

Internet Based Art Installations

Franc Solina

University of Ljubljana, Faculty of Computer and Information Science

Computer Vision Laboratory

Tržaška cesta 25, SI-1000 Ljubljana, Slovenia

Phone: +386 1 4768 389, Fax: +386 1 4264 647

E-mail: franc.solina@fri.uni-lj.si

Keywords: multimedia, video over Internet, virtual galleries

Edited by: Jozsef Györkös

Received: July 23, 2000

Revised: October 1, 2000

Accepted: December 4, 2000

An overview of some internet-related computer applications which were used in several art presentations and art installations on the Internet is given. The technical solutions range from the design of typical hypertext contents combining text and images, creation of virtual environments, sending of life video images over the Internet and controlling remote robotic devices over the Internet. These technical solutions were successfully used for presentations of classical fine arts on the Internet as well as for creation of contemporary art installations.

1 Introduction

Already in the spring of 1995 we presented on the Internet the Slovenian Virtual Gallery which was a typical first generation web multimedia presentation of Slovenian fine art consisting of an interconnected set of texts, images, and video clips. Beside following the interconnecting links, an alternative way of exploring the pictorial information in this multimedia data set was by “walking” through a virtual gallery space.

This multimedia concept which we present in Section 2, in combination with our module for real-time video observation over the Internet (Section 3), was later used by the video artist Srečo Dragan for several of his art-Internet installations described in Section 4. By adding the possibility to get real-time video from any physical point, which can be connected to the Internet, one can effectively blend actual and virtual spaces.

2 Slovenian Virtual Gallery

The Slovenian Virtual Gallery (SVG) was developed in the first half of 1995 by senior students of computer and information science Andrej Lapajne, Bor Prihavec, Žiga Kranjec and Aleksandar Ruben as a project in the framework of a course taught by the author. The goal of the project was to present Slovenian fine-art on the internet [8, 13]. In cooperation with distinguished slovenian art-historians¹ we prepared an overview of Slovenian art from the gothic period up to the present day². SVG consists of three main

parts (Fig. 1(a)):

1. Overviews of the main art historical periods which contain biographies of authors, each with an iconized index of their works (Fig. 1(b)). Icons can be blown up to the screen size (Fig. 1(c)).
2. Permanent collections and current exhibitions in selected Slovenian art galleries.
3. A 3D virtual gallery where the viewer can move through a virtual three-dimensional architecture and view the paintings hung on the walls (Fig. 1(d)). By clicking on the paintings the user switches to the works and their authors in the first part of the SVG.

SVG supports also search of authors or works of art by using different keys (names, years, art techniques).

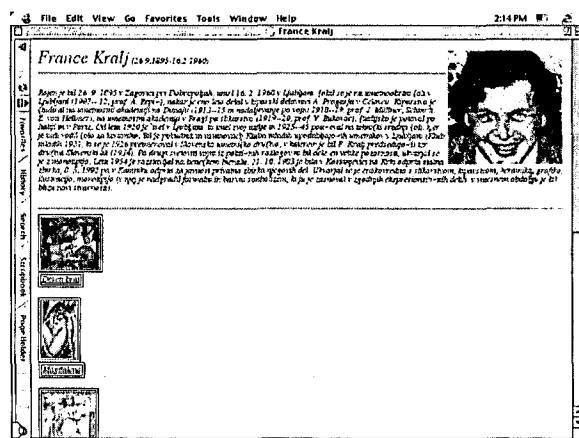
SVG, judged by its implementation, was a typical first generation web site. Due to the lack of appropriate tools at the time of development we wrote our own data management tools and tools for automatic generation of HTML documents, all implemented in PERL. Data was stored in files which were directly manipulated. Since there were just a few typical types of documents in the SVG, we used patterns to generate HTML documents. The administrator of the system whose role was to add new content to the SVG didn't need to know the HTML syntax (Fig. 2). Additional features of the SVG system were a distributed database and remote management of the system. In the span of just a few years, however, the web related technology has experienced a tremendous growth. On the market is now available a range of relational and object-oriented data management systems which make such types of web applications much easier and faster to develop. We

