

The Virtual Trip Through The Medieval Torun Possibilities of Using Open Source and Shareware Software in Multimedia Projects and Archaeological Interactive, Virtual Reconstructions of Medieval Architecture

Lukasz Andrzej Czyzewski

Laboratory of Computer Methods, Institute of Archaeology,
Nicolaus Copernicus University,
Torun, Poland
lukasz.czyzewski@uni.torun.pl

Abstract. Torun is one of the most typical example of red-brick gothic architecture of northern Europe. The Medieval town-planning structure of Old Town which survive till now is one of most unique in central Europe. Archaeological researches allow us, in combining with historical documents, to reconstruct most of non existing parts of the Town. Its also allows us to reconstruct original style of existing gothic objects.

Proposed “multimedia application” – give the opportunity to present results of archaeological excavations and beauty of the formerly preserved parts of the Old Town to the wide audience in the virtual form. All materials will be multilingual. Project main aim is to prove that its possible to create at least proper “virtual application” only with open source and low-cost shareware. Solutions for project are discussed widely in the text. Main aspects analyzed are: unity of formats for any system platform, possibility to cooperate with other persons using other platform in practice (like Linux), opportunity to attach low-res version of such multimedia on regular web pages. Project is planned at least for 2 to 3 years.

Keywords: Open Source, Shareware in Archaeology, visualizations, virtual trips, low-cost multimedia

1. Introduction

Torun owes its origins, as a medieval town, to the Teutonic Order, which built a castle there in the mid-13th century as a base for the conquest and evangelization of Prussia. It soon developed a commercial role as part of the Hanseatic League. Torun is also birthplace of Nicolaus Copernicus. Now it's a university and tourist town which attracts thousands of visitors from Poland and abroad yearly. In the Old and New Town, the many imposing public and private buildings from the 14th and 15th centuries (among them the house of Copernicus) are striking evidence of Torun's importance. Preserved almost untouched since 15th century town planning system of the city center (former a two neighbourhoods towns: Old and New Torun) and tens of gothic tenement houses, churches and city walls are also a main tourist attraction today. Modern Torun is the one of the most beautiful gothic towns in northern Europe. Unfortunately not all of the buildings preserved until today in their original form. Several churches, monasteries and part of city walls was demolished in 19th and at the beginning of the 20th century during a fervish expansion of the town. In 1997 Torun as a uniquely preserved medieval town planning system was subscribed to the UNESCO World Heritage List.

Among the most precious and the most interesting objects, interesting also from the archaeological and architectural point of view, we should mention:

- the Old Town Hall,
- the church of SS. Johns, now cathedral, former parish church of the Old Town,
- the Church of the Blessed Virgin Mary and monasterial buildings of the Franciscan monastery,
- the Church of St. James, former parish church of the New Town,

- ruins of The Teutonic Knights' Castle,
- dormitory of Torun's Medieval Grammar School,
- town walls from the side of Vistula River banks with The Leaning Tower, The Monastery Gate, Sailing Gate, Bridge Gate and The Rifle Guild Manor.

Several very attractive gothic monuments are now unavailable for wider audience. Most of them were demolished at the mid-19th and at the beginning of 20th century by spreading and growing city:

- St. Nicholas Church with Dominican monastery,
- most part of the Franciscan monastery buildings besides the Church of the Blessed Virgin Mary,
- first church of the Holy Ghost and Benedictine convent connected to it
- churches of St. George and St. Laurence (behind the city walls)
- the New Town Hall,
- medieval town walls and 17th century ramparts from western, northern and eastern city side,
- town Crane Lift.

That is why the main program created in the project will concentrate on presenting the virtual, original versions of non-existing, existing and hardly accessible parts of the monuments and presentation of non-existing medieval town structures.

2. Project History

“The Virtual Trip...” presentation aims at comparing different technological solutions and choosing the best one into complete package of the software, based on open source and low-cost shareware. This software package should be enough

to create interactive presentation of archaeological sites, objects and other historical monuments, with particular attention to “The Virtual Trip Through The Medieval Torun” project.

