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# DIGITIZATION OF THE MUSEUM MATERIALS OF THE "MUSEUM HERZEGOVINA TREBINJE"

**Abstract**. The paper presents the implementation and results of the project "Digitization of museum material of the Museum of Herzegovina Trebinje", started in 2019, with the aim to show all the possibilities that digitization provides and relates to the manipulation, use, distribution, and especially storage of material for the future. Given the large amount of material that makes up the cultural, historical and scientific heritage, and kept in the Museum, it was necessary to approach the process of protection of the original, and with the help of digital photocopies to improve the availability of material. Digitized objects are mostly three-dimensional objects for the digitization of which a 3D scanner with accompanying equipment and software was used. Based on the results of the research, it's assumed that access to and use of the Museum's collection will increase, valuable specimens will be protected and easier use of frequently used material will be enabled.

**Keywords**. digitization, 3D scanning, protection, museum material, cultural heritage of Eastern Herzegovina

## 1. Introduction

Even in ancient times, there was a human need to leave a record - let's just remember the ancient Egyptians whose images of animals and hieroglyphs still occupy the curiosity of scientists. As human civilization has progressed, so have the records that people make changed shape, to today come to something called digitization, that is, the conversion of objects such as text, images, or sound into binary code. This new field and modern technology has unexpectedly found great application in the field of culture - the digitization of museum material is a trend of today that changes the very way in which modern museums are defined. The importance of digitization in the field of museums and other institutions for the protection of cultural heritage can be seen through the increase in the number of scientific publications in this field in recent years. The paper [15] presents an analysis of the number of papers published in publications indexed in the Web of Science (WoS), which shows a sharp jump in the number of published papers since 2014 and thus indicates the relevance of this area. Digitization can be defined as a complete process that focuses on: "development of complete digital catalogs of cultural heritage, translation from analog to digital form of cultural heritage objects and appropriate documentation on cultural heritage; development of tools and instruments, including legal ones; long-term preservation of digitized cultural heritage; development and connection of program and physical network of information systems on digitized cultural heritage; providing permanent and reliable access to digitized material; multimedia presentation of digitized cultural heritage" [26].

The paper [27] especially emphasizes the need for a systematic approach and standardization in the digitization process, including the standard for metadata. The authors presented a metadata scheme, which is compatible with the most well-known international schemes and standards, while enabling integration with local cultural institutions. Its application in the process of cultural heritage documentation management is proposed in order to ensure the protection, presentation and availability of cultural goods over a longer period of time. Two examples of a case study on the management and protection of the use of cultural heritage documentation are presented, on which national policies and guidelines for digitization have been applied, as well as a proposed metadata scheme.

Under the digitization of museum material, we consider a series of activities from the selection of the object to be digitized, to the final use of materials in digital form. The aspiration of the museum is to set up its collections at just one click from the user, that is, to make them available via the Internet. In addition, the benefits of digitization are manifold - once an object is digitized, it can be further analyzed and reconstructed in one of today's widely available geometric software without physical use (hence, without possible damage) of the original and often very valuable object.

The digitization of museum material, which includes exhibits, works of art and artifacts, often of inestimable value, began somewhat later due to the technical complexity of the work, but also due to the sensitivity of the digitization process (photography, 3D scanning, etc.) of such rarities. Today, the digitization of museum material is recognized as an important activity in the field of cultural and national identity of a country, and accordingly, many national and European projects are being implemented. One of the projects in this area that was realized with the financial support of the EU is the project "Collection, documentation and digitization of the material of the Museum of Criminology of the National and Kapodistrian University of Athens" [18]. The goal of the mentioned project was to extract information and knowledge from museum collections for the needs of education and science. The project "Digitization of the museum material of the Museum of Herzegovina Trebinje" is a national project co-financed by the Ministry of Scientific and Technological Development, Higher Education and Information Society of RS, which aims to increase the availability and visibility of digital collections at the Museum.

