

Administration examples for the usage of cultural heritage recordings

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ABSTRACT:

At the University of Technology in Vienna the project APIS Architectural Photogrammetric Information System was created in 1997. Its aim is the administration of the documentation of objects of cultural heritage. APIS accessibility via internet provides the possibility for everyone to take part in the conservation work. The description of the preparation of a documentation and (amateur-) photogrammetric documentation will support those interested people and help to make the incoming material good for further use. In co-operation with schools and interested societies the collection of information has been started. The next step was to create applications which support the use of the collected material especially for communal authorities.

In local politics the appearance of the townscape gets more and more important. The potential of a harmonic townscape, especially for tourism but also for the satisfaction of the urban population is increasingly recognised by planners and politicians. Therewith the need for a permanent continuous documentation of the town, of its buildings, places, its history and its stories is growing. With the help of a computerised community-archive this idea can be realised. The collection of the information cannot be the duty of the municipal administration alone. For the purpose of a popular local politics this work should be done by interested people inside and outside the community. The municipal administration or an authorised office undertake the verification, administration and maintenance of the data. In that way the reliability of the material is secured and makes it available for various further use, such as for questions of planning, maintenance of the townscape, preservation of monuments and education. Beside that the information can be the base for a regional or supra-regional advertising campaign for tourism, such as the presentation of a town via internet.

In the process of documentation special attention should be laid on the photogrammetric aspect. The awareness of the value of photogrammetric documentation can be enforced by simple applications which enable everyone to analyse the change of the townscape. An example for such an application is the subject of the diploma thesis of two students at the Institute of Photogrammetry and Remote Sensing. The aim of "OBIS, Ortsbild Informations System", or "VOPIS View-Of-a-Place-Information-System", is to collect the documentation of places or groups of houses in the APIS database. That makes them available for a simple automated change detection program via internet. In that way everyone interested can collect a time related series of pictures of a place, put them into the database and can make his own change analysis.

The paper shows the structure and an example of a municipal archive as a part of APIS and the content and function of OBIS/VOPIS.

1. INTRODUCTION

The architectural heritage is besides its priceless cultural value a part of the history of peoples. As the architectural cultural heritage has grown over centuries in towns and villages it is a part of the history and of the identity of its inhabitants. Much too often its importance is recognised only when it is lost. We don't see the facade, we pass every day, but we can feel its absence when the house is demolished. Politicians and planners do increasingly realise the value of a harmonic urban environment for the contentment of the population and its economic impact especially in tourism. This circumstance make the composition of the townscape of increasing importance in local politics. The conservation of the architectural heritage becomes more and more an integral part of urban and regional planning. That requires a permanent dialogue between conservationists and those responsible for planning. Only on a base of continuous co-operation planners can consider the individual character of areas of historic significance. The acknowledgment of the claims of the aesthetic and cultural values of the architectural heritage will lead to the adoption of existing standards to specific aims and planning rules for old architectural complexes.

To make necessary integration possible, an inventory of buildings, architectural complexes and sites is required. It should be open for a wide use and should be widely circulated, particularly among regional and local

authorities and officials in charge of town and country planning, in order to draw their attention to the buildings and areas worthy of protection. Such an inventory will furnish a realistic basis for conservation as a fundamental qualitative factor in the management of space. The possibility of building up extensive networks by including various disciplines can build the base for future co-operation. The conservation of the architectural heritage, however, should not merely be a matter for experts. The support of public opinion is essential. The recording of the cultural heritage must be question of substance at all levels (central, regional, local and public). The population, on the basis of full and objective information, should take a real part in every stage of the work, from the drawing up of inventories to the preparation of decisions.

To accomplish this purposes the need for a permanent continuous documentation of the town, of its buildings, places, its history and its stories is growing. With the help of an computerised community-archive this idea can be realised.

To cover a part of required instruments the APIS-Architectural Photogrammetric Information System was developed in 1997 at the University of Technology in Vienna. APIS is an information system accessible via internet which provides a platform for all who are interested and work in the field of conservation and preservation of cultural heritage. The system, focused on the collection of material about single objects in the beginning, was enlarged by modules which are

designed especially for urban data management. "OBIS-Ortsbild Informations System" or "VOPIS View-Of-a-Place-Information-System", provides the possibility for the input of site-information which covers a group of objects. A simple change detection module enables the user to visualise the differences between pictures made at different time which are collected in the database and Finally the sub-databases which will be part of the main database as mentioned above, which enables groups with special interest like communities to administer their material.

