Virtual Heart of Central Europe

Andrej FERKO & Jozef MARTINKA & Mario SORMANN & Konrad KARNER &
Jiri ZARA & Sebastian KRIVOGRAD

Andrej Ferko, Comenius University, SK-842 48 Bratislava, Slovakia, ferko@fmph.uniba.sk,

Mario Sormann, VRVis/AR2 Austria, Inffeldgasse 16, A-8010 Graz, Austria, sormann@icg.tu-graz.ac.at

Jiri Zara, CTU Prague, Karlovo nam. 13, CZ-121 35 Praha 2, Czech Republic, zara@fel.cvut.cz

Sebastian Krivograd, Univerza v Mariboru, Smetanova 17, SI-2000 Maribor, Slovenia, sebastian.krivograd@uni-mb.si

1   ABSTRACT - INTRODUCTION

We present a cultural heritage oriented EC project for documentation, digital preservation, and on-line dissemination of selected towers, wells, and rarities in Prague, Graz, Maribor, and Bratislava. We overview the methodology, technology, and digital content including digital storytelling. The results contribute to semantic web and digital libraries European Research Area priorities, as well. We discuss current state and prospective future work.

Our EC Culture 2000 project starts with the 3D reconstruction of top European added value places in Central Europe. Philosophically, we plan to approximate the phenomenon of *genius loci* [Norb00]. In four cities we create the ontology using mainly verticals in cultural cross-road cities – towers, wells, and places of highest added value (as identified by the UNESCO World Cultural Heritage). We enable sharing these values in wide public and Internet global village population. Thus we create the true bridge between the past and the future. The results contribute to semantic web by the jewel seeds from Prague, Graz, Maribor, and Bratislava. Additionally, we have developed the methodology for future completing this network of cultural heritage highlights in Central Europe. All in one.

The purpose of the project is to reconstruct the most valuable towers and wells and rarities in Prague, Graz, Maribor and Bratislava. The idea meets all Culture 2000 priorities - address citizens, new media aided creativity, tradition and innovation, link the past and the future. The portal entry point is at **http://www.dcgip.fmph.uniba.sk/~projects/virtual-heart.**

In mid April 2004, we will publish the 3D models and digital stories at a, hopefully, beautiful site **Virtual Heart of Central Europe**. Project logo and look-and-feel created Jozef Martinka. This is a project, whose purpose is to promote cultural understanding throughout the world and protecting outstanding universal value.

From the point of view of the target group, our intention is to enable Europeans to be consciously (and interactively) proud of their contribution to the World Cultural Heritage. Up to now this is neither done nor started! (There are remarkable single-site projects like Virtual Pompei or Sagalassos, but we wish to contribute to the future 3D on-line heritage network.) We hope that our model of cooperation, our workflow, and project results might inspire future European initiatives within the arising knowledge-based society.

At the CORP 2004 conference we present a subfinal version of the solution. The paper is structured as follows. We introduce the methodology and technology first. Second, we present the brief stories of selected places in four cities. Third, we conclude and discuss the future work.

2   GENIUS LOCI

Our approach is based mainly on an influential book on Heidegger-phenomenology of architecture - *Genius Loci* by Christian Norberg-Schulz [Norb00]. The book came in the time of disgust from modern architecture (1980s). The author provided the deeper (phenomenological) understanding of *genius loci* or *spiritus loci.* This ancient (Latin) notion denotes the local spirit of the place. Pre-christian people believed that each *place* - house or nameable outdoor location - has some spiritual being associated. Today the unique harmony of the given interior or exterior is meant by this. In contrast to artificially created uniform urban solutions, the spiritus loci arises - in a valuable *place* - from the dialogue of multiple cultural and historical influences.