¹Dr. Samo Štefanac (gothic period), dr. Tomislav Vignjevič (renaissance), Matej Klemenčič (baroque), dr. Barbara Jaki (19th century), mag. Igor Zabel (20th century)

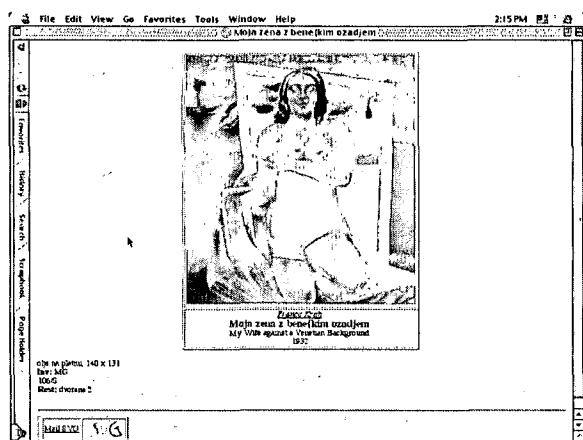
²Špela Zorčič helped with the graphical design of the SVG web site.



(a)



(b)



(c)



(d)

Figure 1: (a) Home page of the Slovenian Virtual Gallery showing its three main constituent parts, (b) Presentation of painter France Kralj, (c) “My wife against a Venetian background” by France Kralj (oil on canvas, 140×131 cm, 1932), (d) Inside the virtual gallery.

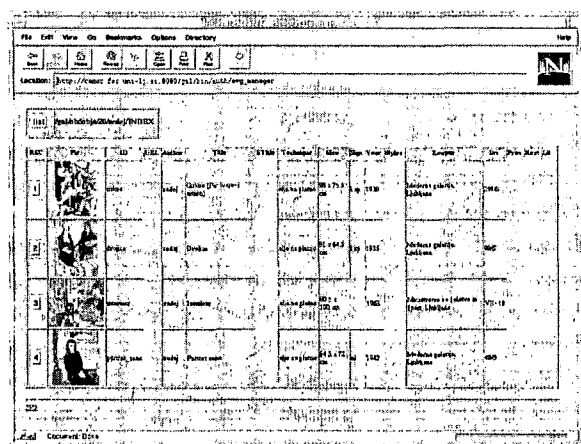


Figure 2: Management window for changing or entering new information into the SVG system

have in fact made a pilot re-implementation of SVG using a commercial object-relational data base [6]. The most critical and potentially time consuming step in such re-implementation is the conversion of existing data to the new data structure.

The virtual exhibition space of the SVG was implemented using a structure of inter-connected clickable-

maps. Each view of the 3D gallery space, which was initially constructed as a classical CAD model, was pre-rendered and converted to a clickable map by addition of carefully selected links to the next possible views. By clicking on the pre-selected areas of the clickable map the observer moves to the corresponding destination. Thus a



Figure 4: VRML model of Jakopič's death mask

selected sequence of such clickable maps forms a walk through the virtual gallery. If a visitor of the virtual gallery clicks on any of the paintings which are hung on the walls

