Database of Historical Monuments

The New Approach

Introduction

Contemporary development of knowledge became guided on using its potential in various systems of new communications technology. Some attempts of putting a new quality into function and organization of new computing domains should have been in a maximum degree promoted and used, for tasks from domain of protection and architecture monument preservation as well. The database presents a complete system of writing a material description together with a deduction algorithm of preservation conditions of individual objects.

A complete database system gives classic information about historical buildings and detailed advice of restorer planning preservation tasks. All information is accessible from the Internet page, besides the administrator can monitory an environment data and add an algorithm from the detailed Internet DBA page. Connecting the historical object description with deduction algorithm for danger evaluation (danger for building) is an important determinant. This is an active database for evaluating of preservation problems. Support by the information system, a very humanistic and artistic domain as history of art and a knowledge about architectonic art, is an attempt of filling a hole, which appeared in this domain. System presented by this work is going to support restorer researches in assessing of environmental and structural dangers on the basis of an active database for monitoring of a condition of historical monuments preservation.

Main diagnosis problems

Database. The initiative of monument base study for preservation goals and its general conception [1], [2], [3] arises as a result of research works conducted in Institute of Study and Preservation Researches of Institute of History of Architecture and Monument Preservation of Cracow University of Technology, for needs of fast catalogue and diagnose, i.e. assessing preservation and technical condition of historical objects. Thanks to taking advantage of informatical back in the Centre of Information Systems of the Cracom University of Technology, has begun a phase of information gathering about possible problem solution [4], [5]. It turned out that now there isn’t some solutions can fully to be up to architecture historian awaiting [6].
Deduction. The historical monument database for preservation goals will be an universal integrated module system, having support searching of information about historical monuments and support decisions about preservation works progress. A goal of the project is building a system of objects catalogue and taking an attempt of knowledge consolidation from history of architecture and monument preservation domain in taking a decision as for deadlines and preservation work kinds.

So that the system could serve as a knowledge base for some kinds of users, an access to searched data is possible by context searching: for ex: police numbers, registration numbers of monuments register, as well as by the geographical location. That is the reply to stronger and stronger expanding GIS type systems. Crossing by next division thematic sectors: geographical, architectural and town planning, ethnographic or archaeological, leads to object groups location. Certainly it is possible as well any description of multimedial maps. Historical monuments can be as well unambiguous identify by GPS data.

Historical Monument Review In Poland. The database contains data from the field of styles, forms, structures, and pictorial word explaining in searching of picture key. The data enables some analysis in the field of logical connections of structural context glossaries.

Context Glossary. The module of context glossaries of cultural heritage collects freely available information's, enabling in principal unlimited system development by elements connected with catalogue of architectural data.

But some important is the monument catalogue module. Historical monuments can be described very wide with respecting of historic transformations and stylistic, technical, material and usable information's. The system is filled on context glossary level, used to create description elements, before arising a stable prototype of target system. Extremely important problem is an arrangement of monuments vivid key, i.e. proper data and functionally – artistic connections.

Context Glosary’s Module Access Way. The database allows to multidirectional access to individual structures characterizing architectural – urbanistic heritage, from general to detail and from detail to general.

Monitoring, Preservation Conditions. The system is supplied by monitoring data according to geographical location, influence of climate and environmental conditions, and also some opinion of aesthetic and technical preservation conditions of historical monuments. These tasks are quite separate, because a system can give a possibility of separating its maintenance. A novelty is a possibility of values assessing. An example is geographical and administrative regions grouping with respecting time and space changes. A multimedia module allows to catalogue multimedial data in any format, with special support for AutoCAD and Flash. Additional elements of the system are modules of information's maintenance about environmental protection, influence of atmospheric conditions and a module of estimating of environmental influence on
technical conditions of historical monument. About its functionality will decide such structure, which makes possible an automatic expanding of choose possibility or insert some data by users.

For example – we can define as an object – a tower and add to the superior historical monument description, various tower kinds with their characteristic styles feature of period or century origin. Final functionality creates during designing phase and system prototyping.