The results presented here are just the beginning of creation, of similar projects. It is significant that the experiments with software, and also the final software package and “multimedia engine”, are being done not only on architecture, but also on strictly archaeological object such as, the multi-level old stone age site in the Bisnik Cave (see Czyzewski 2003, Czyzewski 2004). That gives the wide a wide range of archaeological demands which could be met by the tested software – from historical architecture to old stone age environmental reconstructions.

Example of demands for panoramic tools and the results table:

SOFTWARE	Configurable lens settings	Using predefined photo data from digital cam	360 degree pano	Spherical single-row pano	Spherical multi-row pano	Partial pano	Auto color and brightness correction	Tilt up/down	Roll left/right	Correct distortion	Auto stitching with control point correction	Manual stitching with control point correction	Optimizing settings	Preview available	Time creating less than 15 min in 24 single row or 12x2 multi-row pano	Resample on different spheres	Saving output as: bmp, jpg, js, QTVR	Create / edit hot spots and pano parameters	Intuitive and effective Wizard	Functional GUI	Output Results Quality	Multipatform	Comments	Overall
VR Worx 2.0	1	2	1	0	0	2	1	0	0	0	1	0	0	2	2	0	1	2	2	2	1	0	C	20
PhotoStitch	1	2	1	0	0	1	1	0	0	0	1	0	0	2	2	1	1	0	2	2	1	0	C	18
PanaVue Image Assembler	1	1	1	0	0	0	0	1	1	1	1	1	1	1	1	0	1	0	1	1	0	0	C	14
PanoTools with corrected pano12.dll and PTAssembler	2	2	2	2	2	1	2	2	2	2	0	2	2	1	0**	2	2	0	1	1	2	2	F	34
PanoTools with corrected pano12.dll and Hugin	2	2	2	2	2	1	2	2	2	2	0	2	2	1	0**	2	2	0	1	1	2	2	F	34
PanoTools with corrected pano12.dll and PTOpenGui	2	2	2	2	2	1	2	2	2	2	0	2	2	1	0**	2	2	0	1	1	2	2	F	34
PanoTools with corrected pano12.dll and PTGui	2	2	2	2	2	1	2	2	2	2	1*	2	2	1	0**	2	2	0	2	2	2	2	S	37
Panorama Factory 3.2	2	2	2	0	0	1	2	0	0	0	2	2	2	2	2	1	2	2	2	1	2	1	S	30

Scale: option non exist or extremely poor 0; poor quality or limited quality 1; good quality 2
 C - commercial F - freeware S - shareware
 * - with using of autotimizer
 ** - GUIs based on PanoTools are extremely slow even on fast machine, stitching of 90 deg. 2 rows panorama took in average 90 minutes. In choosing of the software to test also use data form www.panoguide.com site. Some their data are agreed some are not.
 3D Vista Studio, Panoweaver and ISeeMedia PhotoVista Panorama was also tested but not on so complexity way. Partial results are unsatisfactory due to their price.

Fig. 1. Demands for panoramic tools tested in the project.

3. Goals

The main goals of the project is to find a proper combination of features that this “tool package”, as well as output “multimedia engine” posses. They should be:

- multiplatform – according to the EU policy in promoting GPL, open source software and growing popularity of GNU/Linux OS,
- easily scalable – from a single object to a wide area interdisciplinary reconstruction of the past,
- adaptable to different parts of the timeline, from prehistory through antiquity to historical archaeology,
- relatively short time consumed to create satisfactory results and publishing it in electronic version,
- possibility of future development of the final multimedia,
- fully functional and intuitive usage on the level equal to commercial programs specially developed for such purposes.

It is important to mention that partial result’s files, like panoramic views, music, animations, navigation panels, can or even should be saved in popular and portable formats (also commercial) if only free software can manage to edit and save it and if this software met our demands. Very good examples are QuickTimeVR (*.mov) or Flash (*.swf) which works very effectively, with typical plug-ins, in prototype “presentation”.