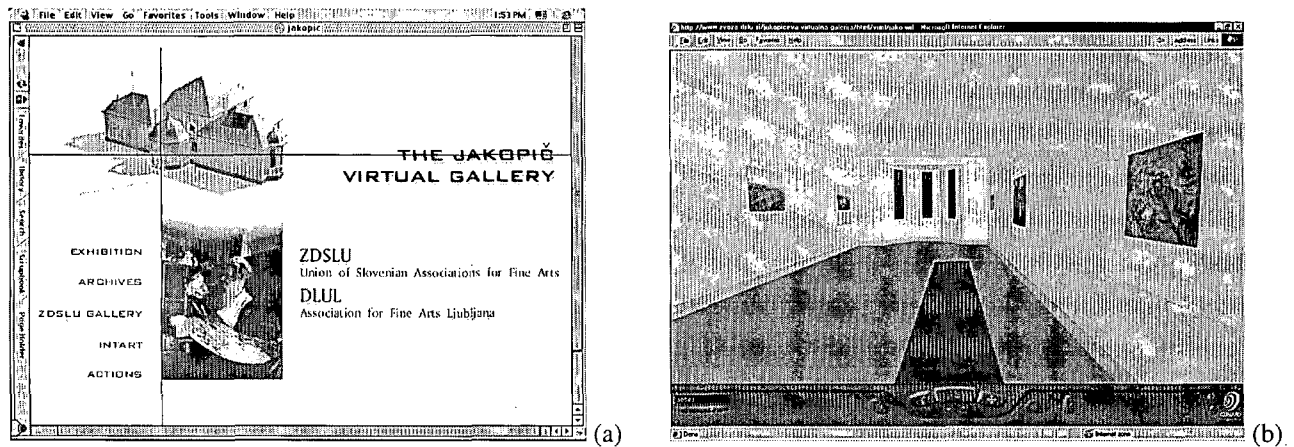


Figure 3: (a) Home page of the Jakopič Virtual Gallery, (b) VRML model of one of the rooms

he gets to the presentation of the paintings in the first part of the SVG. In this way all parts of SVG are interconnected. Although similar result can be obtained using a VRML model, our implementation was much faster and enabled greater flexibility in connecting to different parts of SVG since each step in a walk was just a link to another HTML document. Such predetermined paths through a virtual space are also easier to handle for a novice user who can get quite easily lost if a multitude of options are open such as in a typical VRML rendered virtual space.

SVG was warmly received in Slovenia [5, 7] and, as judged by a high number of visits, on the Internet in general. In 1996 the McKinley Group's online editorial team rated SVG as a "4-star" site excelling in "Depth of content", "Ease of Exploration", and "Net appeal". Unfortunately, no institution in Slovenia at that time showed any interest to support, maintain and upgrade the SVG system. The SVG system was a result of student work and was after the authors left the University no longer maintained. While the first part of SVG which contains the historical overview is fairly content stable, the second part was supposed to offer information on current exhibitions in several galleries in Ljubljana.

Recently, the Union of the Slovene Fine Artists Associations (ZDSLUI) sponsored a project which was inspired by SVG. A VRML model of the Jakopič Pavilion, which was demolished in 1962, was built to serve as an environment for virtual exhibitions of Slovenian artists on the Internet and to celebrate the anniversary of Rihard Jakopič [3] (Fig. 3). Rihard Jakopič was the premier Slovenian impressionist painter who in 1908 actually financed the building of the pavilion in Ljubljana. In the virtual pavilion, which closely follows the original plans of the architect Maks Fabiani, is included also a 3D model of Jakopič's death mask (Fig. 4) which we rendered using our structured light range sensor [12].

3 Life video over the Internet

Life video transmission over the Internet is becoming more widespread as the capacity of the networks expands and the access speed of the end users increases. At this moment thousands of cameras, all across the earth, are sending images to web sites which can be used as our remote eyes. In 1996 we developed our own system for remote video observation over the Internet that we named Internet Video Server (IVS) [10, 11]. The IVS system consists of a camera mounted on a robot pan/tilt manipulator which makes possible to turn the camera in any direction.

The user of the IVS system observes the video image and controls the direction of the camera in a browser window shown in Fig. 5(a). This interface required the user to press the left/right and up/down buttons to move the camera. Due to buffering, slow, and uneven reaction times of the network these controls did not seem to be very predictable from the user's point of view. The reaction time of the system depended mostly on how the camera and the pan/tilt unit was connected to the Internet. Many types of connections were tested, ranging from direct computer network connections to GSM mobile phone networks. Due to the uneven network response the user could easily lose any sense of where the camera was pointing to, especially if he or she was not familiar with the location where the camera was placed.

These interface problems motivated us to design a better user interface for remote video observation [11]. Due to the precisely controlled position of the camera by means of the pan/tilt unit, individual images acquired by IVS can be assembled into panoramic 360° views of the surroundings (Fig. 6). These panoramic images are then used as a backdrop for live video images, to give the user the correct context for his observation. In the new "GlobalView" interface (Fig. 5(b)) one can simply drag the live video frame over the static panoramic image to define the new camera view directions.