The paper shows the structure of APIS, the content and function of OBIS, an example of a municipal archive as a part of APIS and the function of the change detection module.

2. APIS – Architectural Photogrammetric Information System

2.1. Objectives

The aim of the information system is to provide a platform for all who are interested and working in the field of conservation and preservation of cultural heritage. The first intention to develop this information system was to invite the public to bring in their contribution into the conservation and preservation work of cultural heritage.

The preliminary work was done at the Institute for Photogrammetry and Remote Sensing of the University of Technology Vienna by defining the 3 x 3 Minimum Rules for Architectural Photogrammetry. The rules are based on the possibility of modern computer technology which enables photogrammetrists to calculate the restitution of pictures taken with non - metric cameras. By following the 3 x 3 Minimum Rules for Architectural Photogrammetry non-photogrammetrists are enabled to prepare a photogrammetric usable documentation of an object. Although a photogrammetric recording prepared by non-photogrammetrists with non-metric cameras will never be able to reach the precision of a professional documentation, it can be a useful and economic enrichment of the inventory of the cultural heritage. Especially when we are thinking of all the treasures of cultural heritage which get lost every day without being documented in any way, because of the limited capacities of professional recording teams, we have to face the fact that we can't cope the work of conservation and preservation of monuments without the help of amateurs.

Therefore the APIS - Architectural Photogrammetric Information System was created to show interested people how they can prepare information and photogrammetric usable documentation of objects and the possibility to publish this material in a database accessible via internet. To administer the information in a database accessible via internet opens the possibility for the building of decentral archives which can contain material from any place in the world. The information about the archives will ensure that people will find their material needed even if someone is keeping it on the other side of the globe.

A further task of APIS is to build a connection between those people who are interested in contributing their part for conservation and those working in this field. An important part is the link to photogrammetrists who can use amateur-photogrammetric documentation in order to prepare materials for the renovation or restoration of objects.

Further APIS should be a place for people working in the field of preservation and conservation of cultural heritage independent of their status as professional or amateur to contribute their documentation work to their common interest and to exchange their experience.

2.2. Basic content of the Information System

The internet-site www.apis.org provides the access to the APIS - Architectural Photogrammetric Information System. It includes the description of 3 x 3 Minimum Rules for Architectural Photogrammetry and a detailed step by step instruction for the realisation of a proper documentation. The site provides examples of applied photogrammetric recordings and links to photogrammetric institutes which can handle non-metric pictures. For an alert exchange of information and experience there are discussion platforms provided, which are prepared for various groups, such as schools, communities or societies.

APIS provides a service for those who want to make a useful documentation.

People interested can

- copy the instruction for a proper documentation,
- ask for help,
- join the discussion about the conservation work,
- find photogrammetrists who can handle their pictures,
- read more about photogrammetry and conservation of cultural heritage,
- find links to related internet-sites,
- see examples of already applied photogrammetric documentation,
- provide others with the information they collected by data input into the database. The latter is nothing but a systematic filling in of data sheets.

But APIS also provides facts for people who need material about objects.

They can

- search the database for a special object,
- get historical and background information,
- find people who could have material,
- find the archive which administers the needed photogrammetric documentation and
- people who can handle them.

The most important part of the information-system is the database which administers the information about the objects, documentation, plans, the archives and the photogrammetric institutes and offices.

APIS will help everyone who wants to work out a documentation of an object. It provides hints on how to take useful pictures and investigate useful information about the documented item. So it makes collected data available for those, who will need this information, independent if this need is actual or will occur in the future.

3. Modules for Urban Data Management

3.1. Communal- and other Special Archives

3.1.1. Objectives

The inventories of townscapes are manifold and spread over very different areas. A lot of people have collected data in many categories with different point of views. Books, files and volumes have been filled and put into drawers where they are condemned to stay. Their making usually was an end in itself or a by-product of a scientific work, that left some data files. Whoever, if it is a planner, a scientist or a politician faces the same problem in the acquisition of existing data. A lot of people know about material, that someone collected years ago, but nobody knows where it is by now. Everyone has to search in various archives which even don't know about each other. Therefore not only the knowledge of the already existing methods of making an inventory, their contents and their results are relevant. Also the co-ordination and co-operation between the various fields and the integration of the public gets more and more important. Systems have to be developed which allow to publicise and find an archive where material is kept or the material itself in the most easily accessible way in the moment, via internet.