The Assessment Of Authenticity Status. Each of joined historical monument and each its element catalogued in the system can be estimated as regards authenticity of objects and their elements. Source materials can support assessments. On identical principles works an assessment of artistic, historical and science value for historical monument and its element, on the basis of accessible information. Obviously the same way of giving assessments written then in the system is depends on specific system concept apparatus.

All functionality of the system completes a possibility of leading a wide source data description. The feature treats the element of historical monument description and for instance description of currency used before centuries in former investments connected with the object.

Danger Estimate System. Danger estimate can be a quintessence of introduced system. Correct concluding requires defining proper algorithms. General value and condition assessment is carrying to the need of the assessment verification on the basis on estimate system algorithms. Declaration of material type, what given element was made, and which has an indeed influence on the object condition, gives a possibility of time processes diagnosis, makes its physical and chemical degradation. For various kind of materials was declared their assessment algorithm based on environmental conditions.

For example, the elevation conditions are depended on air pollutions, atmosphere conditions and UV radiation as well. All information's contain in monitoring module and data about chemical factors comes in material degradation, analysed by the assessment support system, can verify expert assessment inserted earlier. There are of course suggests of estimate state.

The mechanism of algorithm defining has to be independent of the system, because during a system introducing, possible changes required the fewest input of program works. To estimating danger condition of materials, their changing process in time, the system analysing temporary data from environment monitoring module and material data, specified for substance, the historical monuments were made with. The system uses an independent calculate-deduction module, which on the basis on defined action course, after its rousing by time-releasers functions, gives forecast about material conditions. Crossing declared norms, may give some basis for sending information's warning about danger.

Perspective. The system lets to catalogue some data about historical monuments, opinion about factors affecting on culture environment degradation
mainly in the aspect of monument preservation before environmental pollutions and supporting restorer decisions about time limit and a character of renovation works.

The conception of building elastic system lets programming tasks and algorithms for estimating costs of protection and preservation.

**Universal deduction-computational module**

One of the system elements is an universal deduction-computational module – OD. To assume it has guaranteed accelerating of projecting works in the realisation of Internet projects based on databases. The OD module consists of database tables and functional apparatus in the form of PHP files. Tables storing numeric values of entrance data and results and source codes of mathematical and logical functions in the PHP language. Directly after recording, added functions (operators) are accessible in action defining. If outside function gives data to the module, is taking a text recording about appropriate action and dividing on individual defined operations, and then there are executed on advisable data with result notation in proper place. The essential matter is including the OD module to the system of material dangers estimating of historical monuments.

So as to use of OD subsystem possibilities, it’s necessary to build functions allows to control calculate actions calling and build functions for information transferring. The definition of same actions and data operations is constructed by independent Internet OD system page. Before the implementation of these functions, stands a task of correct programming calling them in appropriate moments that is the definition of peculiar periodal releasers. For the dangers estimating database it’s necessary to establish all factors reacting on material and environmental conditions influence. It has begun works on equations (algorithms) description of danger estimating for various kinds of natural and artificial materials.

When the historical monument is adding or its element, for example attic, the proper material is declared, for example brick type “x”, joining by material type “y”. For chosen material are defined its additionally parameters by a material-specialist. For given material are defined estimating algorithms of environmental conditions influence, air pollutions, which by using specified information's can automatically determine a material degradation in regular time periods. In case of exceeding threshold values, defined in the system as well, deduction-computational subsystem can transfer information about expected danger with earlier defined overtaking. This information can next use to preservation works planning. It’s particularly essential in a case of distribution and winning financial resources for renovation works.
A diagnose and monitoring of historical monuments.  
Widen database access module

Introduction

For easy, but first of all for effective operating of data resources, the base was divided into two parts: the access module for study goals and other module for wide random access. The module for study goals, based on programme module is orientated towards a wide range of precise character information, making appropriate searching, setting together, reporting, and getting preliminary help for taking decisions regarding concrete historical monuments, preservation conclusions and scientific studies.