The city has, among other places (squares, riversides, streets, quarters), the *city verticals*, given by towers, memorials, silhouettes, rivers and wells (old water sources). The oldest known ancient algorithm for founding a new city has been preserved in Latin books. The founders of Rome were the Etruscans – "engineers" invited by the rural Romans who had no knowledge in the field. The Etruscans computed the city location, ploughed the city border around, erected the city tower to transcend the city to the sky and – nearby – they have dug a *mundus*. The mundus was not necessarily a well. It was the root of the city, transcending the city downwards, into the earth and into the depth. (One can see in erecting and rooting the male and female principles.) The Etruscan language, being isolated from Indo-European languages, has been not preserved up to now. Despite the fact that we do not know the language, we have two fundamental Etruscan words in the international language – *urbs* (the city) and *mundus* (the world, the meaning was changed by the Latin users).

Thus, the city verticals today both resemble the oldest known urbanisation algorithm and define the vertical extent of the *place* or city. This gives us physical and mental borders and they are very important because of prominent stories. "The urban physiognomy faithfully tells the story of its historic development" – says UNESCO evaluation and appreciation of Graz historic centre. From practical point of view, the city verticals can be reconstructed more easily than the large city blocks. Additionally, there are rarities, the most popular places in our cities. Cities can be understood as processes in time and space [Fers02]. Our idea is to provide the procesuality using stories.

3   METHODOLOGY AND TECHNOLOGY

Our general project decisions can be summarised in the following steps. We start with the *UNESCO's World Cultural and Natural Heritage List* to identify the global priorities in cultural and natural values in Central Europe. As there are four capable research teams to run the initial phase of the strategic mission, we have adopted the practical and pragmatic (minimum cost) restriction to start with global values in crossroad-cities *Graz, Prague, Bratislava, and Maribor*. Second, we select the representative *city verticals* and embed them into the *virtual old cities*, modelled at the reasonable level of precision. Third, we add some very special local rarities to preserve and publish the top quality attractions. Fourth, we will create the 3D reconstructions, models, and *virtual environments*. So far, the creations are static and having no inhabitants. Therefore, the creation of *virtual habitat* follows – navigation, exploration, and on-line co-operation support. Interactive communication with the environment and with the virtual inhabitants – avatars. There are virtual environments with avatars and without avatars. *Avatars, Digital Storytelling* and tools for *Immersive Experiments* are the final phases of creating the successful reconstruction shared by many visitors. To our best knowledge, there is only one systematic theory of virtual environments which consistently explains the spectrum ranging from Matrix movie dystopic ideas to really working useful applications. The unique know-how is accumulated in 3 books - 1. Virtual Interaction, 2. Virtual Space, and 3. Production Methods: Behind the Scenes of Virtual Inhabited 3D Worlds [Qvor01], [Qvor02a], and [Qvor02b]. We have found a lot of inspiration in these books. Not surprising, they fit with the Genius Loci book ideas in using the same phenomenologic approach.

