

PhotoPa – Database of Czech Historical Monuments

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SUMMARY

There are many historical monuments in the Czech Republic and most of them have been documented photographically. But hardly any can be use in photogrammetry because of absence measuring attributes. The aim of PhotoPa system is a collection such photo documentation which would be sufficient for future geometric interpretation of a monument. To fill the PhotoPa system are being used students' projects of course Photogrammetry, Geodesy and Cartography, Faculty of Civil Engineering in Prague. In PhotoPa system has been saved over 180 monuments which photographs were taken during 2001 and 2002.

This paper presents development of a system based on open source technology. First we will talk about genesis and history of PhotoPa project, later we will focus on software use for data collection and in the end we will introduce a design of data structure for input and a proposal to Internet presentation of mentioned monuments.

The PhotoPa project is being created in cooperation with Laboratory of Photogrammetry, Faculty of Civil Engineering in Prague.

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1. THE BORN OF PROJECT THE DATABASE OF MONUMENTS IN CZECH REPUBLIC (A RESCUE OF MONUMENTS)

An idea to make such project came at the end of year 2000. The aim was definite – application of students' project to create a database of most threatened and unused historical monuments in Czech Republic. Students choose one object in CR (a list of listed buildings is recommended <http://www.supp.cz/html/publikace/seznohrpam>), this object is geodetic located by GPS and than transformed into Czech co-ordinate system S-JTSK; photo survey uses an elementary photogrammetry method by digital cameras. A survey of geometric parameters is determinate by a tape. Whole survey process comes from paper 3*3 Rules from Peter Waldhäusl and Cliff Ogleby (see <http://www.univie.ac.at/Luftbildarchiv/wgv/3x3.htm>).

The project started in spring term 2001 and in this term the projects were processed in digital with binding regulations but a conception of project was still missing; that came with us in autumn term 2001. Already in summer we had formed first version model of web system based on 86 finished projects.

In next academic year were finished around 100 other projects from all Czech Republic. These projects were processed with development a method mentioned below which creates XML document for every single project.

2. THE REGISTRATION OF OBJECTS

The PhotoPa system consists of two sections (Presently we work at the third section – web presentation of measured objects – will be mentioned in the end of paper.) The first part is web system for registration of objects. The registration has to be completed during opening course. Every student fills a form consisting of user's name and a password, name of a project, e-mail for further communication and student's personal identification number; after completing the form every user obtains unique ID in the form YEAR- XX (e.g. 2002-052) and his chosen project obtains ID in the form P-YEAR-XX (e.g. P-02-052).

The registration is important to obtain unique ID for student and object. Another reason of registration is agreement of teacher, which should avoid duplication and selection inappropriate object (too large for a term project). A teacher also handles with system through web interface. He has possibilities to send e-mail, to accept projects, to make a list of registered object, etc.

Nowadays the PhotoPa system is launched at server GaMa.fsv.cvut.cz (Pentium II 333MHz, 256MB RAM) with Linux operating system, distributed by Debian Woody, the core 2.4.18 and support of PHP4 4.1.12. The web service is available on <http://gama.fsv.cvut.cz/photopa>. All web pages of PhotoPa project are completely valid XHTML 1.0 Strict a standard of W3C

consortium <http://validator.w3.org>. The second part is a local application for a data collection from students.