This system for live video transmission over the Internet was used in June 1997 during the exhibition of the

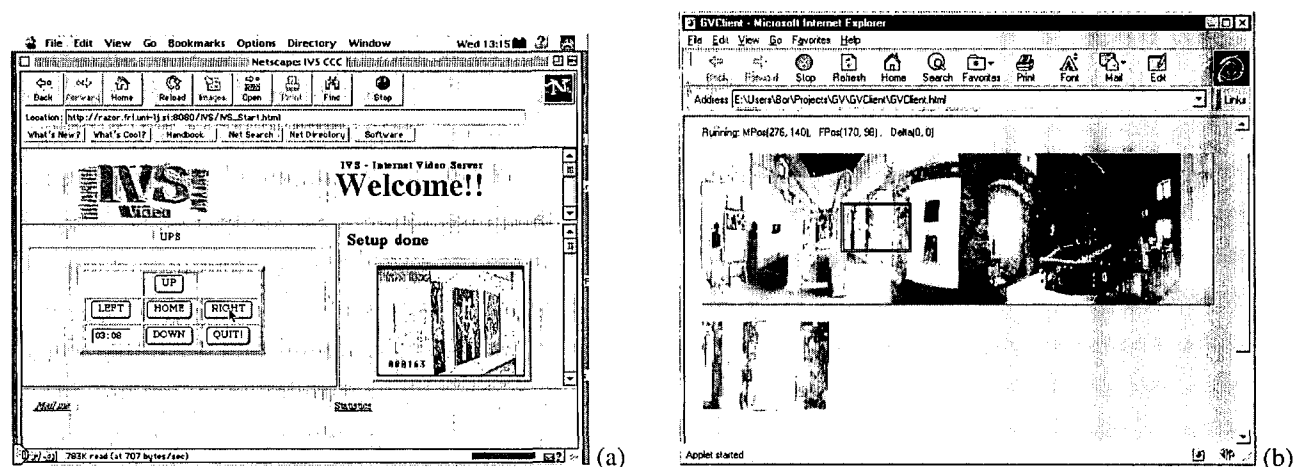


Figure 5: (a) old Internet Video Server interface, (b) new "GlobalView" interface



Figure 6: 360° panoramic image taken in the ZDSLU gallery during the exhibition of Silvester Plotajs Sicoe in 1997.

painter Silvester Plotajs Sicoe in the Gallery of Union of the Slovene Fine Artists Associations in Ljubljana. On the static panoramic images, taken in each room of the gallery (Fig. 6), one could click on paintings to get the corresponding pre-scanned images of these paintings (Fig. 7) and other information about the painter. From the current position of the camera platform, however, a web user could receive live video as well as control the camera to observe not only the sterile static exhibition, but also the visitors moving through the gallery.

4 Art-Internet projects

While the efforts of Computer Vision Laboratory in promoting Slovenian fine art over the Internet did not receive any institutional support, a very stimulating and fruitful collaboration started with the new-media artist Srečo Dragan. Dragan is one of the pioneers of video art and conceptual art in Slovenia. He was eager to explore and use any new technological solutions which related to his artistic interests. Our multimedia experience, in combination with our module for active Internet video observation, was used in several of Dragan's art-Internet projects and installations [14, 4, 15] (Fig. 8). These projects offered, in general, the visitor a blend of actual and virtual spaces which could be



Figure 7: "Chair for van Gogh", Silvester Plotajs Sicoe (oil on jute, 100 × 180 cm)

visited over the Internet. Visitors on the web could control the view direction of the camera to interactively observe