According to Konrad Karner et al. [Karn02] we proceed in the 3D reconstruction as follows. A set of calibrated high-precision images is processed using MetropoGIS [Baue03] to obtain dense façade point clouds. For very special input we create 3D models manually (3D Studio Max, PhotoModeller, Maya). An alternative of high precision panoramas has been proposed and developed by Mario Sormann et al. [Sorm04]. Another low-cost work-flow has [Ftac04]. Output formats include VRML, QTVR, video, digital stories, animations, and even computer games. Sometimes, there are virtual guides as emphatic avatars [Stan03]. The complete look and feel is designed in Flash and we compose the various data formats using XML and the fruitful idea of data containers.
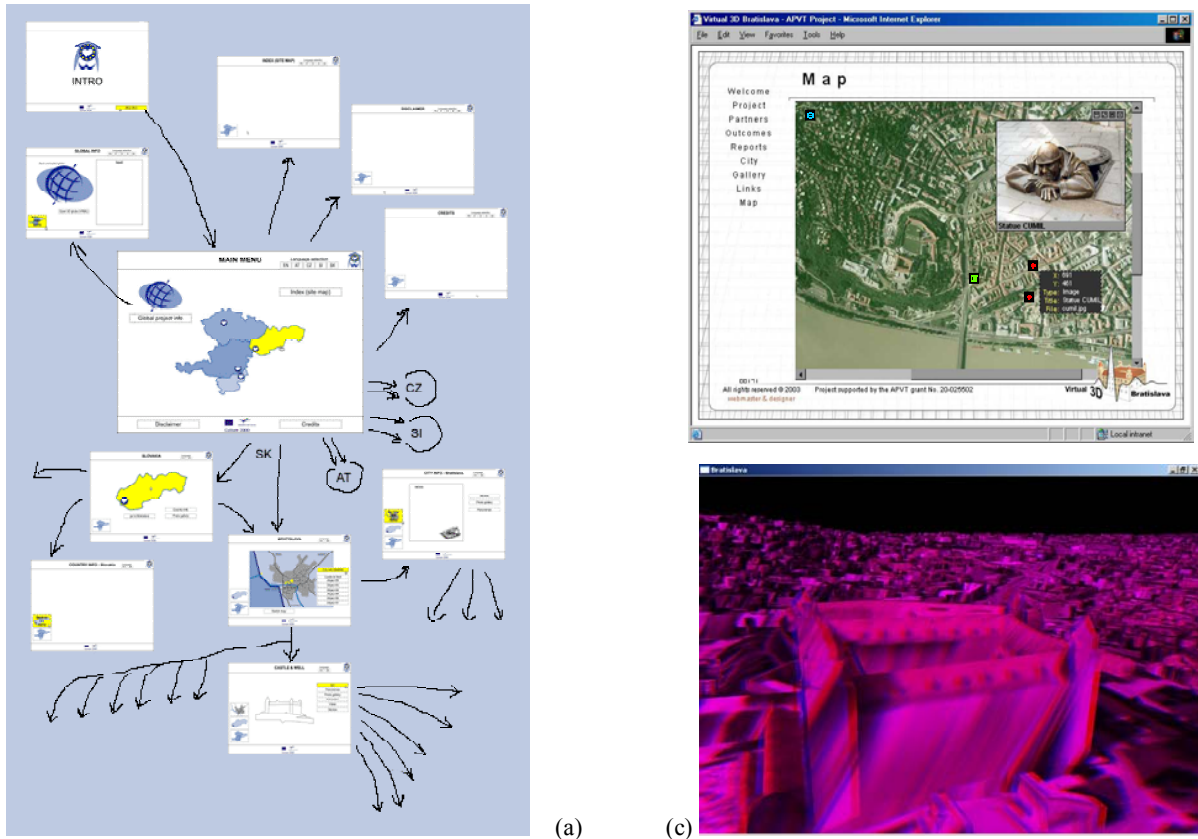

(a)   (c)

Figure 1: (a) Central Web Pages Navigation Scheme Designed by Jozef Martinka, (b) A Screenshot from Virtual Bratislava Navigation Tool by Stanislav Stanek. Aerial Photo Courtesy Eurosense Slovakia. Terrestrial Photos by Matej Zeman. (c) Strereoscopic View Created by Peter Borovsky.

4   PRAGUE

Prague is known as "The city with one hundred towers". That fact corresponds perfectly with the subtitle of the project (Towers, Wells, and Rarities) and offers to choose historical and cultural jewels from a large set of candidates. Naturally, we have selected the most well-known and interesting towers representing unique and outstanding solitaires on the old-time Royal Route used on the occasion of Czech kings coronation [Poche85].

Powder Tower (Prasna brana) used to be the opening point for coronation processions. The gothic tower (built in 1475) was a part of Old Town's fortification and served as a gunpowder store. A number of ornamental decorations have been added to the tower during neo-gothic reconstruction in the 19th century.