4. Tools Package

At the beginning of designing a project whose main goal was creation of archaeological multimedia, many typical hi-cost solutions like: Adobe Photoshop, Macromedia FlashMX, Macromedia DirectorMX, VRWorx or, on the other hand, standard website output were considered. Very high costs of those solutions definitely exceed possibilities of a PhD project. The same problem appears with part of the shareware

software tested on montage, stitching and publishing panoramas. Among over ten programs and GUIs only a few are closer to minimum acceptable level. Moreover, with exception for Panorama Factory and PTGui with Helmut Derch’s PanoTool, none of the hi-cost programs met demands. What is more interesting most “official” software for QTVR format were not on this list.

But why was it decided to create separate “multimedia program” instead of a dynamic web site? Generally good quality transmission of very detailed graphic is still a problem for end-users, especially in Poland, where except academic centres and internet clubs typical bandwidth is between 56Kbps up to 128Kbps (rarely up to 512Kbps). The low-res solution may also destroy the effect in presenting very detailed materials on architecture. The bandwidth quality in the nearest future could changed but by now non-internet solutions always be better.

The result of this considerations is “end-user engine” based on the open source, multiplatform, web browser (HTML with CSS and Java Script) with other needed plug-ins.

Taking into usually low-budged of such projects and a very wide area and diversity of types of archaeological sources, the proposed set of software would consist on:

- MozillaFirebird (0.8) with QTVR, Flash and JavaScript plug-ins as the base output “multi-media engine” of presentation (multi-platform),
- EdHTML – (HTML text-editor with JavaScript, PHP and other network technologies support – Win32 only),
- GIMP (quite powerful graphic editor),
- XnView, IrfanView (graphic viewers and converters),
- CDex+LAME codec (for music audio encoding),
- VirtualDub + Xvid codec (for video encoding),
- SWiSH shareware simplified and intuitive flash editor for short cutscenes,
- more specialist:
- Helmut Derch’s PanoTools with different GUIs: PTOpen-

Gui, Hugin, PTAssembler, PTGui (shareware) and JavaScript Based Viewers of 360°x180° panoramas,

- Panorama Factory (shareware) ,
- Blender with Yafaray and Game engine for presenting interactive 3D output.

For the environment reconstruction and 3D modelling very interesting, but also very time consuming, alternative could be tools such as OpenSceneGraph, GRASS or different Open-Source game engines like QuakeForge or Irrlicht (Anderson 2004, Boss 2004). Currently main stress is put on finalizing the set of software. The whole pack should not cost more than 100–200 euro. If we use some shareware with better optimized GUIs or a bit faster algorithm which increases our efficiency in creating materials for end-user, such costs are unavoidable. Best example of that are GUIs for PanoTool among which shareware PTGui is the most efficient (Fig. 1).

The Virtual Trip Schema:

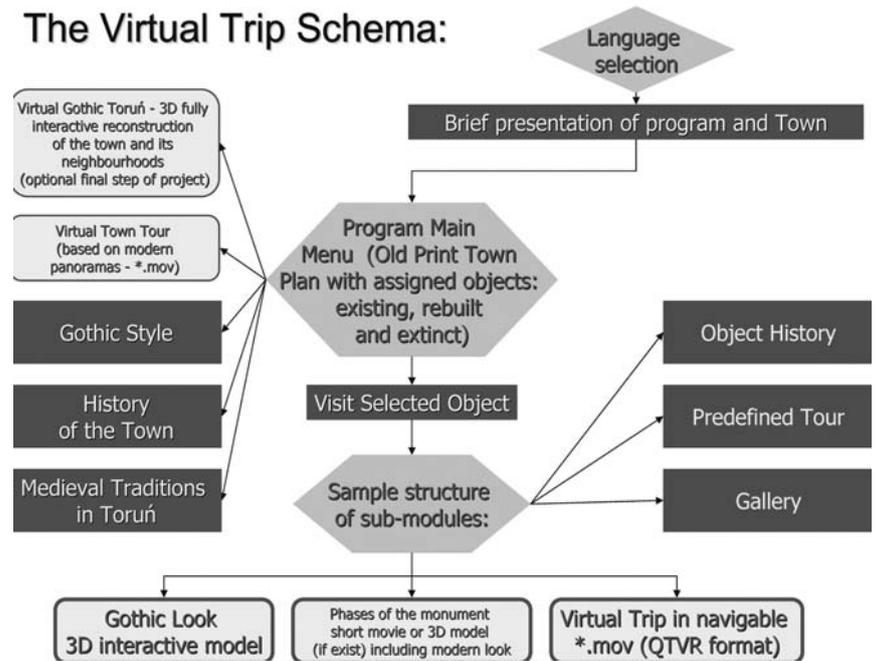


Fig. 2. Schema of the “Virtual Trip...” project program.