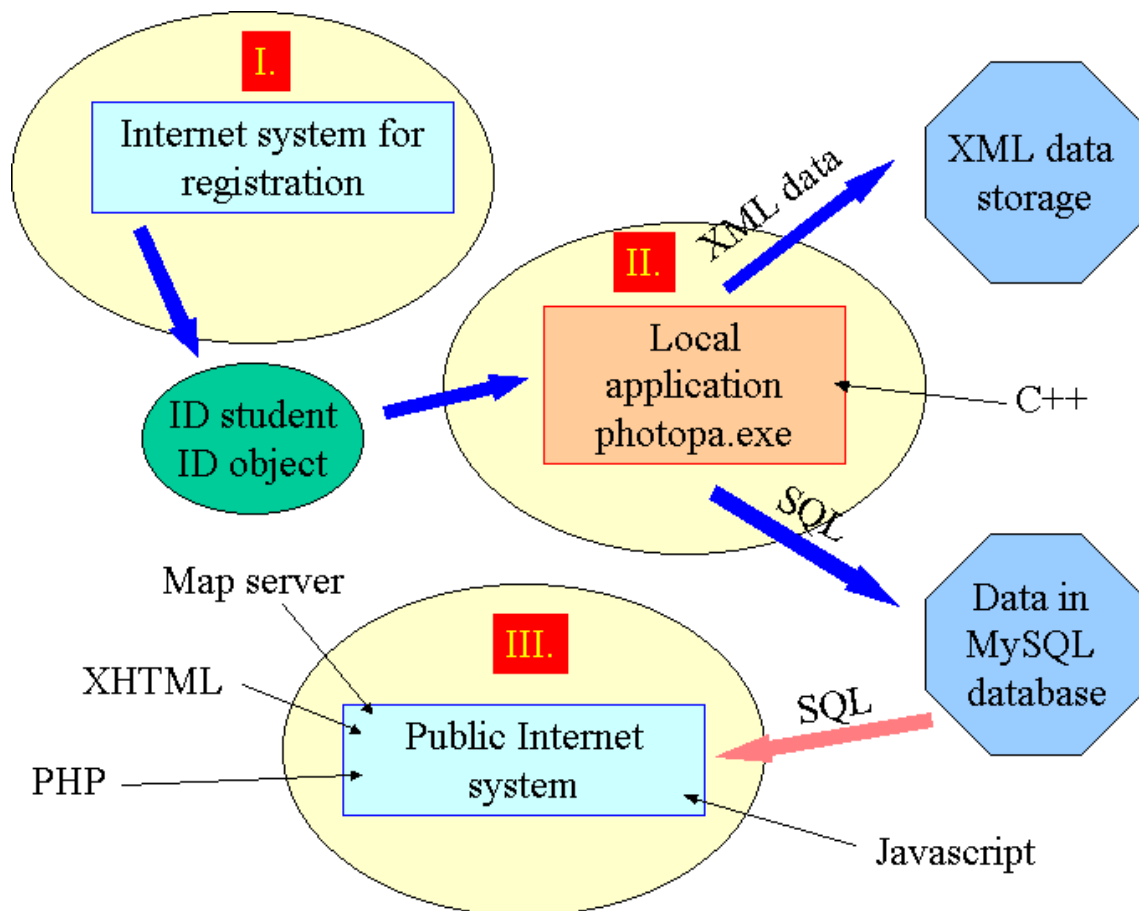


Fig. 1 PhotoPa schema

3. THE APPLICATION FOR A DATA COLLECTION

3.1 Introduction

The PhotoPa program – input monument data, is made for structured data acquisition (text and graphic as well) about monuments in CR. The program is written in C++ with use graphic library VCL. The source text compilation and link modules was made with C++Builder 6 (<http://www.borland.com>). The final program PhotoPa is possible to launch in operation system with win32 architecture. That means Windows 95, Windows 98, Windows NT, Windows 2000, Windows ME a Windows XP.

3.2 Installation

The installation of PhotoPa is really easy. From PhotoPa archive <http://gama.fsv.cvut.cz/~soucek/archive/photopa/>, you only need to download last version of PhotoPa, a file “setup-x.xx.x.x.exe“. In case that you already have had installed database module Borland BDE, download a file “setup-

x.xx.x.x-withoutBDE.exe“. Today the latest version is 0.22.2.2. After download start installer and it will carry out all needed (copying to the hard disk, creating link at the desktop and Start menu and installation of BDE). Obviously, as every sophisticated program, there is possible to choose a folder for installation and avoid creating of link as well. The PhotoPa, after installation, contests 4.1MB. Uninstall is in standard way Control panels – Add and remove programs – PhotoPa x.xx.x.x.

3.3 Look and Function of the Program

After starting the program we'll see the main screen of the application. We can maintain application either by instrumental slat, where the icons which bring the most commonly used orders are placed or by the main menu of the application, were all orders are available.

