appears here as a vital step. In writing relevant hypertexts, the question of establishing clear relationships between sources and destinations has been acknowledged as a vital one, and the same issue is raised when trying to attach 3D architectural shapes to information. But taking a closer look on what existing computer tools and formalisms offer when dealing with the architectural heritage shows that their relevance on this particular application field may not be optimal. E-databases and XML technologies are applied in building or site management and their documentation. In parallel, geometric modelling tools, along with photo-modelling platforms, allow the construction of 3D models in which simulations of a morphology is possible.
Moreover, GIS systems have proven useful in numerous site management experiences, particularly in the field of archaeology. But whether there is a way in between those families of technologies remains to be fully examined. To put it more simply, can 3D models be efficient in data visualisation or retrieval? Can they offer semantic views on the data collection that are absent from other media? Can

[*] *VIA workshop – Les issues de visualisation scientifiques dans le domaine de Patrimoine architectural: Les objets architecturaux peuvent-ils être employés en tant qu'interfaces 3D sémantiques ?*
Zagadnienia Naukowej Wizualizacji w dziedzinie Dziedzictwa Historyczno-Architektonicznego: Czy obiekty architektoniczne mogą służyć w tworzeniu semantycznych trójwymiarowych interfejsów, dających dostęp do danych historycznych?

they synthetically localise pieces of information with regards to a position in space and a moment in history Documentation analysis and organisation are vital to the researcher when trying to understand the evolution of patrimonial edifices and sites. Documentary sources are undoubtedly the only scientific basis from which various virtual renderings can be derived and justified. The workshop will be centred on needs and means for the visualisation of the architectural heritage's documentation.

Topics:

- data collections,
- access policies,
- data analysis and/or visualisation methodologies,
- digitalisation,
- interfaces (3D/2D/Textual/…),

- 3D modelling,
- Solutions on the Web,
- links between geometrical and qualitative information,
- support for the notion of Architectural scale,
- interpretative modelling vs realism,

- architectural modelling,
- concept analysis,
- theoretical models,
- existing libraries,
- geometry vs architecture,
- architectural objects vs architectural documentation,

- heritage-specific problems,
- uncertainty handling,
- conservation documentation,
- comparison based reasoning.

The workshop will consist of short presentations proposed by participants and by thematic sessions during which the above-mentioned questions will be addressed both by critically examining existing experiences and by isolating fields of research to investigate. More detail can be found in the pre-programme.

diploma design of Christian RADI (2000)

(title of Architect DPLG), June 2000, Marseilles
School of Architecture, Marseilles

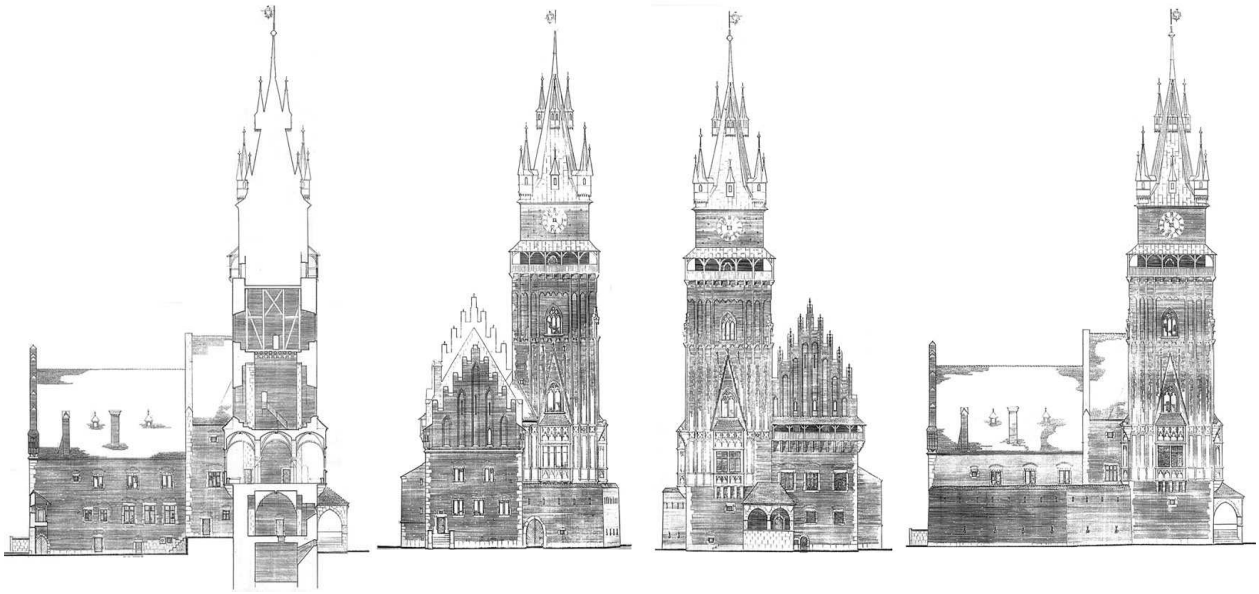
"Historical evolutions of Kraków's Old Town Hall"[*]