5. Project Structure

It would be necessary to present the first tryouts of “The Virtual Trip Through the Medieval Torun” realized with this guideline. The end-user multimedia are planned as multi-language interface booted straight from CD-ROM in full screen mode (Fig. 2). Through the brief presentation of the contest it is going to the main menu based on oldest Merian’s print isometric view of the town from the mid-17th century. All monuments presented on the plan which have their own sub-modules, are assigned properly to their contemporary condition as: original, rebuild or demolished (Fig. 3). A popular presentation about gothic architecture, town history and medieval culture itself will be available also from this level. The module plans as the last of all output materials will be independent 3D interactive trip through the town and its neighbourhoods, reconstructed basing on archaeological, historical and environmental data and sources. Blender with game module, some open source game engine (compare with existing examples in Anderson 2004, Boss, Meister 2004) or completely open source, GPL game engines like Irrlicht, Genesis3D are taken under consideration. The final choice is still undefined. Sub-modules presentation of monuments are the core of the output program. Each sub-module begins with a brief object presentation, possess its own main menu (Fig. 3) which gives access to:

- virtual trip (to the existing object) based on panoramas probably in a QTVR format,
- documents like foundation bulla, plans, sketches, old prints and contemporary slides,
- monument history (navigable presentation),
- predefined tour presenting the most precious objects of the monument (navigable presentation) ,
- 3D detailed reconstruction of the former medieval monument look (some 3D engine with full accessibility to manipulate the point of view, probably game engine mentioned above).

A model of contemporary monument’s look, that gives audience a possibility to notices changes through the ages, would be an additional element. For non-existing objects the main attraction is, of course, its reconstruction based on scientific sources.

6. First Results

The first monument upon which the work is being done is the church of Blessed Virgin Mary. The project began with an archaeological query and taking photographic documentation of the church. It allows a relatively fast presentation of the first results in virtual tour module with additional text, comments and explanations. The same procedure will be provided for most monuments. By now, the church of Blessed Virgin Mary and post-Franciscan monasterial area were elaborated in the following form:

- over 6.000 documental photos were taken just for multimedia,
 - over 30 panoramic views combined into virtual tour (Fig. 4),
 - partially finished archaeological and architectural query.
- This year this element of sub-module is scheduled to be completed and work with 3D engines may hopefully begin. The first model of monastery should consist the church and monasterial churchyard buildings with cloister (which exist only on foundations level 1m under ground).

7. Conclusion

The project has just begun. The results will be divided into two parts. First which is almost completed, is the creation of the software toolset. Here, in fact, only the problem of 3D engine is left. The second part is complete reconstruction of the medieval Torun, and it is much more time consuming and