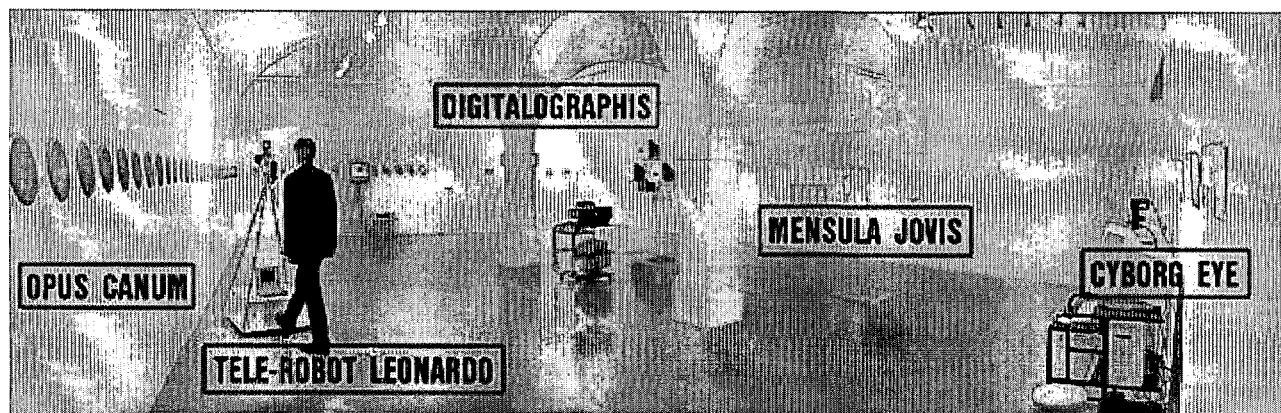


Figure 8: Exhibition of Srečo Dragan's electronic art projects in gallery Equrna in 1997



Figure 9: Web project ROTAS-TENET

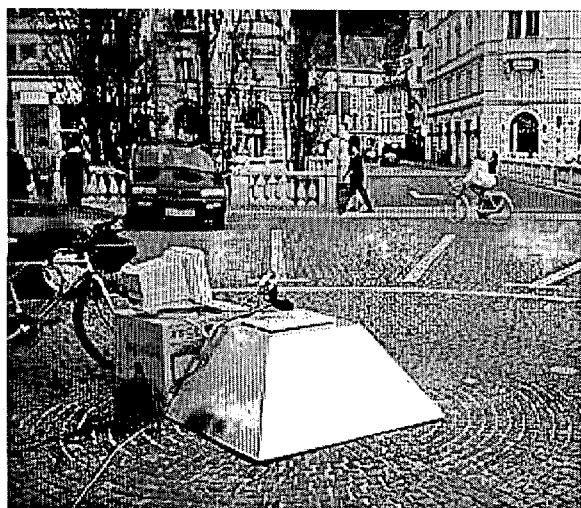


Figure 10: The IVS camera mounted on the pan-tilt robot manipulator on Prešeren's square in Ljubljana on 23 May 1996

actual physical locations which were again in an inventive hypertextual fashion connected to other virtual spaces or other visual or textural information.

The first joint interactive Internet installation ROTAS-TENET was entirely dedicated to the architect Jože Plečnik (1872–1957) and his exhibition “Architecture for the New Democracy” at the Hradčany castle in Prague (Fig. 9). To spiritually link Ljubljana and Prague by new technological means during the opening ceremony on Hradčany the IVS camera was set up on the Prešeren square next to the Three Bridges in Ljubljana which are one of the most famous demonstrations of Plečnik's mastery in urban development (Fig. 10). In the web site was included also a computer model of Plečnik's plan for a new Slovenian Parliament which was never realized. This event in May 1996 marked also the first occasion when live video from a public space in Slovenia was available on the Internet [10].

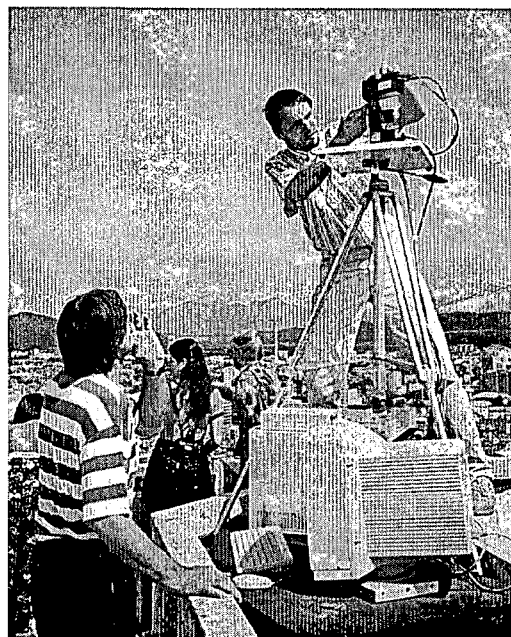


Figure 12: Scanning of panoramic images with the IVS system on top of Ljubljana castle.