A method of access to study goal data

Overriding assumption accepted for the technology of database communication resources using is a bidirectional principle, that is two possibility of searching data: moving from general to detail (from the great data area, containing certain amount of another, much and much precise) and into opposite direction – from detail to general (searched element is setting against other elements; it contains a reference to the space location within the appropriate building, next a reference to the greater space, next to the space, where are elements the same or similar features. All maps, where some objects are located, are based on GIS system.

Essential element for effective database using is working an accessible for user set of elementary option. They should to facilitate exploration work; interactively leads to get appropriate information set in required range and precision step, and simultaneously further directions and suggestions. Therefore in each stage of programme using (in each level of base using), should ever been possible access to base option:

a) **INFO** – base information about programme, authors, using principles,

b) **SEARCH** – a field to registration a keyword, for example object address, place name, surname etc. – making possible fast (direct) transfer to interesting subject for user,

c) **QUERY** – a direction to the module creating varied combination based on users conditions or filters (as in Access programme), for example a combination (and subsequent report) of all Cracow tenement houses, which:

- have a crossing hall
- have a possibility of making additional storey
- requires an overhaul
- have specific usable floor space
- have gothic portals
- have free locals
- were described first in the XIV-th. century
- other options or their connections

d) **OBJECT DATAS** – An access to the information about single object – on principle of consecutive approximations – from data sets with general information to narrowing down data areas with increasing of information accuracy – with appropriate graphic interface, leading cross active fields to next charts, for example:
  - administrative map of Poland with active provinces,
  - province map with active administrative units
  - administrative unit map with active communes and for example options:
    - cities with historic complexes
    - single historical monuments
    - architectural styles
    - options within the confines of freely created query
  - town (place) map with active quarters and for example options:
    - marking historic objects
    - architectural styles
    - sacral objects
    - options within the confines of freely created query
  - quarter map with active building blocks
  - building block map with active building plots
  - building plot map with projection of ground floor with options:
    - storey change
    - sections
    - elevations
    - marks to detail projections and photographs
    - thematic object card
    - possibility of getting any file: described (text, sheet), illustrated, vectored (flat or 3D) and multimedial.

  The same path can contain described mode access to data (instead of maps and projections – registers with possibility of proper term choosing) or simultaneously: graphic access connected with text access.

e) **CALCULATIONS** – creating analytic and statistical results for user formed combinations, for example amount of tenement houses overhauled before 1980 year or the sum of building area within the confines of building block,

f) **REPORTS** – receiving user predefined or formulated printouts.
The diagnostics and monitoring of historic relics
An abridged module of the database accessing

Introduction
The necessity to work out a second parallel model of accessing data which would address the needs of a wide body of users was caused by a wish to make it possible for a wider group of people to use a database comprising an extensive choice of precise information on historic relics.

The model is based on an initial assumption that there exists a suitable tool filtering information towards their more synthesized form. The concept of accessing data can be similar to the one underlying the previous module. Only the character of data has been changed by means of reducing the amount of information and the extent of its precision as well as by altering the kind of options of choice. Due to that, one can operate the data quicker and the results of search can satisfy the expectations of a wide body of users who e.g. don’t require stratigraphic information but want to find particular issues connected with historic relics such as the characteristics of a gothic house or a list of objects of a given type.

The method of accessing data by a wide body of users. The overall idea – from the general to the particular – makes it possible for the user to find the required information having gone through two stages of defining it:

a. the first stage – defining the required term by means of a context dictionary
b. the second stage – defining the required place in which a given term appears.

The method of presenting data. The data which is searched for is presented by means of graphic files as well as text files. They have, however, their limitations connected with the amount of data presented, e.g. maps are not shown in the vectorial format, descriptions contain only basic data. The mode of presenting data as well as their extent are adjusted to the educational function this part of database is to serve.

The possibility of extending the range of basic data

a. building ID card – the user interested in more specific and precise data can download it
b. spatial relations – the access module allows for using data based on GIS.

This publication deals with the new approach to construction of the database of monuments. The use of introduced solution is supported by conservators’ works. The project is being realized by Laboratory of Information Technology of The Institute of Computing Science and Division of Study and Research Preservation of The Institute of History of Architecture and Monument Preservation, Cracow University of Technology.

