

## Application of virtual components in historical - environmental coexistence on selected examples from museum practice

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### Abstract

*Education and presentation played a key role in the creation of museums and their collections. This moment has been deepened at the turn of the 18th and 19th centuries, when the bases of the exhibition plans were laid for the realization of "large" exposures, and the virtualization plan is currently dominated by the fact that the idea of "own survival of values" The digital system is directed by several channels and gradually penetrates into the consciousness, with the aim of maximizing the expansion of virtual reality, and creates a psychological-mental process based on the experience of the individual. Sensible to mechanical-analytical thinking in order to create concrete conclusions and results. The subject of the author's study is not only the analysis of the relevant plan through the so-called museum cyberculture in several directions, as there are at least three segments of its design. Visitor's view, re-visit, and virtual and cyber exposure play a key role in stabilizing cyberculture in museums by exemplifying 3D fortifications that are in the artist's interpretation. The weight of the study is also focused on a new alternative to cyber-digital fortification (Virtual or 3D castles) into university practice, resulting in the direct and indirect indication of the interconnection of museum, university and virtual spectra for both visitors and listeners.*

**Keywords:** digital exhibition language, cyberculture, presentation, history, pedagogical environment

### Introduction

The instinct of the collector and exhibitor is present in man since the oldest phase in the form of cave paintings and sculptural art already in the form of Paleolithic and later Mesolithic Venus. This trend of preservation and expansion of the "art of the past generations" took place in all the following periods, but it gradually manifested itself as an attribute of preserving and documenting the authenticity of the time through objects or objects. Today's display language is a product of a combination of current knowledge of science and exhibition practices, knowledge and needs of a 21st century visitor. Priority needs for visitors to the modern museum are not only to learn about collectible subjects but also to examine them in detail, try them, touch them, or to make them a trusted copy. Satisfying the needs of visitors at present allows technology in the form of 3D printers, as well as direct craftmaking of castings of selected collections.

Alternatives to modern cyber adaptation - techniques are almost unlimited; from visual presentations (we no longer talk about PowerPoint educational products, etc.) to technological development itself (eg software - graphic reconstruction of monuments and collection objects, 3D shapes and forms of architectural places using 3D print or 3D Puzzle of World Places and Cultural Heritage and other).

Today, we can not only talk about the form of "help and troubleshooting", but it is necessary to create modern procedures (on - line presentations of field results related to video - call, practical adaptation of acquired theoretical knowledge to practice eg. when examining the issue using a virtual archive, verification of architectural knowledge in 3D and XD virtual monuments, etc.) in combining the acquired knowledge with technological achievements.

### Deepening exhibition museum plans with university practice

Since its very existence, the museum has been pushing for the idea of providing new facts to those interested in expanding their knowledge of the horizons. An example of this is the collections from the second millennium BC before the city of Larsa for teaching purposes. It is the education and the acquisition of new knowledge which plays a key role in the creation of museums and their collections. This moment has been boosted at the turn of the 18th and 19th centuries, when the bases of exhibition plans for exposure were laid. At present, we can document the existence of three exhibition plans:

**Syntagmatic plan.** The plan came about in 1750/1860, depending on European countries. During the visit, the social status of the visitor was important at that time, even his education. The change of the exhibition plan came only after 1950, when part of the artifacts was made available to the public even freely. The syntagmatic plan represents a diverse array of collection items that are directly embedded in the display case, that is, a pre-planned space. According to this plan, all collections should be exhibited in showcases or plastic constructions.

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**Asociative Plan.** The plan creates a non-linear form of presentation in a dedicated space (Šuler, 1997). This state can also be declared on the idea of I. Maroevič that "the gradual processing of a museum subject leads to the reduction of multi-significance (museal indefiniteness) through more detailed knowledge, which is presented through communication levels"(Maroevič, 1998). McLuhan also drew attention to an association plan in the context of museum communication in 1967 when creating expositions. The author stated that the exhibition collections should be exclusive of descriptions to allow the visitor to participate in the interpretation of the facts (McLuhan at al., 1967). This issue was overturned in the years to come, yet in the last twenty years it has re-enacted its basic idea of virtual exhibitions (Mensch, 1992). In an association plan, educating visitors to understand interpretation plays an important role, social status plays a marginal role as museums are made accessible to everyone. This state is now visible even with the free entries of some museums every first or last Sunday of the month.

**Visual-Virtualization Plan.** This plan began to be applied in museums at the turn of the 20th and 21st centuries. It is related to the gradual establishment of the idea of "own survival of values" derived from an exposure visit (Šuler, 1997). On this principle, a new digital display language has been created. The scheme is in practice based on the targeted intervention of the perpetuum in the sense of its initial engagement. The digital language is routed through multiple channels and gradually penetrates into consciousness, with the aim of maximizing the expansion of virtual reality.

The basic contours of the visual-virtualization plan are:

- Direct transformation of the digitized collection items into the exhibition hall. For a visitor, it means moving the collection from a cognitive to an emotional plane. At the technical level, innovative collections are still available in digital form. This is also the case for collections not yet available to the public. Percipients, thanks to virtual reality, can explore collections from almost every angle. Collection items transferred in virtual form are not created by the exhibition itself. In most cases, the digitized objects are presented with authentic collection artifacts. As a suitable example, we can mention part of the collections collected by the 3D optical scanner from the Slovak Mining Museum in Banská Štiavnica from the Slovak environment (<https://www.facebook.com/digitalizacnecentrum>). From a foreign environment, for example, there was an exposure from the National Museum of Rome (Thermae Diocletiani) or the Museum of Archeology in Naples.
- Creating exposures to historical events that have not yet been processed and presented. Apart from the historical context, natural themes resonate. Various visual reconstructions in the form of static models or film simulations are used to achieve the step. Animations can also be linked to interaction. These attributes provide current scientific knowledge, which also revives older claims. An elaborate example of this type is an on-line exhibition titled "Keys to Rome"(<http://keys2rome.eu/>). Many museums collaborated on the exhibition, Museum of the Fori Imperiali of Rome, Allart Pierson Museum of Amsterdam and others. The exhibition has been made available to the public since September 2014.
- By creating a variety of technological structures depending on the execution of museum cyberculture segments. At this stage is the effort of more detailed editing of the exhibition themes. That's why attempts were made to rebuild old exposures. The archive documentation is used to obtain the output process. A good example was the 3D exhibition of the most important Italian Renaissance paintings found in the Louvre Museum. E.g. 3D Mona Lisa recovered from Nintendo's gaming console, snapping balls, nodding her head, waving her hands, but also answering questions to visitors in seven languages. This show was created using the Nintendo console, and visitors did not even have special glasses to create a 3D image.
- Creating virtual exhibitions and interactive collections not found directly in the museum. In this regard, some museums use so-called "multimedia XD digital artifacts and museum holograms: such as Dubai Museum and Al Fahidi Fort: *حصن الفهيدي - متحف دبي* (<http://www.dubaiculture.gov.ae/en/Live-Our-Heritage/Pages/Dubai-Museum-and-Al-Fahidi-Fort.aspx>) to present historical stories. In addition to 2013, we also have exhibitions using nanotechnology: eg Museum of Science in Boston (<http://www.mos.org/>), or robots: eg the Robot Museum in Madrid (<http://www.therobotmuseum.eu/>) for which current technological knowledge is applied.

### Virtual reality (Cyberspace) - Museum (Cultural Heritage) - University (Virtual Education)

In the last 50 years life in society has changed greatly. Undoubtedly, this is also the result of a technique that has, as early as the arrival of conventional television receivers, boosted virtualization. This was most evident in cinematography.

Virtuality is one of the basic forms of cyberculture that is "generated by fictitiousness and illusion in confronting mimeticism, in the sense of identity in the sense of ideal presentation, and the existence of what is

otherwise impossible, inaccessible, and bringing about a permanent settlement with the degree of expression, to hyperreality and superficiality... "(Malíčková, 2004).

However, virtualization cannot be understood purely as a way of visual presentation (Schehe, 2007), since it is a fundamental phenomenon of networking, cyber - communication. From a sociological point of view, virtuality is an epistolary genre (Alijevá, 2001), ie writing on a screen, not a paper. This type of writing is also used in communication mainly on social networks and e-mail.

The development of science and technology in the field of communication and information tools opened new, previously non-existent premises. These spaces combine relatively large geographic distances, they can move around and create virtual communities. The current consumer population adapts space and time, even discovers and explains the importance of linking borders. In this spirit, J. Pašiák outlined the basic scheme of spatial trends, forms and types of society which, during the course of historical development, responded to the technological boom (Pašiák, 2009).

Similar opinions have already emerged from the technological and economic predictions of many authors (eg, D. Bell and H. Kahn) who emphasized the evolutionary model of a post-industrial society. Also, in 1968, Toffler predicted that the main "sign of cyberculture" would be "housework", carried out using a computer connected to a telecommunication network (Toffler, 1969). These predictions led from the industrial and urban space to cyberspace and virtual networks. This transformation of processes represents a global trend and is characteristic of the civilization component of globalization (Alexander, 2003).

Globalization cyberbullying has established some boundaries and barriers between different social, such as:

- Among people who have access to information and people without access.
- Among people who are able to work with new technologies and among people who do not have the necessary knowledge to use technology (Stifflinger, 2004).

This trend is also applied in museums and galleries through museum digitization and virtual reality elements, particularly in terms of virtual reconstruction and high technology (Proslar, 2004).

The director of the British Museum as well as the director of the Musée du Louvre in the conversation in 2008 also drew attention to the direct role of globalization in museums. The two directors perceived museum globalization as a new phenomenon, depending on attendance, presentations of multi-cultural exhibition themes, and interactive communication with percipients (Cock, 2008).

The purpose of museums is not only the exhibition activity but also the formation of the public opinion of the past. Contemporary museums are exposed to a compromise between authenticity, by exhibiting original museum collections and virtual ostentatiousness in the struggle for their existence. This status affects the websites and the degree of presentation of the publicized online collections on the Internet, which has both supporters and opponents.

Google's computer application has also made a significant shift in information and traffic. Google Corporation launched a project called "Google Art Project" to unite selected world museums with artistic and graphic creation in virtual environments via the Internet. The revolutionary idea was to create a list of the best virtual museums in the world based on certain criteria (Kennicott, 2011). The criteria were, for example, virtual museum with the best exhibition activity, best application of virtual products, animation-virtual stories (scenes), interest of visitors, etc. The list of museums is expanding every year, and even new applications are being created in the project, with the main intention of attracting visitors to the museum premises.

Today, Google's search engine rankings include the French Louvre (Musée du Louvre) on a weekly basis (Dömötör, 2011). The museum now has the most detailed elaborate graphic design and interactive interface. The virtual tour offers, in addition to the interior, some of the exterior walls of the museum.

Other museums have been placed in other top places, such as Smithsonian Institute: Museum, NASA Museum or Virtual Museum of Canada, etc (Župčán at al., 2014).

The relatively specific virtual museum is the NASA Museum in Washington (<http://www.nasa.gov/externalflash/50th/main.html>). The museum has an animation-interactive page. The robot in the role of a guide accompanies a virtual visitor to the history of the US National Space Program. The virtual museum is complemented by original, authentic materials from archive collections, photographs and various audio / sound samples.

The Museum with the largest number of existing virtual exhibitions is the Virtual Museum of Canada (<http://www.virtualmuseum.ca/home/>). The virtual museum operates on the basis of a group of physical museums from Canada. So far, 752 virtual exhibitions have been constructed. The most interesting presentations within the exhibition are cartoons in 2D and 3D and profile cities. Individual cities are processed in virtual form. It is possible to follow their historical-architectural development, or contemporary local sounds from factories, quarters, cars, etc. It should be noted that the last mentioned museums are located exclusively on the Internet.