Old Town Hall and Old Town Tower (Staromestska radnice) belong to the places that are a *must* for every visitor of Prague. Those buildings together with the Old Town Square played exceptional role throughout the whole Czech history including royal weddings, election of the King George of Podebrady (1458), tragic execution of 27 leaders of anti Habsburg rebellion (1621), and many others. Old Town Square represents one of many genius loci in mysterious old Prague. A European rarity, astronomical clock (Orloj) from 1410 is a dominant part of Old Town Tower. Every hour during the day, a strong bell attracts crowds to watch a parade of twelve apostles appearing in two tiny windows, and four mechanical figures of Vanity, Greed, Death, and Turk.

Towers of Charles Bridge (Mostecke veze) are gothic end points of Charles Bridge built by king and emperor Charles IV in the 14th century. Monumental bridge decorated by 30 statues was built using a special technology. The legend talks about thousands of eggs that were added to mortar to improve a solidity and durability of the bridge construction. Actually, eggs did not stop couple of arch crashes during the life of the bridge. Some damages were mystic, of course, including arch collapse at the place from which Saint John of Nepomuk was thrown down [Peti95]. Then a devil's help was necessary to rebuild the arch again.

Both bridge towers, **Old Town Bridge Tower** and **Lesser Town Bridge Tower** allow passing through as well as viewing from them to wonderful panorama of Prague Castle (Hradcany) and Vltava river. Old Town Bridge Tower is nicely decorated including a sculpture of kingfisher bird in a bath towel ring, a symbol of king Wenceslaus IV, reminding king's escape from a jail and his cleaning from the prison dirt.

Singing Fountain (Zpivajici fontana) built in front of Queen Anne Summer Palace is a kind of historical rarity. This bronze solitaire (1564) contains two basins. Water drops falling from upper basin down to the lower one make sound similar to music.
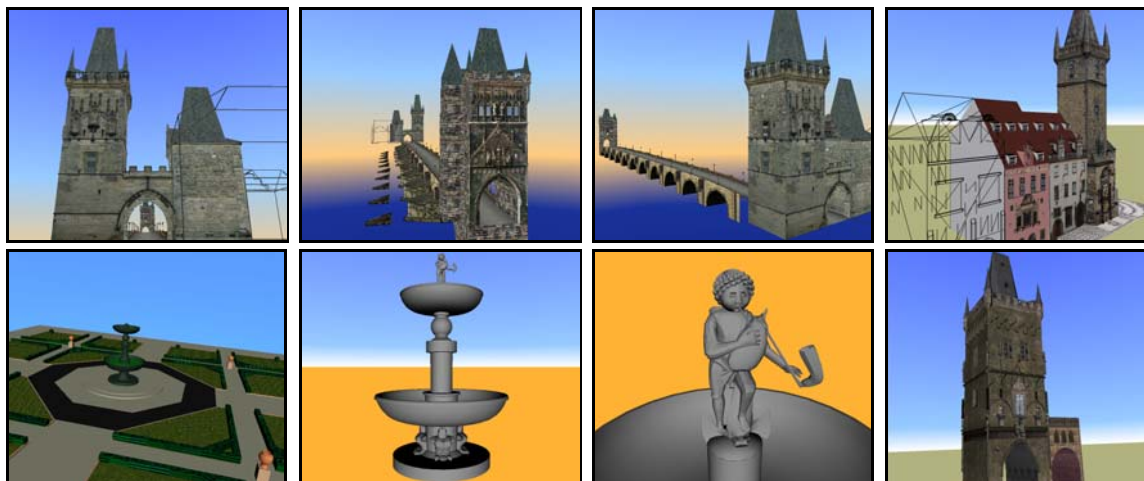

Figure 2: Preliminary versions of 3D models. First row: (a) Lesser Town Tower Bridge, (b) Old Town Tower Bridge, (c) arches of Charles Bridge, (d) Old Town Hall with Old Town Tower. Second row: (e) park layout around the Singing Fountain, (f) Singing Fountain itself, (g) detail of a musician on top of Singing Fountain, (h) Powder Tower.