Digitization, preservation and presentation of cultural heritage resources includes activities of an interdisciplinary nature that use a wide range of knowledge, not only in the field of culture and application of modern information and communication technologies, but also advanced technological concepts that include the application of Internet of intelligent devices (IoT) [16], processing of large amounts of data (BigData), artificial intelligence [6], and virtual and augmented reality [29]. To learn about how the Internet and computer science affect the culture and work of museums in general, we recommend the monograph [15], while the anthology [2] explores the philosophical, historical, social, artistic, biological, geographical and linguistic relationships - created within cultural complexes the ubiquity of computers in this area. In the paper [39], the author deals with the digitization of cultural material from the aspect of efficient use of all possibilities that new technologies provide in the field of culture. A closer acquaintance with the choice of appropriate digitization methods is described in [32]. Research conducted as part of the master's thesis [10] also deals with the analysis of characteristics and selection of appropriate digitization methods on the example of the Museum of World Culture in Gothenburg. In [28], the authors present the process of rehabilitation and cataloging of the zoological collection in the National Museum of Georgia, which was realized as a pilot project with the aim of systematizing data on

objects and collections, and creating and promoting new knowledge in cooperation with academic institutions and museums.

Although the countries in our environment are mostly just pioneers in this field, we highlight the experiences of the Republic of Serbia in the digitization of museum material and cultural heritage. These are projects implemented by the Mathematical Institute of the Serbian Academy of Sciences and Arts, which have digitized several dozen archeological sites, museums, monasteries and other objects of cultural heritage of certain regional parts of the Republic of Serbia. A web presentation of Cultural Monuments of MI SANU [22,31,33] has been created, which contains records of about 1350 immovable cultural assets. The Cultural Heritage Search Engine is a national project in the field of digitization, which has enabled all movable and immovable cultural property, as well as a map of monuments and cultural institutions in Serbia, to be presented on a single portal - www.kultura.rs. [30]. Another example of activities in the field of digitization is the digitization of the museum collections of the Museum of the City of Belgrade presented in the research [21, 23].

More recently, mobile applications have been used as guides for museums [35, 36]. The mobile electronic guide acts as an interactive presentation, where visitors play an active role due to the possibility of navigating through the guide, according to their interests.
In the paper [35], a possible scenario of application of information technologies in the presentation of archeological parks is proposed. The scenario is based primarily on a purpose-designed electronic guide and specific projection systems. In the proposed scenario, the data of interest to the visitor are presented in multimedia form, including: text, photographs, drawings, audio and video recordings and computer-generated 3D objects, which is especially important for the needs of reconstruction. The designed electronic guide allows the visitor to be independent of the guide and allows him to explore the place independently. In this way, the visitor has an active role in creating exhibition content depending on their personal interests, prior knowledge and available time.

The Universal Guide to Mobile Cultural Heritage, presented in [36], is based on Android technology that can help visitors to various exhibitions to search for multimedia information from mobile devices. The system consists of several independent software modules that can be combined in different ways to create different mobile applications, to present cultural heritage. The system was verified on the example of the application for the Mediana Archaeological Park in Nis, Serbia.

Certain activities in the field of digitization of museum material have been realized in Bosnia and Herzegovina. The paper [21] presents the digitization of material available in paper form, more precisely the digitization of the Gazette of the National Museum of BiH, as one of the oldest scientific publications in BiH. The paper also presents a model for digital presentation and preservation of the Herald. Digitization of Serbian heritage in the village of Osredak, which belongs to the municipality of Cazin in Bosnia and Herzegovina, is described in the paper [34]. The digitization included the Church of St. Peter and St. Paul, the 19th-century Tetraevangelion, and tombstones in the Orthodox cemetery.

Activities on the digitization of library, archive and museum materials were also recorded in Montenegro. In [2], the authors present a multimedia electronic database that contains a lot of data in the field of maritime affairs, as a kind and comprehensive electronic catalog that covers a very wide period of time. The paper [8] presents the pilot project of digitization of the Museum of the Bar district, within which the analysis of possibilities and selection of an adequate software solution for the management of digital resources of the museum was performed. Through the mentioned pilot project,

the processing and cataloging of the digital material of the Museum was performed using the selected web-based software.