The basic forms of museum cyberculture include digitization, internet communication, cyberspace, virtual reality and online presentation (Župčanová, 2014). Defining the concept of museum cyberculture is complicated for a number of reasons, non-uniform terminological bases, absence of elaboration of methodological procedures in the analysis of the impact of digitization and virtualization of museum artefacts, different versions of virtual

reconstructions based on technical demands and lack of financial and marketing promotion. From museum practice, digitization of museum artifacts and internet presentation of the museum are the most used elements of cyberculture or virtual tour's (Parry, 2007).

Although digitization is a relatively long-term issue from a time and a technical point of view, it gradually becomes familiar with the pedagogical environment. The biggest manifestation we can see is the emergence of digital and multimedia laboratories directly at universities or in the museum sphere (Župčan, 2014). In addition, the digital visualization trend has also affected the educational process. Nevertheless, different forms of application of cyberculture components predominate between research and knowledge interpretation between departments (as well as universities). This fact is also evident in the Slovak Republic, where it is necessary to improve the usability of digitization and work with virtualization in the university environment. Compared to other comparable countries (such as Poland, the Czech Republic or Hungary), this situation is greatly underestimated in our territories, which is also reflected in European projects or the success of graduates with digital work experience.

In most humanities and societies, the adaptation and dissemination of technological novelties (such as the use of tablets, smartphones, Tesla transformers, etc.) from the field of visual elements is now the most appropriate. The basic task of virtualization is to present and verify theoretical knowledge in real form. It is just the visual practice that documents other research alternatives from other disciplines as well. At present, the following scientific phenomena are most preferred:

- Creation of reconstruction models of existing collections in order to present them in online form as a promotional article, as well as for available study (eg the Digital Museum under the patronage of the SNP Museum in Banská Bystrica).
- Creating a variety of collection items (most often damaged or stolen, processed on the basis of preserved documentation) using 3D printers.
- Making available museological reconstruction exhibitions of historical and social themes in the premises of universities (eg "Virtual exhibition of Slovak castles" at St. Cyril and Methodius University in Trnava or "History of Scotland" at the University of Glasgow). In this regard, it should be noted that most of the foreign universities (eg University of Denver, University of Maryland and many more) focusing on history and architecture research at their official (departmental) site offer a direct virtual exposure.
- Construct the ideal virtual form of cultural monuments (especially ancient and medieval buildings: sacral and profane constructions) in a digital format to study the history of architecture.
- virtual animation shows and feature films about individual historical periods. Most are 2D or 2D. 3D examples documenting social relations in the past.
- virtual geographic and cartographic plans and maps created using technology and navigation systems (eg GIS).
- Creating simple educational presentations using multimedia tools, eg virtual book (<http://brunelleschi.imss.fi.it/pencil/index.html>) to simplify and explain the historical - socio - cultural processes for high - school students (especially grammar schools) and colleges. A similar example is the construction of a virtual book on UCM in the framework of the KEGA project entitled Natural Conditions of the Nitra Stool in the 18th Century as viewed by M. Bel (a university textbook), which will be available to the public at the turn of 2020/2021. An important basis in addition to the processing of natural conditions from the modern era will be an alternative application of information from several disciplines in virtual form via individual online applications.

Most of the points mentioned above must gradually be incorporated and expanded into the Slovak university system in the humanities. In the Slovak environment, such an example may be the Archeology Department (eg the Department of Archeology at the Faculty of Philosophy of the Comenius University, the Department of Archeology at the Philosophical Faculty of the University of Constantine the Philosopher, etc.), which, within the framework of the study program, performs constant teaching of subjects such as "Computer Support in Archeology" "GIS in archeology" (Fig 1). and others.

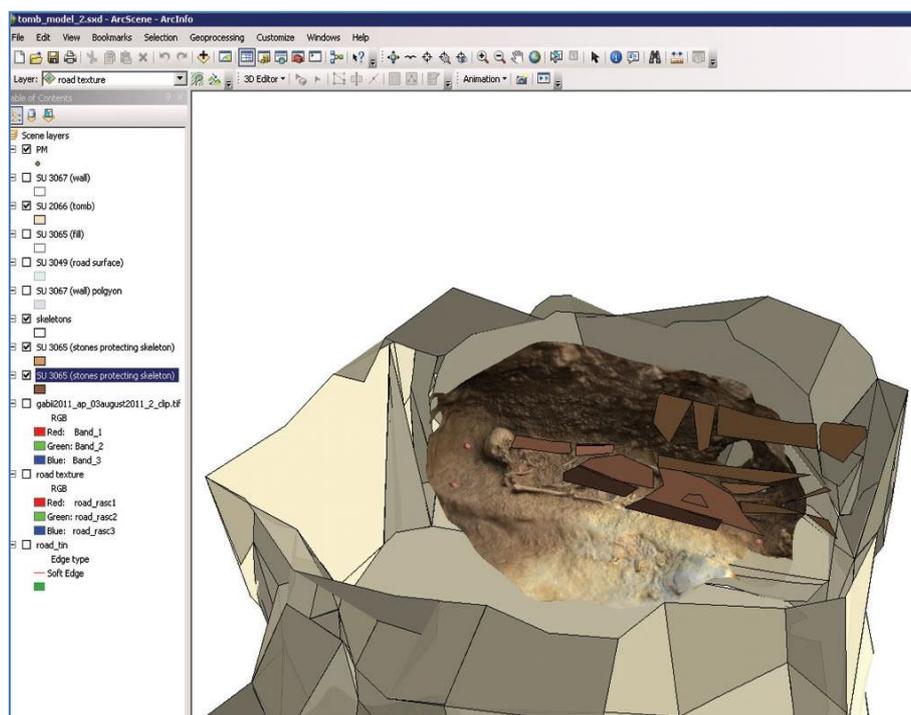


Fig. 1 Example GIS modeling and archeology photogrammetry

The general history (everyday life of the ethnics) and the contemporary architecture from the viewpoint of disciplines such as history, ethnology, museology and others can be explored and subsequently presented in our environment by establishing the components of cyberculture. The current research of human history is not just about analyzing and memorizing preserved authentic and secondary works or existing historical commentaries as it was in the previous century as many documents are also processed in the digital library., terrain work plays an important role, in particular for verifying older data.