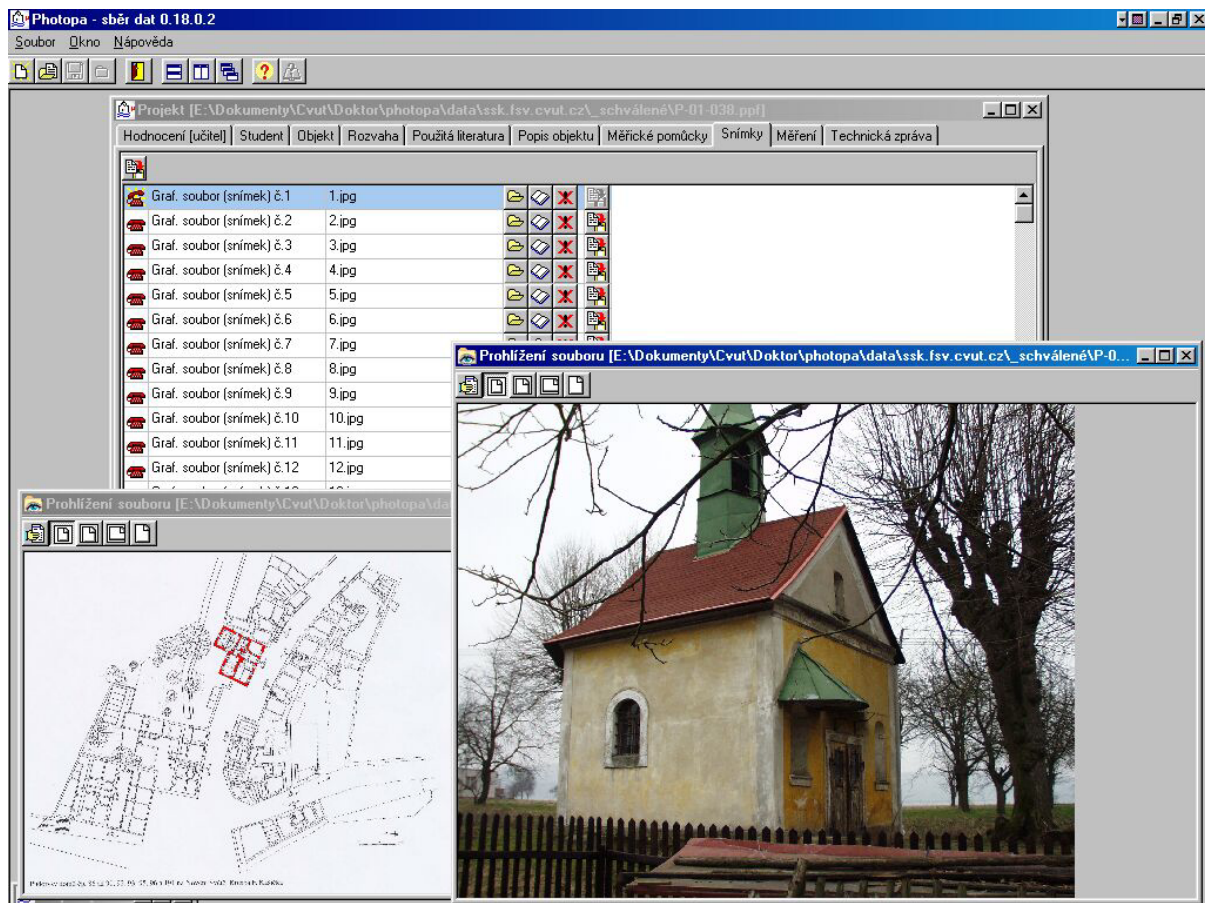


Fig. 2 Screenshot of application PhotoPa

Now lets look at each order in details. At the first phase you can create a brand new project. You'll use this possibility in case you have just started your project. In case your project is being worked out you have a chance to open it. In both cases the next window will open. Because it is MDI application, you can have more than one project open at a time.

Project window is the most essential form of whole application. This is where the process of recording the data in goes on. The window consists of few folders: Student, Object,

Analysis, Bibliography, Object Description, Measuring Tools, Photos, Measuring, Technical Report and Evaluation (teacher). These 9 respectively 10 folders contain all information about the project necessary to record. Last folder appears only if the application is started by a teacher who evaluates the project.