With APIS the first step for a co-ordination system was laid. Here we collect the data of single objects including links and contact addresses of archives which have material about it. In an update of the system the function of special archives is included. This special archives are developed for the needs of a municipal administration to administer the material about the cultural heritage of their build environment. The idea is to have a database on a central server which consist sub-databases which are maintained by the sub administrators. That opens the possibility for a number of special archives to use a central maintained data management system and to have direct access to and control over their data.

This can be a useful tool for a community to handle the information about their built environment. Administration, planning, science and the protection of monuments will be enhanced with an easier access to needed material. Via internet people can contribute their work from anywhere. The municipal administrators maintain the data and assure its quality. So it can be used manifold like described above but also for economic reasons in regional and over-regional tourism promotion.

3.1.2. Function of Community Archives in APIS

The input of the data can be done in the same way like into APIS via the forms on the internet pages. New data has restricted views only for authorised administrators. With a key the administrator of a community archive enters the database. His access is restricted to all data concerning the town, which is defined with the name and/or the zip-code of the town. The external administrator has the exclusive right to change or delete the views of records, which will stay physically at the server. The data-check is done direct at the town offices, where the special archives administrator can manipulate the data in the purpose of the town. So the community office is responsible for the quality of the

data. Also the decision which material will be opened for the public can be done here.

Several service modules facilitate the handling of the data in a town archive.

An interface to a program at the municipal administration office enable the administrator to up- and download the whole data. This can be used for maintenance or updates of the material. It also eases the handling of the data for the use inside the municipal offices.

An interface to a local GIS may also be useful for various applications.

Although the sub-databases were designed for the use in communities, they may also be of use for other groups. So scientific teams which are spread over different countries may collect their data on the central server. The access and maintenance procedure will be the same.

3.1.3. The Benefit of Special Archives

Municipal administrations who have recognised the value of their built cultural heritage will have a tool for an easy and economic administration of documentation material about it. Even if not in every case the data will be provided directly, at least the information of archives, who have material will be available. The use of an "open" internet system facilitate the co-ordination between the various teams, who have to make or use documentation material. But it has also the big advantage to enable the public to contribute their interest and work to the documentation collection. That will accelerate the procedure of the recording of the cultural heritage. The integration of the public into this serious field will besides

- initiate more and better awareness of the cultural, social and economic importance of the cultural heritage.
- contribute to serious public discussion on the necessary documentation and protection measures concerning the cultural heritage.
- facilitate contributions by the youth.
- stress the attention of the public on the slow and serious changes of the built environment.
- provide a means for local, regional, national and international communication and co-operation.
- help to initiate work at very work-intensive and thus most valuable working places.
- Enable fast and economic updates of existing records.

For the use in scientific teams it could accelerate their work and shorten the time after the end of the research work to the publication of it's results. Again interested amateurs can be useful contributors of valuable information or updates.

3.2. “OBIS Orts Bild Information System“ or “VOPIS View-Of-a-Place-Information-System”

3.2.1. Objectives

The aim was to build up a comprehensive archive of the pictorial recording of the views of places. This information system would be of interest for environment planners, urban planners, architects, protectors of the views of places and historical monuments and all historically interested people – to put it in a nutshell – for everybody who needs information about changes of the views of places.

The OBIS/VOPIS could provide an useful tool for the decision making procedure concerning the build environment. The system should be very easy to understand and put into a standard so that also interested private persons will be enabled offer their help.

3.2.2. Structure of OBIS/VOPIS

OBIS/VOPIS is designed as an extension of APIS using it's facilities, like the internet-site and the database.

To reach the possibility of a trend analysis the description of the procedure of a continuous documentation of places is needed. Like the instruction for a photogrammetric usable documentation of a building in APIS, OBIS/VOPIS provides the description of the needed steps for the documentation of places .

The pictures are stored in the database with the addresses of the objects seen on it. APIS and OBIS/VOPIS are linked via the addresses of the objects. So you can see, if APIS provides information of a single object of the place, when you look at a view of a place in OBIS/VOPIS. Vice versa APIS shows if the viewed object is stored as a part of a view of a place in OBIS/VOPIS.