### Cyber - Artifacts and Cultural Heritage

In the way of studying and interpreting the nature of complex historical processes and their contexts, the implementation with individual virtual elements is increasingly present worldwide. Significant promoters of virtualization include, in particular, German, Anglo - Saxon, French - speaking and Chinese - Japanese university specialists who apply forms of virtualization and cyberspace when analyzing human history.

This state is reflected in a number of patterns (eg from short clips to exercise and repetition alternatives, etc.) that are accessible to the public, especially in the on-line interface. In the educational process, and especially in the interpretations of the history of architecture, especially in the presentation of structural changes in urban planning and the differences in architectural monuments, we can consider the following elements as decisive elements:

- 2D to 3D virtual reconstruction of various cultural monuments set in the cities (Fig 2 and Fig 3). These forms are based on sources of archaeological provenance and also on architectural and historical graphic documents (<https://www.youtube.com/watch?v=-64kHmCJGMA>; <http://paris.3ds.com/en-sainte-chapelle.html>).



Fig. 2 Example Preview: 3D Paris created using the Dassault system

- Cartographic, geographic virtual plans and ground plans of the cities. Virtual maps, as well as books, are based on geography and preserved maps (<https://www.youtube.com/watch?v=yI5YOFR1Wus>.)

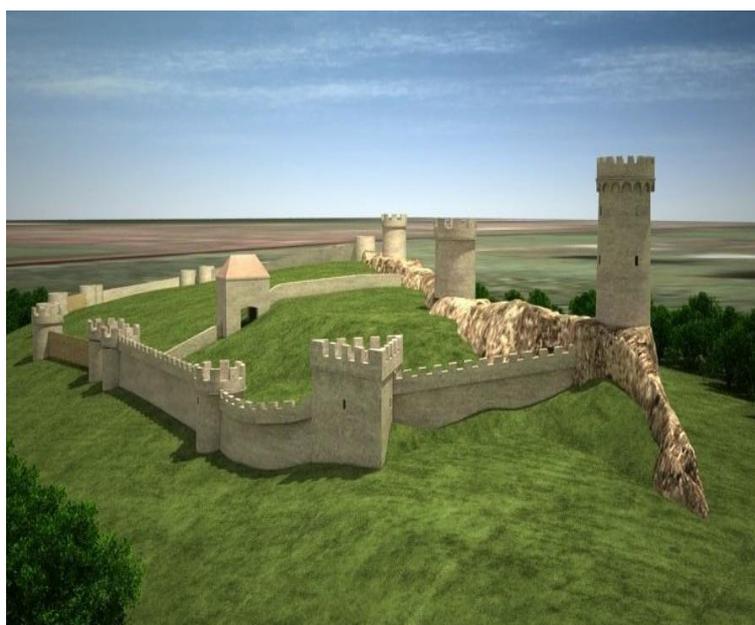


Fig. 3 Example 3D Castle Košice – Hradová (L. Župčán)

- Static and virtual reconstruction models of cultural heritage (layout of buildings, natural attributes, as well as period sounds). In particular, literary and graphic and audio analyzes play a significant role in the creation. A typical example is the exposure to The Virtual Museum of Canada (<http://www.virtualmuseum.ca/home>), which documents one of its exhibits of social changes of selected 19th and 20th century Canadian cities through old photographs and period sounds (Fig 4) or on - line exhibition of the Manhattan city plan from 1812 to the present. A demonstration of our environment is an interactive exhibition of Huncok ethnicity in the Castle Museum in Častej. The exhibition maps the arrival and existence of a German ethnic group in the former pezinian "terra Pálffy's" dynasty. The museum collections open up unlimited possibilities to apply virtualization from the position of restoration of the dwellings and settlements (high in the forested mountains) of a narrow group of people who have fed the work in the mountains in the form of woodcutters. Additionally, the documentary basis (including photographic material) as well as oral history allows, on the basis of the digital genealogy, to monitor the progressive development of the ethnic

group on and outside the territory of Slovakia. A specific example of Huncokar's research is their outrage, which is also possible to analyze and explore their native language strains using a variety of linguistic software.



Fig. 4 Example Preview: Exhibition called "Urban Life Through Two Lense" in VMC

- Reconstruction of the later portrayal of the most prominent characters, which changed the character of the town's history (eg king, state, architects, etc.). Selected reconstructions consist mainly of preserved artefacts (eg statues, busts, paintings, graphics, photographs and others).

On many Internet browsers, there are now quite a number of professional websites that visually process the history of individual European and non-European cities. Nevertheless, a single web site (except the National US Archive with its own virtual museum: Fig 5) does not offer historical and factual interaction to the user online (except for pre-stored factuals and graphic recordings). Almost all web pages lack an alternative of creating and documenting the history and visualization of cultural artefacts ([http://www.digitalvaults.org/.](http://www.digitalvaults.org/))

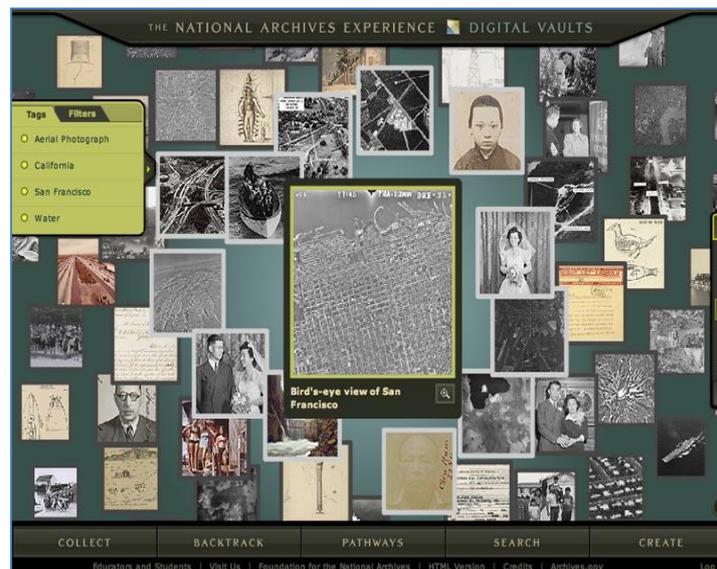


Fig. 5 Example Demonstration: Interactive exhibition with the possibility of self-completion in the National Archives Digital Vault Experience