Carefully selected towers and other buildings from Prague are digitally reconstructed and presented as individual jewels in the current project [Zara03]. The future work will be oriented towards complex creation of the Royal Route presented in a form of a virtual walk through, since such an approach gives a deeper and more intensive feeling of a city and its specific genius loci [Zara02].

5   GRAZ - CULTURAL CAPITAL OF EUROPE 2003

Figure 3: 3D-Model of Province Hall (Landhaus) facade.

Graz - capital city of the province of Styria is Austria's second largest city, with 250.000 inhabitants. Graz has many tales to tell. To start with, the tale of its history which starts some 900 years ago and which tells of the city in its heyday as the residence of the Habsburg monarchy in medieval and Renaissance times. As one of the best preserved historic cities in Europe, the Old Town was designated a World Cultural Heritage Site by UNESCO in 1999. And finally a tale of contrasts: classical music and jazz, tradition and modernism, literature and festivals [Graz03].

The current *City Hall (Rathaus)* is the third one that has stood on this spot at the southern end of the main square. Moreover the city hall was first built in the 1806 and fully reconstructed in the years 1888 to 1893. The *Kaiser Mausoleum* was built between 1614 and 1633 by Italian architect Pietro de Pomis. The imperial mausoleum houses the tomb of Emperor Ferdindand II. The sarcophagus of Ferdinand´s parents Karl II and Maria can also be found here and is very impressive. The famous City of Graz landmark, the *Clock Tower (Uhrturm)*, is at the same time considered among its oldest construction works. The core may stem from the 13th century, because the land register chronicle from the time of the reign by the Bohemian King Ottokar over Styria even mentions the tower around 1265. The octagonal, 34m high *Bell Tower (Glockenturm)* with its renaissance style double windows, was built in 1588 under the orders of Archduke Karl II of Inner Austria. The 2 highest floors and the cellar vault, also known as "Bassgeige" due to its shape, earlier served as prisons. Near the top of Sporgasse you may notice a *Turkish Warrior* brandishing a sabre at you from an upper window of Palais Saurau. He spent his early career as a target for charging cavalrymen, but seems to be enjoying his retirement as a house mascot. Another famous object, the *Turkish Well (Türkenbrunnen)* can be found on the castle hill. This well was built in the years 1553 to 1558 and is almost 94m deep. On the 11 January 1558 the groundwater table was reached, thus at this moment the water supply on the castle hill was secured. Our last selected cultural object illustrates another well, the so called *Province Hall Well (Landhausbrunnen)*. This well is a part of the famous Province Hall which was built in the 16th century by the fortress builder Domenico dell' Allio.
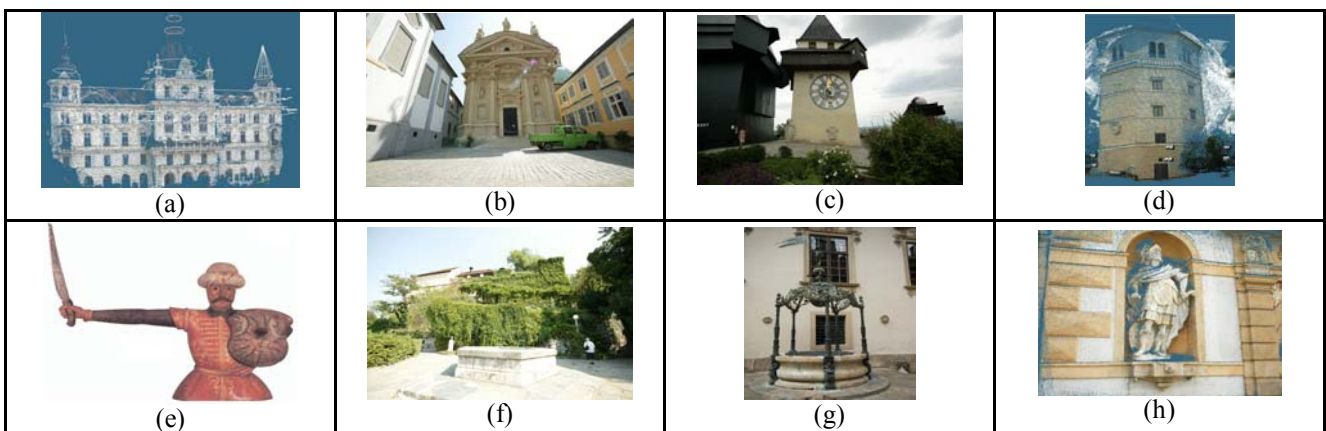