3.3.1 Student

Information about student who works out the project and about the person who documented another historical object in CR are recorded in the folder “Student”. These entries are recorded: name, surname, group, e-mail address, school year and ID number of a student; and are used for listing of the historical objects and are generated by web-system PhotoPa, available on <http://gama.fsv.cvut.cz/photopa> and where every student must register before processing the object.

3.3.2 Object

Information about an object are contained in folder “Object”. I chose the following: name, kind, tectonic style, object category, object location in administrative units (region, district, municipality, CO), object coordinates (in JTSK system or WGS-84), information about owner of an object (name, address,...) and map of object location (cadastral map with the object if possible). Administrative units are chosen from selection generated from database “Regional identification register UIR-ZSJ for whole republic”, which is issued by Ministry for Public Development <http://www.mmr.cz>. ID number of the object needed for registering into web-system mustn't be omitted.

3.3.3 Analysis

There are information in the folder “Analysis” which must be consulted with the teacher before making photo-documentation of the object. It's the technical description of processing – suggested attitudes, control points distribution, ... Next there are graphic information located here which can explain us better the suggested attitudes for taking pictures.

3.3.4 Bibliography

It's possible to enter information about literature at the folder “Bibliography”, it's not only literature used with the project but those who are interested can find there more about the object. One can enter name of the title, author, publisher, year and place where published, type and identification number (ISBN, ISSN, ISKN).

3.3.5 Object Description

One can enter text information to the “Object Description” folder – brief description of the object, its history and simple abstract in a foreign language (English, German, French, Italian, Spanish).

3.3.6 Measuring Tools

We enter information about tools we used for photo-documentation at the folder “Measuring Tools”. It’s mainly camera (brand, type, format, ...) and relevant objectives (brand, type, chamber constant, series number, ...).

3.3.7 Photos

The most important folder of all is “Photos” where there are pictures we documented the object with. It’s necessary to enter information about conditions when taking pictures (camera used, objective, diaphragm, exposure, focus, distance, ...).

3.3.8 Measuring

We enter information about control points (coordinates and control points distribution draft), side measures (list of lengths and side measures draft) and graphic file (ground plan, pictures distribution, final check-points distribution) to the folder “Measuring”.

3.3.9 Technical Report

At the folder “Technical Report” you can only find form to enter technical report, which describe processing of whole project.

3.3.10 Evaluation

Last folder “Evaluation (teacher)” is set for the teacher evaluation of the project – name of the teacher, mark, evaluation date, etc.

3.3.11 Supported Graphics Formats

All entered graphic information (files) about the project can be searched through the simple graphic viewer in the program. The graphic viewer can work with formats: *TIFF images* (*.tif; *.tiff), GFI fax images (*.fax), SGI images (*.bw, *.rgb, *.rgba, *.sgi), Autodesk images files (*.cel; *.pic), Truevision images (*.tga; *.vst; *.icb; *.vda; *.win), ZSoft Paintbrush images (*.pcx, *.pcc), *JPEG File Interchange Format* (*.jpg), Word 5.x screen capture files (*.scr), Kodak Photo-CD images (*.pcd), Portable pixel/gray map images (*.ppm, *.pgm, *.pbm), Dr. Halo images (*.cut, *.pal), external palette file (*.pal), CompuServe images (*.gif), SGI Wavefront images (*.rla, *.rpf), Standard Windows bitmap images (*.bmp, *.rle, *.dib), Photoshop images (*.psd, *.pdd), Paintshop Pro images (*.psp) a *Portable network graphic images* (*.png).

You can use the icon “View” to view chosen graphic file. The window of the application will appear after clicking on it. You can adjust the width, height of the window or both and show it in 100% size. It’s self-evident that you can view more than one graphic file at a time. After closing the project the graphic file views close too.