Pictures of views of the places should be taken in regular intervals. About every ten to twenty years would be suitable. These should have to be taken from the same spots. Therefore the description of the point form where the picture have been taken is a part of the record about the view of a place. In that way the changes of the views of places can be recorded vividly in pictures.



Fig 1: Rauchfangkehrerkirche Vienna 1925/1999

If possible it should be attempted to include also the view of the roofs into OBIS/VOPIS e.g. all the views of a church steeple. Especially the roof-scape of town may show the significant changes that occur with the development of a town.



Fig 2: Rooftops from St. Stephan, Vienna 1860/1994

Like in the picture above the aspects of historic pictures are very important. Especially the view of a place from the beginning of photography supplies important information on the historic condition. It seems to be very useful to include also those photographs into the system. That gets even more important when we consider all the destruction's in wars, natural disasters and gigantic technical projects , like resettlements due to construction of a dam .

To get a useful and sensible sight into the change between a historic picture and a new made the question of the point from where the picture is taken gets even more important. If one attempts to do that, it is essential to have a good knowledge about the techniques of a camera. Apart from distortion the lens of a camera usually reproduces a central perspective picture of the three-dimensional reality. But we have to beware of some camera-techniques which where specially common in historical photograph. Shift objectives which causes horizontal and vertical displacement of the picture have been of common use in the past. That makes the reproduction very difficult, sometimes impossible (see fig 3). In consideration of all that circumstance, the standardisation of the pictorial inventory over longer periods of time gets even more weight.



Fig 3: Landstrasser Hauptstrasse, Vienna 1910/1999

3.2.3. Definition of a Standard for the Reproduction of Standpoints

Making an attempt to find the old photo-position, you a rough estimation of the photo-position. Therefore you quickly observe the historical photo and compare it with the situation today. Like that, you get the first information about the central-perspective through the position shown surfaces compared to reality. When moving from the estimated standpoint you have to watch if the surfaces of buildings are moving more forward or backwards through the line of horizon, which determines the height of the photo-position. In that way a rough interpolation for the close standpoint for a new picture can be determined quite easily.

It should be also possible to find out if a shift objective was used for the old photograph.

To find a more accurate photo-position, you have to look for special details of the houses or significant points in the place. These have to be seen in both, the old picture and view you have now. Therefore you need at least 2 pairs of object-points. Connect respectively two points with a straight line pointing into the direction of the estimated standing point. By intersecting the two lines you will get the exact photo-position.

The described methods enable everyone to you get all the important information about the position of the shot by eye, which is enough in most cases.

The importance of an exact recovered standpoint will be described with the change detection module.

3.3. Change Detection Module

3.3.1. Objectives

The aim of this module also usable via internet in the frame of APIS, is to use the pictures collected in the database to visualise the differences between pictures made at different dates. By means of the change detection module the development of the environment will be shown. It will help people to analyse the effective trend. By using this instrument it is possible for the public to form a view on past decision of urban planning. The pictures are a good argument for a

discussion with communal planners and politicians. It will help people to involve themselves in decision making procedures especially those concerning their urban environment.

3.3.2. Function of the Change detection Module

Step by step description for the usage of the change detection module:

- Find an old picture of the place of interest.
- Reconstruct the standpoint from where the old picture was taken.
- Make a new picture with the same view with approximately the same focal length.
- Scan both pictures and put them into OBIS/VOPIS.
- The next step is the rectification. One picture will be transformed into the shown geometry of the other.

Therefore you have to:

- Identify control points, shown in both pictures. At least four points are needed situated in the vicinity of the edges of the photographs.
- The transformation will be the better the more control points are defined. If the projective transformation is used the best result will be guaranteed. For this transformation 5 and more control points are needed.
- With the transformation parameters the rectification can be executed. For a fast result the best way is to use the nearest neighbourhood-method. The tool also offers other methods to rectify with a better accuracy.
- Now the pictures will show the same geometry of the place.
- Make the difference of the pictures: A histogram shows the dispersion of the pixel-values of the result. With threshold value the pixels with the changes are filtered and coloured.

The most important point for the use of this program is the definition of the resolution for the scanning of the pictures. A high resolution, which will bring high accuracy is not advisable in consideration of the slow data transfer via internet. So resolution have to be chosen which makes the handling of the pictures reasonable for the user and still brings an acceptable result.