## Empires and selected museums

Research samples were selected according to the following basic factors:

- Permanent and stable attendance of selected institutions.
- Scope of digitized collection objects and the degree of virtual reality.
- Necessary economic stability (eg the largest state support) and cooperation with the private sector, which helps to create alternative exhibitions in the form of a virtual presentation.
- Marketing and advertising promotion.
- Multimedia activity education and interactive research of collections for practical purposes.

Based on the above criteria, several national and specific museums of a diverse nature (according to typology: artistic, historical and ethnographic) have been documented, which have applied the elements of cyberculture as much as possible (2013 - 2015/2016).

The priority of the research was to analyze the following difficulties by means of comparison, area diagnostics, psychological and axiological methods:

- The virtual interface of the museum web site (eg obtaining clear information, degree of online interaction, etc.).
- Impact of visual design on a visitor or his need for self-learning and relaxation.
- Invoking an emotional experience from a selected exhibition and presentation.
- Empirical experience in the demonstration of virtuality (an effort to understand the collection subject matter and current technologies).
- Invite your interest to visit selected museums.

A register of cultural institutions using elements of virtuality, respectively. virtual reality is geographically and technologically diverse. The main criteria for creating a museum list for the needs of the study that apply cyberculture to their prepared programs were:

- Combination of classical and virtual exhibitions. A key factor is the degree of diversity in the conversion and adaptation of digital collections.
- Offer interaction on the web, even in classic spaces.
- Utilization of virtual and multimedia elements in the advertising presentation of the museum. It is, for example, to use 3D videos. It also includes design promotions based on the use of technical innovations, manual scanner.
- Experimenting with interactive cyberbullying components during a tour, tablets, audioguide devices and more.
- Presentation of the developmental stages of application of technical novels in the interpretation of their collections in the form of pilot projects and short-term exhibitions.
- Apply more challenging parts of cyberculture (eg holograms) into the exhibition process.

The museums that most closely combine cyberbullying components by typology include:

### **Musée du Louvre (France)**

The selected French Museum is a European cradle of interactive exhibitions in a number of ways, from online presentations, 3D protection of collections, multimedia education, and the adaptation of holograms to the "revival" of the most valuable artifacts. The institution is one of the world's museums that is not directly involved in the Google Art Project system (<https://www.google.com/culturalinstitute/project/art-project?hl=sk>). The reason is digital protection and the creation of a virtual virtualization project in order to keep the originality of its artifacts. The institution offers a diverse range of cyberculture through both on-line and virtual exhibitions at the museum's premises.

The on-line access (website) itself is designed and graphically redesigned, not to mention the Interactive Floor Plans of an institution (<http://www.louvre.fr/plan>). After viewing the individual spaces, the visitor receives information through short previews of existing collections through photos or animations. Navigation in the cyberspace is fairly simple, without much constraint.

On-line elements of cyberculture can be included in the museum:

- Virtual tour of the museum through twenty-one panoramic rooms.
- Five built virtual rooms in 3D format.
- Multimedia presentation of the twelve most important museum collections in the format labeled "Closser Look" (<http://www.louvre.fr/oal>).
- Animation-visual documentation through minisite, a short virtual film of the most valuable paintings and sculptures the museum has (<http://www.louvre.fr/minisite>).
- Interactive acquaintance of collection gains through the eyes of former director D.V. Denon. This offer is accessible only online (<http://www.louvre.fr/le-louvre-raconte-aux-enfants>).

The museum also offers virtual reality to its visitors. Virtual reality is created with digital exhibits in 3D and XD formats (eg Mina Lisa 3D). Today, some expositions can be visited by using the digital archive of the museum. Since 2005, the Museum has made about 80 virtual exhibits using Augmented Reality. Several exhibitions have been created by the CAVE system. Current virtual exhibitions are made especially in 4D and XD formats, in three cases there has been an interactive 5D cinema. According to available information, the museum plans to apply virtual reality to the Renaissance collections (mainly the handwritten works of Italian and French artists) using robotics and interactivity in the coming years.

### **Smithsonian Institution / Museum (United States of America)**

The institute is a collection of several organizations (museums and science centers) on the east coast of the US with 138 million artifacts. Similarly to the Louvre Museum, cyberculture can be tracked through online, but even in individual parts of the institution. The web interface and navigation are much more complex (more demanding control of icons), yet they offer their customers a wide range of virtual applications (<http://www.si.edu/>). By means of individual units, the institution tries to attract potential visitors (already in a partial virtual interface) using film and animation (3D and anaglyphs).

Cyberculture in terms of the performance of exhibition activities can be classified into the practical and scientific level.

The practical plane is a direct part of the exhibition activity. Like most institutions of a similar nature, the Smithsonian Institute has a virtual tour (<http://www.mnh.si.edu/panoramas/#>). The fundamental difference compared to other museums is at the stage of execution, as it has a maximum of 40 objects per pixel, which is a technical phenomenon of the time.

Visitors are currently the most popular dinosaur hall with virtual reconstructions and sound effects. Similar skeletons are in the form of preserved animal collections, which bring real physical and voiced form to technically (using tablets and smartphones and expanded reality).