The paper [34] presents the results of the national pilot project of digitization of archeological material in the Republic of Croatia, which aims to explore the possibilities for 3D digitization and visualization of selected archeological material in order to increase access to museum collections for the general population. With the aim of preserving and making available a part of Croatian sound history, the National and University Library launched a project of digitization of historical sound recordings presented in [20].

Digitization projects in Slovenia: digital library of Slovenia - digitization of national cultural heritage, Kamra - digitization of regional cultural heritage and SIstory - digitization of Slovenian historical literature and historical sources as part of Slovenian cultural heritage are presented in [38]. The paper [7] presents a model of access to historical and contemporary newspapers in the Collection of Serial Publications of the National and University Library in Slovenia (NUL).

Several characteristic attributes derived from the data on the position of the lower part of the dancer's body used for mathematical modeling of dances are presented in [19]. Studying the value of these attributes for a certain period facilitates the process or recognition of Macedonian dances. Traditional Macedonian folk songs play an important role in Macedonia's cultural heritage, but are not as popular among the younger generations as other modern music. In order for this music to get closer to a younger audience, it needs to be presented in a modern way. Music videos make a significant contribution to the popularization of any song, so they can also contribute to the popularization of traditional songs. The paper [12] presents the process of creating videos and using the produced videos for the audience, with the aim of bringing traditional Macedonian folk songs, which play an important role in the Macedonian cultural heritage, closer to the younger audience.

This paper presents the implementation and preliminary results of the project "Digitization of museum material of the Museum of Herzegovina Trebinje", started in 2019, which seeks to encourage the creation of new digital content to protect cultural heritage, promote a systematic and uniform approach to digitization in the Museum of Herzegovina Trebinje, and increase the online availability and visibility of digital collections of recognizable and nationally relevant content.

## 2. Digitization of cultural heritage in the Republic of Srpska

This research was originally related to understanding the state of digitization of cultural heritage in RS, given the fact that the wealth of cultural, historical and scientific heritage is stored in numerous RS's institutions in culture and science. These are valuable collections that speak of tradition, uniqueness, authenticity, and to a greater extent this material is not available to the general public. Since the 1990s, in Republic of Srpska, the use of new information technologies has been increasingly accepted, as well as the need for its implementation in all forms of social action, but we cannot talk about the implementation of a certain digitization project, but about sporadic, partial works in that segment. Throughout the world, museums deal with the digitization of cultural heritage through national programs supported by their respective Ministries and organizations. This is an important segment of the work of every museum, because in addition to easier availability and search of relevant information in databases, cultural heritage is protected in such a way that it does not have to be constantly displayed and moved, as explained in [14].

In Bosnia and Herzegovina and Republic of Srpska, digitization has started without a developed strategy, ie plan and program at the state level. Some museums, including the Museum of Herzegovina in Trebinje, have partially started some kind of digitization, which is reflected in the production of digital records of objects with digital photography and the register of inventory books in digital form.

The e-RS program (visible on the e-Srpska portal for public administration, e-culture) is based on the concepts and experiences of the European Community in the implementation of the eEurope Action Plan, and like it envisages the development of electronic content and services in public activities in the field of culture. Among the regulations that provide the legal framework for the establishment of the information society and public information services or are more important for the informatization of cultural activities and services, the following can be singled out: Law on Archival Activities ("Official Gazette of Republic of Srpska" No. 119/08), Rulebook documentary material in digital form and special conditions for keeping specific documentary material ("Official Gazette of the Republic of Srpska" No. 64/12), Rulebook on conditions that must be met by hardware and software equipment ("Official Gazette of the Republic of Srpska" No. 120/12), Law on Museum Activity (Official Gazette of Republic of Srpska 89/08, 57/12, and 18/17), Law on Library Information Activity ("Official Gazette of the Republic of Srpska, No. 44/16), Law on Cultural Heritage of the Republic of Srpska" ("Official Gazette of the Republic of Srpska", No. 11/95, 103/08) Law on Electronic Signature (Official Gazette of the Republic of Srpska 106/15 ), Law on Freedom of Access to Information (Official Gazette of Republic of Srpska 20/01).