Figure 4: The selected cultural objects: (a) City Hall; (b) Kaiser Mausoleum; (c) Clock Tower; (d) Bell Tower; (e) Turkish Statue; (f) Turkish Well; (g) Province Hall Well; (h) Province Hall Statue.

6 MARIBOR

Historic Centre. Although Maribor as a town goes back to medieval times, very little of its medieval architecture remains - in most cases just the foundations of buildings in the very heart of the city center. On such remains either new buildings were erected, or old buildings totally renovated, so that their original appearance was lost, but there are still some buildings that show the basic layout of the old town. We will digitally reconstructed and presented the seven main historical attractions:

The oldest living wine (400 years): In Maribor next to the Drava River, a more than 400-year-old grapevine (*Modra kavčina*) still grows today and is probably the oldest fine grapevine in the world. Its venerable age was proved by Prof. Dr. Rihard Erker, a dendrologist. The grape harvest is a real annual city festival. It is protected as the natural monument of the Republic of Slovenia.

Water Tower: The Water tower was built in 1555 as additional fortification of the town walls because of increasing Turkish attacks. It is a renaissance architecture with five-sided ground plan and a cannon platform. Construction of the hydroelectric power station caused rise of water level in the river of Drava for 3 metres. For this reason, the building was lifted up in 1968. This has represented an extraordinary engineering work. Since 1989, the first Slovene wine store is located in the tower.

Plague sign: The plague sign was set up in the square in front of the town-hall in 1743 when it replaced the former Mary's column. This column was set up by the citizens in thanks to termination of plague which murdered the third of all inhabitants. The plague sign consists of the column with the Immaculate, and statues of saints – intercessors against contagious diseases.

Castle in the centre of city: The Maribor castle was built during the Turkish invasion between 1478 and 1480 on order of the emperor Frederic III to fortify the city walls. Its main outlines are Gothic, completed by baroque the Loretic chapel, the Chivalric hall, and the rococo staircase). In 1878, it passed from the aristocratic into the middle-class hands. In 1933, it was bough by the town community, which arranged the regional museum in its interior some years later.

Slomsek square with catholic church of St. John the Baptist: The church was built in the 12th Century as a Roman-style building with a single nave. In the subsequent Century, it was devoted to St. John the Baptist, and two naves were added to the building. Today, the church shows mainly the Gothic appearance. A classicistic bell tower that became one of the town symbols stands in the west part. In 1859, the church became the cathedral when the bishop A. M. Slomšek moved the diocese from St. Andrew in Carinthia to Maribor.

Franciscan church: The church in style of a Roman basilica with three naves was built together with a cloister between 1892-1900. The plans were made by the Viennese architect Richard Jordan. The bells were exchanged several times because the former ones were carried away in both world wars. Below the church, there is a vaulted tomb, where the blessed bishop Anton Martin Slomšek was also buried for some period. On November 7th 1906, the pope Pius X. raised the church to basilica.

Synagogue: The Maribor synagogue was mentioned in 1429 already, when it became a periodic headquarters of the supreme rabbinate for Styria, Carinthia and Carniola. it is a simple building with straight wings. In its close vicinity, in the SE corner of the city walls, a town observation post was located first, and the town defensive tower (the Jewish tower) is placed there since 1465. After the persecution of the Jewry on order of the Austrian emperor in January 1497, all Jewish institutions have decayed. In 1501 The synagogue was rearranged into the church of All Saints. Nowadays, the synagogue and the Jewish tower serve for various cultural performances.