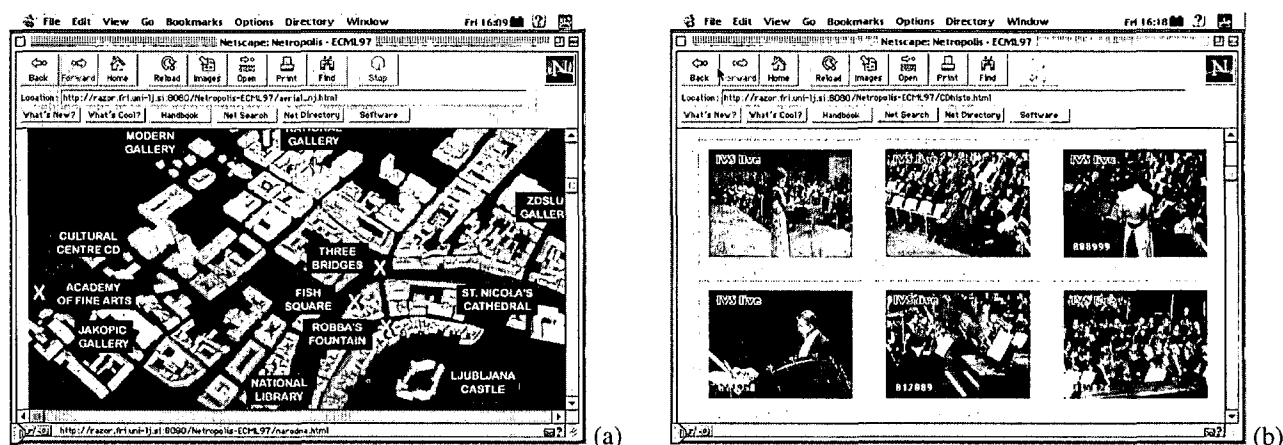


Figure 11: *Netropolis–Cyborg’s Eye* project: (a) 3D model of the center of Ljubljana with locations indicating where panoramic images can be interactively viewed, (b) video frames transmitted through IVS from the opening ceremony.

The two most complex joint art-Internet projects were *Netropolis–Cyborg’s Eye* and *Netropolis–Clavis Urbis*.

4.1 *Netropolis–Cyborg’s Eye*

The *Netropolis–Cyborg’s Eye* project was prepared for the European month of culture in Ljubljana (ECML) in the period of 15 May – 5 July 1997 [1, 2]. The project was dedicated to artistic research and experiment and was supposed to serve as a reference point for art at the entrance to the third millennium. The project was realized as an interactive installation of telepresence on the Internet which has at various locations and at different times connected Ljubljana with the world. The project was a combination of a navigable virtual architectural space, representing Ljubljana on the Internet—*NETROPOLIS* (Fig. 11 (a))—and of live video images, sent by means of a camera that could be controlled over the Internet from the selected points in the city—*CYBORG’S EYE* (Fig. 11 (b)). At these points one can cross from the (live or recorded) video images over into the digital city model and back again. At selected locations in the city 360° panoramic pictures were recorded which can be viewed interactively (Fig. 12 and 13). The conceptual plan of an interactive access from one space to another is only possible as a view from the utopian site, a non-existent, excluded point of view, which is the center of all actual and virtual plans of space and time. Additionally, images of other ECML events were digitized from video clips prepared by TV Slovenia and presented in the Chronicle section of the project web page. Unlimited possibilities of interactive dialogue formed a temporal image of the whole event which is still available on the Internet [14]. *Clavis Urbis* was a later “technical re-implementation” of the same concept but in the town of Slovenj Gradec.

4.2 *Netropolis–Clavis Urbis*

Netropolis–Clavis Urbis was the title of Srečo Dragan’s participation at the U3, 2nd Triennale of Contemporary

Slovene Art in Modern Gallery Ljubljana, 14 November – 11 January 1998. The participants were selected by the curator Peter Weibel.