3.3.12 Preview all Text in Web Browser

Text information necessary to complete before finishing the project are entered in HTML format. This is chosen especially due to results presentation on the Internet and also due to simple entry. In addition we limited the use of HTML language only to few signs – paragraph <p>, subscript and superscript <sub> and <sup>, text underline <u>, <i>, , headlines <h1> - <h5> and Internet reference . Text in HTML format must strictly follow basic demand XHTML that signs must not cross (record “<p>text</p> is not allowed!). We’d like to remind that to record signs outside the basic ASCII chart it’s necessary to use record in “&entities;” pls. see list of the most used signs on <http://www.w3.org/TR/xhtml1> (i.e. the sign a as α...).

The user can check his entry by button „view“. Function finds mistakes and mark the place in the text, where the mistake most probably is. In case the text is correctly entered, the HTML view is showed, as you would see it in a common viewer.

After entering the data you have a chance to save whole project – name of the file will be implicitly set on ID object with .ppf – and close. The other function of the application is connected with MDI application. You can adjust all the windows as horizontal and vertical tiles and cascade. You can minimize, close them or restore their size at a time. The last function enables you to get information about the program, besides others you’ll learn about the version of the program.

3.4 Program from the Programmer Point of View

As above suggested whole program is written in C++ programming language using several libraries. The most essential one is graphic library VCL, which is supplied as a part of developing tools Borland C++ Builder. This library provides graphic boundaries of the program. Next the GraphicEx 9.9 library is used securing viewing of graphic files (png, gif, ...) <http://lischke-online.de>. The library is to be used no-commercially and is distributed as freeware. And last but not least parser Expat <http://sourceforge.net/projects/expat/> by James Clark 1.95.5 version is used which provides conversion from original XML file version into existing DTD 0.02 version. Software Inno Setup 2.0.19 <http://www.jrsoftware.org> is used for compiling installation program.

```

<photopa-xml version="0.01">
  <project-data>
    <authors>
      <author>
        <name>Tereza</name>
        <surename>Bajgarová</surename>
        <email>franciska@centrum.cz</email>
        <school-year>2001/2002</school-year>
        <student-ID>7757310484</student-ID>
      </author>
    </authors>
    <object>
      <object-ID>P-01-081</object-ID>
      <name>Roubená sušárna (Polabský skanzen - obj.č.10)</name>
      <category>ostatní</category>
      <build>lidová architektura - roubená stavba z 19.st</build>
      <address>
        <street>areál Polabského národopisného muzea </street>
        <cp-oc>objekt č.10</cp-oc>
        <municipality>Přerov nad Labem</municipality>
        <post>Přerov nad Labem</post>
        <PSC>289 16</PSC>
      </address>
      <location>
        <plans>
          <FilePath>P-01-081/graphics/plans/mistopis.jpg</FilePath>
        </plans>
        <coordinates>
          <WGS-84>
            <fi>50°09'40''</fi>
            <lambda>14°19'23''</lambda>
            <hight>185m</hight>
          </WGS-84>
        </coordinates>
      </location>
    </object>
  </project-data>
</photopa-xml>

```

Fig. 3 Example XML data

3.5 Other Development

We want to focus on operating systems Linux in the following periods of time, which means we will either convert to graphic library CLX and use developing tool Borland Kylix or we will set on to web services <http://www.webservices.org>. CLX is the object library of both visual and non-visual components. The library is written over Ot library by TrollTech company <http://www.trolltech.com> in object pascal. This doesn't prevent it being used in Borland Kylix 3, where the compiler C++ is included so it means "minimal" intervention into our source code.

Second solution comes out of web services principle based on simple Internet records <http://www.w3.org/Protocols/HTTP/HTTP2.html>, xml <http://www.w3.org/TR/REC-xml>, soap <http://www.w3.org/TR/SOAP>, wsdl <http://www.w3.org/TR/wsdl.html>,

xsl <http://www.w3.org/TR/XSL>, etc. This would be the most flexible solution as the web services aren't limited by OS Windows/Linux, but we can use it in other operating systems.

4. PRESENTATION OF HISTORICAL OBJECTS



Fig. 4 Student's projects

4.1 Introduction

Our work and work of all students would be useless if hid the achieved data and didn't show them to public. The world wide net - Internet is the easiest way of presenting the data. We are currently working on this – doubtlessly the most important – part of the project, because real data which whole public system can be built on are available.