Town Hall in the Main Square: The town-hall has appeared gradually from two houses in 1513-15. It obtained its current Italian – renaissance appearance in years 1563-65. Building works were completed in the 19. Century. The building lost its function of the town-hall in 1967. Since then, the art gallery and headquarters of several cultural institutions are located there.
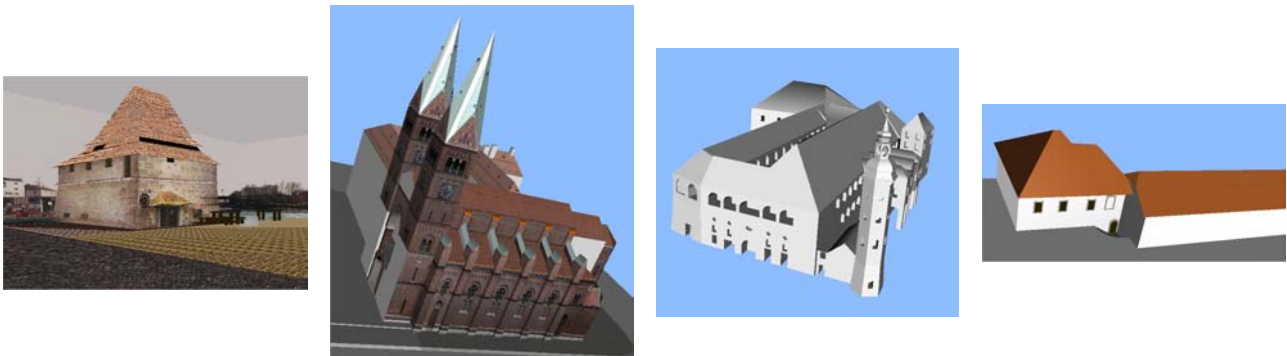

Figure 5: Preliminary versions of 3D models: (a) Water Tower, (b) Franciscan church, (c) Castle in the centre of city, (d) Synagogue

7   BRATISLAVA

Figure 6: Bratislava Towers Painted in 18th Century, http://www.bratislava.sk/.

We present Slovakia and its capital Bratislava for the sake of urban and cultural context for the following six places:

Chatam Sofer (1732-1839) was the most famous Jewish spiritual leader of his century. Nowadays, his grave is a prominent part of a unique burried cemetery (23 graves and 41 thombstones). Unbelievably, one part of the cemetery has been allowed to be preserved by a concrite cover. **Chatam Sofer Mausoleum** is a property of Jewish religious community and it has been proposed to be a part of UNESCO World Cultural Heritage in 1999.

Dom sv. Martina (St. Martin's Cathedral) is a three-ships gothic church where 11 kings and 8 queens (including Maria Theresia) were crowned in 1563-1830. The first try to use parachute took place here. Professor Fustus Verancic jumped down from the tower in 1603. The top of the tower is decorated by a golded copy of Hungarian royal crown.

Bratislava Castle is a National Cultural Monument and the well-known landmark of Bratislava. Originally, it was a fortress in 9-th century when Great Moravia was the first state of old Slovaks. Later on, it served as border post and residence of kings (Maria Theresia). In the courtyyard, there is a famous well connected with many ledengs. Nowadays, the palace with Rennaissance and Baroque additions is both a museum and the top representative place. E. g. the creation of free democratic Slovakia has been celebrated here (January 1, 1993). The famous ancient – and pretty fat - sex idol, Moravany Venus, made from mammooth bone, can be seen among other treasuries.

In the beautiful and remarkable position above the confluence of the Danube and Morava rivers, there is a wonderful little tower. It is said that here happened the most famous legend among Bratislava ones. It is a story on prohibited love, similar to Romeo and Juliet. When the wedding was already held, the Devin Castle has been attacked by the bad uncle of the bride. Her lover was killed and she jumped into the muddy Danube river. This is why people name this place a **Virgin Tower**.