The practical plane, in the sense of creating an unreal world and museum collections, is also crystallized in a virtual book, library that delivers "show" and gain information through interactive study. Archaeological and paleontological collections in several digital formats are also prepared for the visitors (<http://www.mnh.si.edu/fossil-hall/last-american-dinosaurs/>). Visitors' interest is also a 3D reconstruction of daily provenance from the oldest to the modern history (up to the first half of the 20th century).

As part of the exhibition activity, 3D and 5D film versions of various themes, from historical to space (eg 3D Jerusalem, 5D Hubbl's Telescope etc.), are now the dominant article of the institution (<http://www.si.edu/Imax/Movie/125>).

The basis of the exhibition activity of the secondary segment of museum cyberculture is the application of immersive and expanded reality. Typical examples are technically interesting exhibitions, Immersiv Room - Collection of tapestry cooperative Hewitt (<http://www.cooperhewitt.org/events/opening-exhibitions/immersion-room/>). The advantage of the exhibition is that the visitor can create his own design using high technology and can take the printed form with him.

The science plane is presented in the 3D digital collections and, of course, in the repair of damaged artifacts. Digitization helps to complete the missing parts of the collection items. The basic aim of the scientific plane is to verify older theories, to parallel research of the same kind of institutions. Some sections (such as the Latino Virtual Museum) of the Smithsonian Institute have some suggestions for creating and interacting with peripients.

### **The British Museum (United Kingdom)**

The museum was the first institution to launch the world's exhibitions with the contribution of the technique. This tendency is present today as the museum combines current knowledge of science and technology into its exhibition and professional activities. The British Museum is one of the pioneers in the launch of its own museum site on the old continent. At present, there are several tens of thousands of art objects from around the world. Most of the artifacts came from its colonies. In its premises it is possible to study human development on the basis of preserved artefacts from the earliest times to the present history. This is also undermined by the overall character of the museum. Most of the exposures are presented to visitors in ten language mutations. Museum cyberculture can be classified into two levels.

The first level is part of the internet promotion and marketing of the museum. The web interface (<http://www.britishmuseum.org>) is in a classical form with plenty of information. In particular, Internet exposures are resonant to those interested in viewing and partially examining them. Online expositions are divided into categories, e.g. culture, objects, humanity, material, and others. The most studied collections of world history, or the work of Michelangelo in graphic form

([http://www.britishmuseum.org/explore/online\\_tours/europe/michelangelos\\_drawings/michelangelos\\_drawings.aspx](http://www.britishmuseum.org/explore/online_tours/europe/michelangelos_drawings/michelangelos_drawings.aspx)). A specific article is an interactive pedagogical aid, multimedia guide that describes selected collections.

Internet Multimedia Interaction is also being rolled out in games and virtual videos.

The second part of cyberculture is represented immediately in the exhibition activity. It appears in the form of permanent (eg the life of ancient Egyptian ethnicity, the sculpture of ancient sculpture and others) as well as short-term (eg Napoleon Bonaparte) exhibitions

([http://www.britishmuseum.org/whats\\_on/exhibitions/bonaparte\\_and\\_the\\_british.aspx](http://www.britishmuseum.org/whats_on/exhibitions/bonaparte_and_the_british.aspx)).

In addition to digital examples, virtualization is evident in the visual description of important historical facts, as well as in the production and everyday life of a person. For this form of construction, the museum also uses a virtual book and diverse multimedia maps.

#### **Museum of Future Government Services (متحف الخدمات الحكومية المستقبلية) - (United Arab Emirates)**

It is the first real virtual-interactive museum to use the latest technological knowledge to practice the technologies that accompany and accompany the human population in different areas of life (<http://museum.governmentsummit.org/2015>). The institution also has a revised website.

The Cyberculture Museum enforces through the complex mechanism of virtual reality and robotics (eg using the ASIMA robot). There were almost 180 designers and technical experts working around the world to create a museum in the shape of an ideal, life-sized city with streets ("Smart City"). Virtualization of the museum is divided into several sections (<http://museum.governmentsummit.ae/2014/#smart-cities>).

The bottommost, hidden part of "Smart Street" creates a way of future human life through virtual reality (widespread reality). The whole is made up of the "Total recall" movie.

The "Future Services Laboratory" is another department that was created by the Honda car company. Toyota Museum has a similar type. In this section, visitors can try using the simulator to drive in the future (<http://www.toyota.co.jp/Museum/english>). In this embodiment, automotive prototypes are tracked through integrated intelligent systems. Curators are also trying to make use of artificial intelligence.

The third section, "Personal Cloud", deals with energy. Its origin is related to the cooperation of MIT University with the intention of presenting the latest results of the technological base.

Favorite is the "Fitzania" health day. The proposed concept is both a CAVE system and a holographic version. Percipient is pulled into the human body. It recognizes the function of the organs, cells, the body's response to the diseases and the treatment. Exceptional is the monitoring of your own pulse, blood pressure and special life functions, especially the liver, lung and brain.

The exposition, entitled "Exoskeleton", can show visitors the worry of people with serious illnesses, to point out the lives of people with disabilities (eg blind, deaf) people. In this part of the exhibition, the most demanding employment of people working in extreme conditions and situations is processed and presented. The role of the exhibition is to interpret the impact of the environment and society on the human organism. The virtual museum offers the possibility of surviving a variety of extreme situations.

The vision of the museum is to construct permanent exposure in the future (short exhibitions already offered by the museum, such as Mars life on the planet). The intention is to apply cosmetology research technologies to the solvent public.

### **VIRTUALIZATION IN SELECTED MUSEUMS THE VISEGRAD FOUR**

Virtualization is also acquired in museums of the V4 countries (Župčanová, 2015), but with a certain time lag. The implementation of cyberculture is understandable in digital collections and exposure building. In the last 10 years there have been fundamental changes in the use of elements of virtual reality in the museum environment. We are no longer talking about commercialization, but rather about digital protection, multimedia education and the creation of entertaining, instructive and scientific events. The basic intention of selected museums from the Central European space in the application of cyberculture is not only the attraction of visitors but above all the increase in the intensity of the visitors, the expansion of the scientific knowledge and the strengthening of the cultural identity.