With this module the often hard to define change of a view of a place or an object can be documented. The change detection module should raise the awareness of the public for the development of their build environment. This can support the enhancement for a critical discussion with urban planners and politicians. In that way the residents of a community can involve themselves into decision making procedures. This initiative sets bounds the create the relation between sense and knowledge of the place of life and the cultural heritage as a part of it.

4. Summary

The project "APIS Architectural Photogrammetric Information System" with the modules, special archives, OBIS/VOPIS and the change detection module provides the possibility for the comprehensive documentation of architectural cultural heritage. With the involvement of a large number of amateurs a realistic chance is given for sustainable photographic and photogrammetric recording in a relatively short period of time. The pictures can be used for the documentation of pending and actual damages on buildings and sculptures.

The access to the documentation material via internet offers a fast and inexpensive base for assessment of damages on objects of cultural heritage.

The information system and its implemented tools will help the public to form a view on the development process of their urban environment. The awareness for the importance of the cultural heritage will be raised. With the integration of communities and tourism the social and monetary benefit from preservation of the cultural heritage will be emphasised. That entails the demand of the public to be integrated in the decision making process concerning the townscape. Community planners and politicians have to react on changes of the opinion of the public. So they get forced to include the cultural heritage in future community development.

The project will invite the public to help in monitoring the status of cultural heritage. The documentation collected in the database will contain the description of the status. That makes it possible for authorities concerned to react fast on shown up damages. The process of recognition and the reaction on a pending damage will be accelerated which makes it possible to prevent further damages or loss of objects. Database technology and monitoring will allow also for change detection and revealing of positive and negative trends in time.

The target is to use the information system for the comprehensive monitoring of the cultural heritage to renovate buildings before heavy loss occurs. That entails a significant decrease of costs for the conservation of cultural heritage.

References

Brunner, M. (1988)
Expeditions-Architekturphotogrammetrie. Diploma thesis. Institute for Photogrammetry and Remote Sensing, University of Technology Vienna. 60 pages.

Waldhäusl P., Brunner M. (1988).
Architectural photogrammetry world-wide and by anybody with non-metric cameras? In: G. Hadjiev (Editor), 1989. Contributions of modern photogrammetry, remote sensing and image processing methods to the architectural and urban heritage. XI. Symposium of CIPA, Sofia, pp.35-49.

Waldhäusl P., Ogleby C. (1994)
3 x 3 Rules for simple photogrammetric documentation of architecture. In: J.G.Fryer (Editor), International Archives of Photogrammetry and Remote Sensing, Vol. XXX, Part5, pp 426 - 429.

Almagro A., Patias P., Waldhäusl P. (1996)
The CIPA Otto Wagner Pavilion Test. International Archives of Photogrammetry and Remote Sensing Vol. XXXI Part B5, pp. 463 - 470.

Lagerquist B. (1996)
The Conservation Information System, Photogrammetry as a Base for Designing Documentation in Conservation and Cultural Resources Management, Dissertation for the Ph.D. Degree, Acta Universitatis Gothoburgensis, Göteborg, Sweden, 156 pages

Camara L., Latorre P., (1996)
Information Systems on Heritage Conservation, International Archives of Photogrammetry and Remote Sensing, Vol. XXXII, Part5C1B, pp 53 - 67.

Herbig U., Waldhäusl P. (1996)
APIS - Architectural Photogrammetry Information System, International Archives of Photogrammetry and Remote Sensing, Vol. XXXII, Part5C1B, pp 23-27.

Herbig, U. (1997)
APIS – Das Architektur - Photogrammetrie Information - System. Arbeitsunterlagen und Lehrbehelf für eine Projektarbeit. Institute for Photogrammetry and Remote Sensing, University of Technology Vienna. 28 pages

Fig 1: Rauchfangkehrerkirche, Wiedner Hauptstrasse 1040 Wien

Picture 1925: MA 13 Landesbildstelle, Wien
Picture 1999: Markus Landerer, Institute for Photogrammetry and Remote Sensing TU Wien

Fig 2: View of roofs shot from a tower of St. Stephans Cathedral,

Picture 1860 and 1994, Kulturverein Stadtpanorama Wien

Fig 3: Landstrasser Hauptstrasse 60, 1030 Wien,

Picture 1910: Landstrasse 1860-1930 Album, Verlag für Photographie, Vienna 1996

Picture 1999: Markus Landerer, Institute for Photogrammetry and Remote Sensing TU Wien