St. Michael's Gate and Tower is the only preserved part of the Gothic fortification. At the top of the tower there is a statue of a hero, killing a dragon. One part of this place includes the oldest bridge in Bratislava. People believe that the separate gate entry should be avoided, especially by students before final exams. Nowadays the tower serves as museum and as an endpoint of installation of a popular laser show.

City Well gives a unique genius loci to Primatial square next to City Hall. The new reconstruction of the old square incorporated the well, discovered by archeologists in 1977. The well has been decorated by an artwork with the motif of Bratislava sign. Here is the place where tourists throw little coins to ensure that they will luckilly come back. The water level is about 126 m, aligned with the Danube river level. This is the deepest visible point of Bratislava.

The Old Townhall (Stara radnica) is the most important secular building in the downtown. Bratislava had the first free elections in Centraleuropean Middle Age as the city was very multiethnic. The original part of the rennaissance building is the gothic tower from 13th century. Today, there is the municipal museum. The wall paintings and many lovely details make from this place one of the most favourite ones, especially suitable for summer therate performances, tower brass concertos and folk art and craft exhibitions. The tower bell is said to contain the diamond from the ring of a bad city mayor. The painting above the entry was painted by the devil, says one of the legends.

For two of Bratislava towers there are legend or historical evidence about the jumping down. We have designed two simple physically based games to illustrate this. Additionally, several prominent legends are published on-line by courtesy of famous authors like Maria Durickova.

Figure 7: Preliminary versions of 3D models: (a), (b) St. Martin – typical and non-standard views, reconstructed by Marek Zimanyi, (c) Castle reconstruction with the kind help of Eurosense Slovakia, provided by Peter Borovsky, (d) and the first MetropoGIS reconstructed façade by Stanislav Stanek.

Figure 8: The world oldest living wine in Maribor. Photo by Sebastian Krivograd.

8   CONCLUSIONS AND FUTURE WORK

In Central Europe, there are at least 30 unique and recognised sites in Austria, Czech Republic, Hungary, Slovakia, and Slovenia - within the former Austro-Hungarian area. Sorry to say, this **European added value is not added** to the Internet community, except some fractions in the tourism-oriented web pages, mixed together with other information, often of a different nature or focus. That is why we propose to start the systematic reconstruction of them as a specialised whole – Central Europe Cultural and Natural Heritage – Virtual Heart of Central Europe.

The following is the quote from UNESCO official site: *"With 721 cultural and natural sites already protected worldwide, the World Heritage Committee is working to make sure that future generations can inherit the treasures of the past. And yet, most sites face a variety of threats, particularly in today's environement. The preservation of this common heritage concerns us all."*

However, UNESCO recognised historical centres, e.g. Prague or Graz Historic Centres, represent too much data. Thereafter, it has been necessary to focus on some jewel parts of them first. Our initial reduction and selection idea is the ***cultural crossroad-city verticals – towers and wells*** – embedded into an existing city model.

Our intention is twofold. We intend to reconstruct, preserve and present the top values of the past. In addition, we will provide the people in Central Europe and Internet global village with the well-working and beautiful cyber sites. In other words, we shall bridge the best from the past with the prospective future using the hi-tech, as envisioned in EU strategic research directions like semantic web [Bern01] or digital libraries. The dissemination of results started with [Karn03] and will continue at [VHCE04], at least.

The future work is obvious – to continue in forming the network in Central Europe. That is why we have submitted a follow-up Culture 2000 project named ***3D Virtual Heart of Central Europe***. Our new partner country is Poland and we are looking forward to extend the number of countries, prominently with Hungary, in future years.

9   ACKNOWLEDGEMENTS

Figure 9: Chatam Sofer Mausoleum interior reconstructed from photos taken by Marek Zimanyi and Matej Zeman. 3D reconstruction using floorplans and lighting scenario by Jan Krizik.

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