Abstract:
The central theme of this work is the representation in architecture. Even if the techniques analysed in this work are relatively recent, in the context representation in architecture they should be considered first of all as a new answer to the old requirements. Therefore the objective of my investigation was to verify if this new techniques bring the new solutions.
The following problems were analysed:

The representation techniques in architecture
- The architectural drawing (a traditional graphic simulation) in the antique societies, in the medieval period and in Renaissance,
- A conventional 3D model (the mean of spatial simulation, experimentation and representation),
- The architectural survey,

A numeric 3D model and valorisation of the architectural patrimony
- Use of numerical tools,
- Architectural model and geometric modelling,
- Geometric modelling in archaeological reconstruction,
- Geometric modelling in Maya software.

The reconstructive hypotheses of the Town Hall in Kraków
- The documentary sources,
- The chronological evolution of the Town Hall in Kraków,
- Functional analysis,
- Various hypotheses of reconstruction (Schmaus von Livonegg, August Essenwein, Franciszek Christ),
- The methodology of representation,



Coupe Façade est Façade est Façade sud

Town Hall in XV century – t he hypothesis (author: Franciszek Christ)

[*] Les évolutions historiques de l'Hôtel de Ville de Kraków
Rozwój historyczny i ewolucja Ratusza w Krakowie.

List of Publications

Références bibliographiques / Lista publikacji

[1.] ***„Collaborative network tools for the architectural analysis in conservation research”,***
proceedings: CYBER-REAL DESIGN, International Conference, Białystok, PL, April 1998
ISBN 83-905377-2-9, pp. 75-84
authors: J.Y. Blaise, J.Czubiński, I. Dudek

[2.] ***„JAVA collaborative interface for architectural simulations A case study on wooden ceilings of Kraków”,***
proceedings: The International Conference on Conservation, section IV, Kraków, PL, November 1998
ISBN 83-7242-072-6, pp. 33-40
authors: J.Y. Blaise, I. Dudek, P. Drap

[3.] ***„Evolutions architecturales de l’Hôtel de Ville de Cracovie: un système d’information et de représentation des connaissances.”***
Seminary of UMR MAP, Mai 1999, Marseilles, FR
authors: J.Y. Blaise, I. Dudek

[4.] ***„IT applications for architectural intervention and documentation in monuments' ensembles”,***
proceedings: The International Conference on Conservation, section, November 1999, Kraków, PL
authors: J.Y. Blaise, I. Dudek

[5.] ***„SOL: Spatial and historical web-based interface for On Line architectural documentation of Kraków's Rynek Główny”,***
proceedings: 17th Conference of eCAADe, Turning to 2000, Liverpool, UK, September 1999
ISBN 0-9523687-5-7, pp. 700-707
authors: J.Y. Blaise, I. Dudek