The aim of the project

The aim of the project is to create a system supporting conservation works. The system should be as flexible as possible, giving the possibility of development
and modification in the future. In order to make it possible to have the access to accumulating data, this access should take place through the Internet.

**Construction of the system**

Construction of the system is based on the module cooperating with each other (Fig.1). On one hand, it gives the possibility to modify the system. On the other hand, it makes it easy to develop the system of further modules.

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**Fig. 1**

The Monuments module is the most important module of the system. There are stored basic data about monuments, their administration, history, architecture, owners etc. The Repositories module makes it possible to construct repositories, which are used for the description of monuments. In the Monitoring module are stored information about environment and its influent on monuments. The Events module is used to store data about events concerning monuments. Estimate of Danger makes it possible to analyse information, which may have an influence on monuments.

**Repositories**

The repositories make it possible to develop descriptions of monuments in a simple way. Users can create new categories features and create or modify items of categories. In this way, the description of monuments can be as detailed as possible. An example of repository is presented below (Fig.2). The Repository Tower has a few items.

- Fortified Tower
- Observation Tower
- Residential Tower

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**Fig. 2**
The item of repository can be a repository itself for the new group of items, etc (Fig. 3).

Fortified Tower
- Wooden Fortified Tower
- Stone Fortified Tower
- Brick Fortified Tower

Fig. 3

The communication with database and access to data

The construction of the system is based on three-tier architecture (Fig. 4). The tier of database is separate from tier of an application. In this way, the application can be modified irrespective of database structure. Client should only have WWW browser and needn’t have any additional programs.

Fig. 4

An access to data is secured by a password. Every user obtains rights out of the database administrator. There are many rights and different groups of users that obtain different sets of rights. Some rights only permit to view data, others allow their modification and others make possible their withdrawal. Only the administrator can delete withdrawn data. Some users can make repositories and others can only use already existing repositories. Different groups of users can have the access to the selected modules of the system. In this way, the use of data is under control and the security of data is ensured.
Monitoring

Data about the environment round the monuments are stored in Monitoring module. These are such information as monoxide and dioxide carbon, sulphur, nitrogen etc. and atmospheric conditions which are damaging to the elements of monuments. These data are used for the further analysis of the Estimate of Dangers module.

Estimate of dangers

Working of this module is based on the information accumulated in Monitoring module. Estimate of Dangers module predicts by means of sets of rules, how the individual pollution influences on the concrete material of which the elements of construction are. In this way, conservators can take the working to protect the objects in due time.

Events

There are stored news about monuments in this module. Thanks to the fact that the access to data takes place through Internet and database works in 24/7 system, user have always newest information.

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Database of Historical Monument. The New Approach


Presented system is distinguished by some aspects. Firstly, thanks to the moduling construction, modification and development are relatively simple. Secondly, through the applying passwords and sets of privileges, security and control access to data is greater. Last but not least, the access to the accumulating information through Internet makes possible that the user always have actual data about monuments, completed by current information, and about environment and news.

The Internet connections are becoming faster and faster and algorithms of database are more and more efficient. Thus, it is possible that new modules for multimedia presentations, animations, films with monuments may join the system in the future. It is also possible that a module that analyses photographic data and gets information direct from the picture will be created.

Keywords: historical monument monitoring, historical monument protection, historical monument database
algorytmu dedukcyjnego do oceny niebezpieczeństw (zagrożeń dla budynku) jest ważnym wyznacznikiem. Jest to aktywna baza danych dla oceniania zagrożeń konserwatorskich. Wsparcie przez system informatyczny, tak bardzo humanistycznej i artystycznej zarazem dziedziny jaką jest historia sztuki, a w niej wiedza o sztuce architektonicznej, jest próbą wypełnienia luki, jaka pojawiła się w tej dziedzinie. Prezentowany w tej pracy system ma wspomóc prace konserwatorów w szacowaniu zagrożeń środowiskowych i konstrukcyjnych na podstawie aktywnej bazy danych dla monitoringu stanu zachowania obiektów zabytkowych.

Słowa kluczowa: baza danych, dedukcja, monitoring, dziedzictwo kulturowe, stan zachowania