The information obtained from the selected museums confirms the active use of cyberculture during and outside the exhibition, in the educational and educational area. V4 museums strictly distinguish the concept of digital and virtual museum from the point of view of technical excellence, impact on museum percipients and economic resources for their construction.

Based on virtual museums on the Internet, which are supplemented weekly with new information, especially from the sector of digitization of collections or the scientific scope of the museum.

#### **Magyar Nemzeti Múzeum (Budapest: Hungary)**

The museum in creation of virtual exhibitions using input systems, (<http://www.hnm.hu/hu/fooldal/mainPage.php>), prefers the idea of immeasurable reality (eg collections of objects) or simple holograms (such as the St. Stephen's Crown).

In addition, they offer a variety of display types of individual collections in 2D (tombstones and epigraphic collections or artifacts from the Roman period). In the period 2015-2020, the museum plans to construct 2D and 3D exhibits from the period of ancient and central history.

### **Szépművészeti Múzeum (Budapest: Hungary)**

Museum has (<http://www.szepmuveszeti.hu/>) a long-term experience with virtual exhibitions. Several major virtual exhibitions have appeared in the museum, Virtual Titanic, 3D Mummy Project, 3D Andy Warhol, and so on.

With the 3D Mumia Project (was renewed in 2014/2015), she worked for the first time with several leading departments (eg Anthropology, Microbiology, Radiology, Physics, etc.) to gain insight into the lives of mummies in the museum.

The current (2010 - 2014/2015) museum is dedicated exclusively to the creation of a 2D museum dedicated to museum collections from the Renaissance and Baroque periods. Another specific museum offer (Visitor-Seeking) is to display modern art through anaglyphs and especially "emerging" 3D images. Priority Near Future (2016-2018) is an international exhibition that will be connected with the classic exhibition and the possibility of expanding reality (Augmented reality) on the life and work of the painter Harmenszoon von Rijn Rembrandt (1606-1696).

The museum plans to construct an exhibition in a more sophisticated system, j. in CAVE. This, however, is not only a matter of finance, but also of international cooperation (oriented towards the Virtual Museum of Canada or the Musée du Louvre) and, in particular, by the help of companies dealing with telecommunication-information issues.

### **Moravské zemské muzeum (Brno: Czech Republic)**

By launching the advertising sector of the museum on the Internet, the institution has consolidated its position in stable annual traffic (<http://www.mzm.cz/>). To a lesser extent, there is a lack of online negatives: a virtual tour of the main museum objects. In the short term, workers are working to build a network of online digital artefacts. The benefits are interactive multimedia guides who create so- digital archive of multimedia projects (<http://www.mzm.cz/multimedialni-pruvodci/>). The museum, in this form, records four guides, namely:

- 1st exhibition Messel on Tour;
- 2nd exhibition Gold symbol of power and wealth;
- 3rd exhibition Cyril and Methodius. Time, life, and work;
- 4th World Ballet Mystery.

To date, the most prominent project in which the combination elements of virtuality and multimedia interaction were applied was the exhibition called Cyril and Methodius. Time, life and work that took place on the occasion of the 1150th anniversary of the arrival of the Solomon Brothers. The exhibition mapped the life and environment of the virgins in the area of Bohemia, Moravia and Slovakia. As a multimedia feature, tablets were used, with some artifacts (about 55%) their percipients could use to get more insight into visualization and short film animations. Also using the film processing, biographical reconstructions of saints were created in the theater center. Virtualization has been introduced even in the reconstruction models of the period architecture in the form of visualizations and static models.

At present, the most complete show with a virtual undertone is in the Mendelianum section, and visitors are actively explaining the principles and foundations of genetics. In addition to a visual tour on the Internet, a classic virtual exhibition is also created in which the visitor can actively test methods focused on molecular biology.

### **Národní muzeum (Praha: Czech Republic)**

The implementation of cyberculture is different from the Moravian Museum. The site itself is reminiscent of the third millennium museum, as it has modern technological features (<http://www.nm.cz/>). These are components:

- Virtual tours in classical form (eg virtual tour of the National Museum building and other buildings belonging to the institution).
- Short on-line archive exhibitions (eg virtual exhibition of the Old Czech reputation, etc.).
- On-line archive outcomes of experts in the form of interviews.
- Web collaboration with other museums from the Czech and foreign environment, in the "Touch 20th Century" project. The project is an interactive tool for students to access history and the complex historical processes of the 20th century using museum artifacts. Within the project, even multimedia games (such as presidents, Czechoslovak sports, big 20th century battles, and many others) are being prepared (<http://www.dvacatestoleti.eu/navstivte-virtualne/>).
- Created a news portal called "Museum 3000". Beginning of the "Museum 3000", launched in spring 2014. An important part of this project is the monitoring of the fate of the acquisition of artifacts by the National Museum.
- Electronic collections (collections of cultural heritage). This is a presentation portal that serves to search and view the museum's digitized artefacts. The start of the project was launched in 2010 in cooperation with other cultural institutions as well as with the Europeana portal. Today, about 50,000 collections are

registered. Monthly audience is around 4500 to 5100 Internet visitors. Within the framework of electronic collections, actual virtual exhibitions (such as Czech Modern Art, Outdoors, African Games and Toys, etc.), as well as archive ones (eg My Monarchy, Money, Time of Overseas Discoveries, Death Goddess and others) Percipient can view it as needed.

### **Muzeum Historii Żydów Polskich (Warszawa: Poland)**

The vision of the selected museum is to present as accurately as possible to the visitors of authentic collections through modern technologies. The Web Virtual Platform of the Museum consists of the following parts:

- From a virtual tour of the museum, especially the interior and exterior. Also a virtual film tour of the historical building of the museum is a significant component.
- Archival multimedia-virtual exhibitions. The most significant exposures are Jewish artists and rapporteurs (<http://judaica.jewishmuseum.org.pl>)
- From the central database of "Jewish cultural artifacts". It is an online database of valuable Jewish artifacts and documents that link to the history of Jewish culture not only from the Polish territory but from almost the whole world (eg USA, France, Germany, Israel, etc.). Currently, the listing contains almost 3000 collections that percipient can obtain in both digital and 2D and 3D formats.