[6.] ***An architectural model compiler dedicated to archaeological hypothesis. An experiment on Krakow's Kramy Bogate “***
proceedings: HCP'99, Human Centered Processes, September 1999, Brest, FR
ENST – Bretagne, pp. 118-125.
authors: J.Y. Blaise, I. Dudek, P. Drap

[7.] ***„Modèles et représentation à l ’échelle architecturale: une expérience à Cracovie”,***
proceedings: Rome an 2000, Cahiers de la MRSH - Caen n°33, June 2000, Caen, FR
ISSN 1250-6419, pp. 155-169
authors: J.Y. Blaise, M. Florenzano
,

[8.] ***„Outils numériques et représentation de l'architecture patrimoniale”,***
Culture et Recherche, n°81, MRT (Mission de la Recherche et de la Technologie du Ministère de la Culture et de la Communication), December 2000
author: J.Y. Blaise

[9.] ***„SOL- un outil de gestion de données bibliographiques sur le Web”***
Seminar of UMR MAP 694 CNRS / MCC, Touluse, FR, December 2000
authors: J.Y. Blaise, I. Dudek

[10.] ***„Representation de l’edifice patrimonial: echelles et usages. Une experience a Cracovie.”***
Seminar of UMR MAP 694 CNRS / MCC, Touluse, FR, December 2000
author: J.Y. Blaise, I. Dudek

[11.] ***„Interpretative modelling as a tool in the investigation of the architectural heritage: information and visualisation issues “***
proceedings: VIIP 2001(Visualisation, Image and Image Processing), Marbella, Spain, September 2001
ACTA Press, ISBN 0-88986-309-1, pp. 48-54
authors: J.Y. Blaise, I. Dudek

[12.] ***„3D Models as Visual Interfaces for Documenting the Architectural Heritage: The Defensive System of Kraków „***
proceedings: VIIP 2002 (Visualisation, Image and Image Processing), Benalmadena, Spain, September 2002
ACTA Press, ISBN 0-88986-354-3, pp. 746-751
authors: J.Y. Blaise, I. Dudek

[13.] ***„ On how to link patrimonial information and 3D simulations: a methodology for enhanced exploitation and visualisation of architectural documentation, experimented on Kraków's historical centre"***
proceedings: UNESCO World Heritage Virtual Congress, October-November 2002
authors: A. Kadłuczka, M. Łukacz, Z. Wikłacz., M. Florenzano, I. Dudek, J.Y. Blaise

[14.] ***„ 3D models as visual interfaces for Internet: an application to a multimedia documentation on architectural evolutions"***
proceedings: ICCVG 02, Zakopane, PL
ISBN 83-9176830-9, pp. 250-256
authors: J.Y. Blaise, I. Dudek

[15.] ***„ New experimentation of a generic framework for architectural heritage data visualisation"***
proceedings: WSCG 2003 , Plzen, Czech Republic, February 2003
Journal of WSCG vol 11 n°1, ISSN 1213-6972, pp. 109-117
authors: J.Y. Blaise, I. Dudek

[16.] ***„ On the relevance of 3D shapes for use as interfaces to architectural heritage data"***
proceedings: HCI 2003 Conference (Human Centered Interfaces), Crete, Greece, June 2003
ISBN 0-8058-4932-7, pp. 1228-1232
authors: J.Y. Blaise, I. Dudek, P. Bénistant

[17.] ***„Exploiting the architectural heritage's documentation: a case study on data analysis and visualisation"*** proceedings: I-Know 03 Conference on Knowledge Management, Graz, Austria, July 2003
Journal Of Universal Computer Science, ISSN 0948-695x, pp. 128-134
authors: J.Y. Blaise, I. Dudek

[18.] ***„ Access, interpretation and visualisation of heritage data using the architectural morphology: experimenting emerging interfaces on a case study."***
proceedings: ICHIM 03 Paris, Ecole du Louvre, FR, September 2003.
authors: J.Y. Blaise, I. Dudek