Public web system is going to be based on open-source technologies. It will run on apache web server, data will be stored on MySQL database and web pages will be dynamically generated in XHTML 1.0 strict language with using PHP4. You will learn more about these technologies in the following paragraphs.

Nowadays we created the database the whole system will be built over. You learn about the database from the lines bellow and data into this database were imported from XML data (above mentioned).

4.2 Programming Tools

4.2.1 XHTML

Language XHTML 1.0 was chosen to develop web boundary. His syntax is free, available in web consortium W3C <http://www.w3c.org>. We made another step further and decided to use DTD (Document Type Definition) XHTML 1.0 Strict (there are Transitional and Frameset version available besides DTD). This XHTML version strictly stresses correct web pages entries.

However the advantages of XHTML language to standard HTML 4.0 language is the possibility of promoting. XHTML language is one of the wide range of general XML language applications. And each language built on XML is more easily promoted i.e. with other elements that traditional HTML. Other differences lie in strict following of language syntax. Whereas existing viewers are very tolerant at certain mistakes, i.e. classic sign crossing, XHTML requires correct record.

Traditional HTML language enables the web creators to save work and enter some elements with attributes in shorter way. But XHTML again strictly stresses exact and complete record. Last essential difference is the need for closing so called empty tags. Whereas element
 is commonly used for running the lines on in HTML, XHTML calls for correct record included ending -
. There are some problems with interpretation XHTML when some older Internet viewer is used. XHTML language is surely the future, that's why the language was chosen anyway.

4.2.2 PHP

Database MySQL and XHTML connection is solved by PHP language – PHP4 version in our case. It's hypertext pre-processor, which enables web creators to simply and dynamically work out large numbers of web pages. Pre-processor processes requirements from server and

does not put any other demands on client. Each of PHP orders is entered right into XHTML code. To divide PHP and XHTML you need sign `<?php` for the start and `?>` for end. Syntax of PHP programming language is very similar to C language.

4.2.3 Javascript

JavaScript assists to correct some wrong data entered into forms. JavaScript is the scripting language, which is being processed from client's side. When having some incorrect data it's very advantageous to treat it still on user's side. So there are correct data only on the server. Thus we save transmitting capacity of Internet nets (and user's time), which is especially significant when connected through modem. On the contrary if the mistake is found on server whole page must be transmitted back to client. JavaScript language syntax is quite similar to C language. Documentation to JavaScript 1.3 version is available on address: <http://developer.netscape.com/docs/manuals/javascript.html>.

4.3 Database Scheme Proposal

As above mentioned database MySQL (<http://www.mysql.com>) will be used for store data in the database, it's free and fully satisfying our needs. We are not going to mention relational database systems theory in our presentation and those who are interested can see the relevant literature. Databases are so widely spread and used nowadays that it will not be necessary especially for basic understanding of following scheme, where are only database charts, their columns and mutual connections among them.

Own structure of database was constructed to import data from XML. This structure was slightly adjusted after consulting specialists of Central Database Union of Land- surveyor Office. Schema of database is available on address <http://gama.fsv.cvut.cz/~soucek/cv/prace/2003/fig-paris/database.png>.

5. CONCLUSION

Work of students on historical objects documentation for Photogrammetry seminar is big asset for keeping national heritage and culture for next generations. Especially at the time where many historical sights are going to ruins and disappearing from our maps.

Historical sights are endangered from several factors, mostly by lack of finance, lack of interest at last but not least by modern term – terrorism. In the USA for example the last factor - terrorism is the biggest danger, so experts from University of Texas made digital 3-D model of Statue of Lady Liberty to be able to built new “original” in case the monument is destroyed (you can read more in <http://www.utexas.edu>).

In our conditions the most limiting factor is lack of money and thus our historical sights have been decaying. Even for this reason we set off on more modest way than our American colleagues – basic photo-documentation and sight description.

REFERENCES

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<http://www.gisdevelopment.net/application/archaeology/general/archg0029.htm>
Web system PhotoPa <http://gama.fsv.cvut.cz/photopa>

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