This is an online form (virtual sztetl") of documenting Jewish history within Poland (<http://www.sztetl.org.pl/en/>) from the smallest settlements (the village environment) to the urban way of life. In the relevant sections, the percipient has a number of documents from archive to private, diverse maps, schedules, memoirs, audio recordings, etc. The aim of the project is to support and strengthen the Jewish community through historical sights. The project also benefits from a linguistic mutation in English, German and Hebrew.

On October 28, 2014, the Historical Museum of Polish Jews launched a virtual exhibition at its exhibition venues under the title "1000 Years of Jewish History". The exhibition was attended by 130 scientists from 20 countries of the world. The aim of the exhibition was to reconstruct Jewish history in the last 1000 years (Gruber, 2015) The exposition is chronological. It follows the development of the Jewish ethnic group based on defined milestones:

Period 960 - 1506. Virtual elements are rooted from the oldest religious history (Abraham and Jacob), supplemented by information from the 10th and 16th centuries. Predominantly anaglyphic images and simple holograms illustrating the most important rabbis, patrons, as well as characters reminiscent of life styles of contemporary Jewish ethnicity. This section represents the oldest religious traditions and customs of the Jews, as well as the acquisition of privileges and assets in the Polish regions.

The period from 1506 to 1648, the so-called Paradisus Iudaeorum. Virtually interesting are virtual books presenting the historical context of the Jewish community in the 16th and 17th centuries. Through an immeasurable map it is possible to observe the main European centers with the largest occurrence of the Jewish population. The animated version explains the gradual expulsion and punishment of Jews in European countries.

Period 1648 - 1795. This section is a sign of the interpretation of the Jewish mosque and the way of life especially in the 18th century. The most significant virtual element is the holographic reconstruction of the Jewish house as well as the large sacral buildings.

Period 1772 - 1918, the so-called Modern Jewish History. This area provides information on the consolidation of the Jews' position not only in Poland but also in the surrounding countries. The authors are reminded by the virtualization of significant Jewish scientists, especially in the field of biology and medicine.

Period 1918 - 1939, so-called Street. Using an interactive street, it is possible to track individual life fates in a time-out on selected examples. The most popular are the reconstruction of major Jewish events in "Enhanced Virtual Reality".

Period 1939 - 1945, so-called Holocaust. This section is dominated by multimedia elements, especially period sound and film records of life, various medical reports, casting, etc. There are no virtual ground plans for Polish guns and concentration camps. Virtualization brings valuable insights into the tribulations of Jewish ethnicity during World War II.

Period 1945 to the present. The last part reflects the post-war situation, demonstrations of the liberation of concentration camps from the US and Soviet point of view. Virtual reality is mainly translated into 3D movie shows interpreting the last decade of the history of Jewish ethnicity. It also applies 3D graphics of prominent Jewish artists and politicians. In this part, Jewish cinematography has also been featured in recent years.

### **Conclusion**

We can observe urban changes in culture in several spheres, but above all in the way of perception of art and the presentation of cultural heritage. It is not enough for today to present facts as it was in the past. It is necessary to process the overall context and to present the diverse art and life of previous generations. This attribute can handle the components of cyberculture.

A fundamental change in the impact of cyberculture can also be observed in museums, as evidenced by exhibition, educational and scientific activities. Cyberculture in the presentation and protection of cultural heritage can modify basic emotional elements that affect human organs to the extent that they create an impression of infinite space. A virtual world in which a visitor feels without limits and borders is created with the intent of direct participation in cybersquatting. Existing virtual exhibitions have created some standards for the presentation of artifacts and topics.

This state can be reflected from opening exposures to the cyberspace at the turn of the 20th and 21st centuries. It is the opening of free cyberspace that creates new types of presentation of cultural monuments and artifacts to the public. It is one of the globalization trends in museums and monuments. Using an accessible cyberspace (such as a virtual tour), each potential visitor gets an opportunity to look at the world's unique cultures. The European archaeological sites (eg Pompeii, Herculaneum, Lasaux Cave, etc.) and American natural curiosities (eg Grand Canyon, Niagara Falls and others) will get the most clicks. Supporters of cyberculture as a positive side also welcome the application labeled "Live", t. j. direct broadcasting from relevant sites. This trend of a lively, up-to-date environment has been applied in the last few years to the largest cities in the world, tourist sites. Similarly, most of the world's museums and galleries have similar workmanship. It is important to note that negative attitudes prevailed in making the cultural heritage available to the Conservative group in cyberspace.

Nowadays, this phenomenon is also complemented by a new technological element, j. 3D reconstruction of ideal forms and shapes of existing cultural monuments. This type is mainly used by touristically significant regions (eg 3D Antique Rome, 3D Louvre, etc.) using portable audioguide.

The phenomenon of cyberculture represents unusual components of the presentation and its possibilities are almost unlimited. For this reason, broader application would also be needed in humanities that are lagging behind technical science. It is only for the scientists of the humanities sector in what way their future will develop and what position it will build in the university environment.

The paper deals with the essence of cyberculture in the connection of direct museum examples between theoretical and practical level. The study shows a partial comparison with existing examples from world museums with relatively high marketing promotion compared to cultural institutions within the Visegrad Four countries. The article presents views of foreign experts from the position of museologist or historian. Data from the domestic environment is provided mainly by the analysis of the museological environment, which carries elements of education and promotion of local and world history from selected museums or from the university environment. Some cross-sectional works from the position of geotourism (eg by P. Hronček or P. Rybar and others) are absent due to the preparation of a more detailed analysis of interdisciplinarity between several scientific disciplines due to the nature of the prepared international study planned for publishing activities in the second semester 2020, which is also part of the chapter in foreign scientific monograph.

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