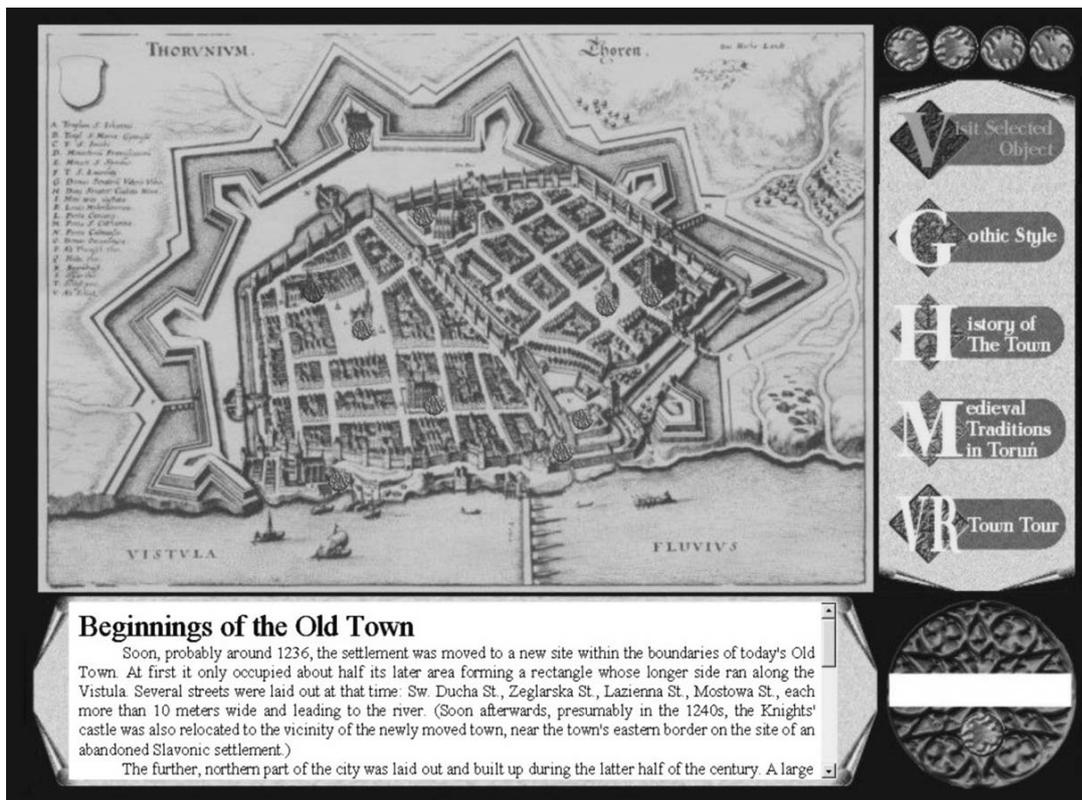


Fig. 3. Example of “Virtual Trip” interface and main menu.



Fig. 4. An example of panoramic photos used in the program.

complicated part of the project. If the whole documentation is collected it could be treated as a partial success. However general idea is worth being realized and finished especially if we compare abundance of Torun’s monuments to its extremely poor multimedia and internet availability.

References

- Anderson, M., 2004. Computer games and archaeological reconstructions: The Low Cost VR. In *Enter the Past: The E-way into the four Dimensions of Cultural Heritage*, Vienna. 521–524
- Boss, M. and Meister, M., 2003. On using state of the art. Computer Games Engines to visualize archaeological structures in interactive teaching and research. In *Enter the Past: The E-way into the four Dimensions of Cultural Heritage*. 505–509.
- Chudziakowa, J., 1973. Badania nad sredniowiecznym osrodkiem miejskim na terenie Torunia w latach 1969–1972, *Zapiski Historyczne* 38, 3; 69–81.
- Chudziakowa, J., 1983. Torun najdawniejszy i wczesnosredniowieczny. In Biskup, M. (ed.), *Torun dawny i dzisiejszy. Zarys dziejów*, Warszawa-Poznan-Torun,: 11–30.
- Czyzewski, L. A. 2004. Five-step project of digital and social adaptation of the Bisnik Cave to the customers of archaeological heritage in Poland, poster abstract. In *CAA2003 Enter the Past The E-way into the four Dimensions of Cultural Heritage*. Vienna, CD-ROM.
- Czyzewski, L. A. 2003. Wieloetapowy projekt udostepnienia Jaskini Bisnik wspolczesnemu odbiorcy dziedzictwa archeologicznego. In Partyka, J. (ed.), *Ochrona dóbr kultury i historycznego związku czlowieka z przyroda w Polskich Parkach Narodowych*, Ojcó, 755–763.
- Historia Torunia 1992–2004. *Historia Torunia (The History of Torun)*. In Biskup, M. (ed.), T. I–II, Torun 1992–1999
- Meister, C. and Asmus, B., Quicktime Virtual Reality (QTVR) and the documentation of rock art localities. In *Enter the Past: The E-way into the four Dimensions of Cultural Heritage*. 548–551.
- Sredniowieczny Torun, 1999. Sredniowieczny Torun (w swietle zródel archeologicznych). In Biskup, M. (ed.), *Historia Torunia, t. 1, W czasach sredniowiecza (do roku 1454)*, Torun. 58–99.