Netropolis–Clavis Urbis is based on a camera carrying robot telecontrolled via the Internet which was developed jointly with the Robotics group at the Jožef Stefan Institute in Ljubljana (Fig. 14). The robot [9] can be directed via the Internet to several locations in Ljubljana, represented in the gallery space by anamorphic images; at the same time, it sends a picture of the actual gallery space to the spectator-actor. But when the camera settles on the picture of the selected direction, the image on the screen transforms into a virtual, computerized picture of the city. The project thus connects the real gallery space with both the real and virtual spaces of the city of Ljubljana and with the dislocated word of computer networks [16].

5 Conclusions

We have built several art-related web sites, ranging from “classical” presentations of picture galleries to interactive art installations in cooperation with the media artist Srečo Dragan.

If a gallery or art museum web site serves only the general public, short information about collections, some pictures, opening hours, and directions for finding the museum generally suffice. Thousands of museum web sites from all over the world are now fulfilling this goal. If, on the other hand, a museum web site wants to serve also the art specialists, almost complete collections should be available in digital form, together with all other relevant information. This is of course a major, several years long undertaking, which must be carefully planned and is best organized in the framework of digitizing the collection also in high resolution for other purposes. The accompanying web design and technical solutions must be more conservative with the primary goal of finding the relevant information reliably and fast.

Web sites devoted to exhibitions of single authors or even

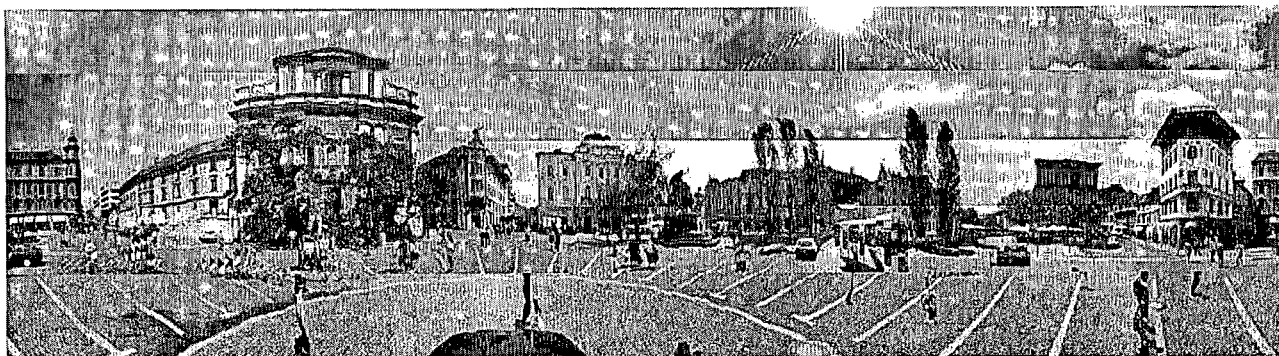


Figure 13: 360° view of the Prešeren square at the hearth of Ljubljana

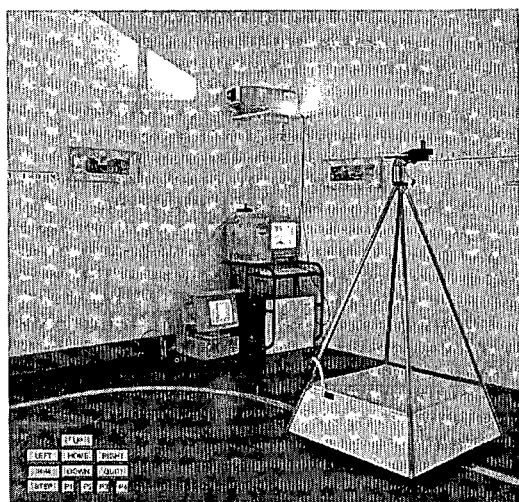


Figure 14: Srečo Dragan's exhibition at U3, Modern Gallery Ljubljana 1998

art-Internet installations are much less restrictive in design as well as in technological solutions since they are much smaller by content and usually short lived. Our art-Internet installations described in this paper served at the same time also as an excellent platform to test new and still unproven technical solutions.