[19.] ***„Problèmes de représentation dans le contexte de connaissances évolutives."***
Seminar of UMR MAP 694 CNRS / MCC, *Saline Royale*, Arc et Senans, FR, December 2003
authors: J.Y. Blaise, I. Dudek

[20.] ***„Maquettes 3D et informations patrimoniales; nouveaux rôles, nouveaux enjeux",***
on line publication: CNRS, Department Sciences de l'Homme et de la Société, (2003),
http://www.cnrs.fr/SHS/recherche/liste_articles.php
authors: J.Y. Blaise, I. Dudek

[21.] ***„Règles d'identification et méthodes de visualisation d'objets architecturaux"***
proceedings: 4èmes journées d'Extraction et de Gestion des Connaissances (EGC'2004), Clermont Ferrand, FR, January 2004
ISBN: 2.85428.633.2, Vol. II, pp. 573-584
authors: J.Y. Blaise, I. Dudek

[22.] ***„Online 2D/3D graphic interfaces using XML "repurposable" heritage contents"***
proceedings: WSCG 2004, Plzen, Czech Republic, February 2004
ISBN: 80-903100-5-2, Vol. I, pp. 39-46
authors: P. Bénistant, A. Durand, J.Y. Blaise, I. Dudek

Documents hypermedia and demonstrators available on Internet *

*Documents hypermédia et démonstrateurs disponibles sur Internet**
Dokumenty i prezentacje dostepne w Intrnecie*

[1.] *Internet site of UMR MAP*
http://www.map.archi.fr/ (see sections)
http://www.map.archi.fr/theme1/axe/axe3.php
http://www.map.archi.fr/theme4/theme4.php.

[2.] PICS et APN/ATIP projects sites (certain documents are have restricted access mode)
http://arkiw.gamsau.archi.fr/

[3.] *Acts and demonstrators of the seminar VIA*
http://arkiw.gamsau.archi.fr/VIA/via.htm (see also)
http://arkiw.gamsau.archi.fr/scenes/legend.htm
http://arkiw.gamsau.archi.fr/VRML/

[4.] *Reconstructions of the Town Hall in Krakw,*
http://arkiw.gamsau.archi.fr/face/VIA/demos/ratusz/slide1.htm

[5.] *Typological study of the wooden ceilings, simulations*
http://arkiw.gamsau.archi.fr/face/VIA/demos/strops/slide1.htm

[6.] *Internet site of APN, interactive demonstrators*
http://arkiw.gamsau.archi.fr/apnSite/apnIndex.pl

[7.] *FACE net*
http://arkiw.gamsau.archi.fr/face/

[8.] *Library of projects and publications*
http://kollataj.gamsau.archi.fr/webKollataj/kollataj.htm

[9.] *DIVA - DIctionnaire méthodologique pour le Vocabulaire Architectural,*
http://arkiw.gamsau.archi.fr/diva/diva.pl

[10.] *Demonstrator of STRABON project (restricted access)*
http://zin.gamsau.archi.fr/strabon/

[11.] *VALIDEUR*
http://alberti.gamsau.archi.fr/valideur/valideur.htm

[12.] *Interactive presentation of stereoscopic images (anaglyphs) extracted from the projection of stereoscopic images (polarizing filters) proposed in action of ARKIW program valorization,within the framework of the European Days of the Culture in Cracow (Sepember 2000)*
http://alberti.gamsau.archi.fr/diasKrakow/slide1.htm

* Note: the addresses, except Internet site of UMR MAP, are installed on a machine of development and can therefore can be periodically unreachable.
Remarque : les adresses hors site Internet de l'UMR MAP sont installées sur des machine de développement et peuvent en conséquence être momentanément indisponibles.
Uwaga: Wszystkie podane nizej strony internetowe, oprocz portalu UMR MAP, sa zainstalowana na komputerze ktory jest okresowo wylaczany.

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