From the human resources point of view, new educational programs are sorely needed to combine the knowledge of technology with design skills. Due to these art-Internet projects the collaboration between the Faculty of Computer and Information Science and the Academy of Fine Arts expanded. To fulfill part of their course requirements students from both institutions form mixed project teams to design and implement various web sites.

References

[1] S. Dragan, P. Grabnar, B. Prihavec, S. Rozman, F. Solina, and A. Vidmar. *Netropolis — Cyborg's eye*. In B. Zajc, editor, *Proceedings 6th Electrotechnical and Computer Science Conference ERK'97*, vol-

ume B, pages 11–14, Portorož, Slovenia, September 1997. IEEE Region 8, Slovenian Section IEEE.

- [2] *European Cultural Month Ljubljana 1997, Programme. May 15 to July 5 1997*. Ljubljana Municipality, 1997.
- [3] The Jakopič Virtual Gallery. <http://www.zvezadslu.si/jakopiceva-virtualna-galerija/>.
- [4] J. Krivic Dragan, editor. *Razstave/Exhibitions Srečo Dragan 1993/98*. ZDSLJ, Ljubljana, 1998.
- [5] A. Lapajne. *Slovene Virtual Gallery. M'ARS, Magazine of the Museum of Modern Art Ljubljana*, VIII(3–4):90–92, 1996.
- [6] A. Lapajne. *Slovenska virtualna galerija — od datotečnega sistema k univerzalnemu strežniku*. Diplomsko delo iz računalništva in informatike, Fakulteta za računalništvo in informatiko, Univerza v Ljubljani, Ljubljana, 1997.
- [7] A. Lapajne, B. Prihavec, A. Ruben, and Ž. Kranjec. *Slovenska virtualna galerija*. Delo pripravljeno za prešernovo nagrado študentom, Fakulteta za računalništvo in informatiko, Univerza v Ljubljani, Ljubljana, 1995.
- [8] A. Lapajne, B. Prihavec, A. Ruben, Ž. Kranjec, and F. Solina. *Slovenian Virtual Gallery*. In F. Solina and B. Zajc, editors, *Proceedings 4th Electrotechnical and Computer Science Conference ERK'95*, volume A, pages 3–6, Portorož, Slovenia, September 1995. Slovenian Section IEEE.
- [9] B. Nemec, B. Prihavec, and F. Solina. *Leonardo — A mobile robot for gallery visit using Internet*. In M. Ceccarelli, editor, *Proceedings 6th International Workshop on Robotics in Alpe-Adria-Danube Region (RAAD'97)*, pages 571–576, Cassino, Italy, June 1997. Studio 22 Edizioni.
- [10] B. Prihavec, A. Lapajne, and F. Solina. *Aktivno video opazovanje preko interneta*. In B. Zajc and F. Solina, editors, *Zbornik pete Elektrotehniške in računalniške*

konference ERK'96, volume B, pages 117–120, Portorož, Slovenia, September 1996. IEEE Region 8, Slovenska sekcija IEEE.

- [11] B. Prihavec and F. Solina. User interface for video observation over the Internet. *Journal of Network and Computer Applications*, 21:219–237, 1998.
- [12] D. Skočaj. Instructions to use range scanner. Technical report, Computer Vision Laboratory, Faculty of Computer and Information Science, University of Ljubljana, Ljubljana, 1998.
- [13] Slovenian Virtual Gallery. <http://black.fri.uni-lj.si/SVG>.
- [14] Razstave/Exhibitions Srečo Dragan 1993/98. <http://black.fri.uni-lj.si/Sreco.Dragan>.
- [15] J. Strehovec. Cybernetic art (Interactivity, game and holistic immersion). *Art Words*, 39–40:168–172, May 1997.
- [16] P. Weibel and I. Zabel. Space is beyond geopolitics 1, Parallel institutional spaces, virtual and telematic spaces. *M'ARS, Magazine of the Museum of Modern Art Ljubljana*, IX(2):23–24, 1997.