Recalling how computers serve to do much more than just transfer material from one medium to another, (Veltman, 2001) [37], points to the possibility and need to creatively upgrade reproductions created by digitization through interdisciplinary and multidisciplinary projects exploring a particular topic, author, historical period, etc. Veltman explains the differences in the demands of digital content users in the fields of science and culture. Their inclusion in scientific research and learning enables the placement of heritage elements in the virtual context of space and time, comparison, creation of simulations and reconstructions and, ultimately, the construction of new knowledge.

### 3. Museum of the Herzegovina Trebinje

The museum is located in the building of the former Austro-Hungarian barracks, built in 1904/1905. years (Figure 1). There are 5 departments in the museum: archeological, historical, artistic, ethnological and natural history [11].

Figure 1. Museum of the Herzegovina Trebinje

**Archeological Department**. The archeological depot of the Museum of Herzegovina Trebinje contains inventoried 357 items (141 items from the prehistoric period, 158 items from the classical period and 58 items from the Middle Ages) with accompanying study material collected during the museum's archeological research and part of the uninventoried material.

**History Department**. The exhibition shows the entire development of the Trebinje region from its first mention in historical sources to the beginning of the Second World War, as well as Eastern Herzegovina; divided into five sections divided by periods. 67 exhibits are on display at the permanent exhibition.

**Art Department**. The art collection contains more than 1500 art paintings and sculptures. The permanent exhibitions include: the legacy of Jovan Dučić, the memorial gallery of Atanasije Popović, the gift collection of Milena Šotra, the gift collection of Radovan Ždralo " The world of stone". Legacies: "Dear Trebinje - collection of donated works of art", legacy of Milorad Ćorović, legacy of Mirko Kujačić, legacy of Branko Šotra, legacy of Ksenija and Vladimir Gaćinović. objects, which, for the most part, represent works by local artists, works from guest exhibitions.

**The ethnology department** has 1,500 exhibits, which came to the Museum by purchase, gift and collection in field research. The depot of the Museum of Herzegovina keeps 850 ethnological exhibits, which are divided into: traditional costume (rural, urban), agricultural tools, livestock items, handicraft tools, jewelry, textiles and tools for textile production.

**Natural Sciences Department**. Mostly prepared animal exhibits were collected, but also minerals and fossils. After reviewing the found material, the experts concluded that two collections can be distinguished: geological-paleontological and zoological.

**The library**. The Library of the Museum of the Herzegovina Trebinje is a professional library whose work is harmonized with the work and organization of the Museum. In its holdings, it has 9159 inventoried and 3000 uninventoried titles of publications related to all areas in which the Museum deals: archeology, ethnology, history, art history, natural sciences, numismatics and museology.

## 4. Objective and methodology of the research

The process of digitization of cultural heritage is based on certain norms and standardized procedures. It is the procedures that are often developed based on the

experience of individual projects, where appropriate guidelines and specifications are developed. Over time, the number of standards adopted by standardization bodies has increased [24]. Given that there are no more formally accepted and recommended norms and procedures for conducting digitization procedures in the Republic of Srpska, the "Museum of Herzegovina Trebinje" for the digitization project should have defined appropriate solutions for the selection and preparation of materials for digitization. There are a large number of details that affect the choice of material, such as: the goals of the institution, copyright over the material, the type and condition of the artifacts that are digitized, as well as the users for whom the project is intended, etc [25].

Taking into account the amount of material that makes up the Serbian cultural, historical and scientific heritage, which is kept in the "Museum of the Herzegovina Trebinje", the digitization process was based on the selection of a representative regional digital collection. The digitization of the Museum's material, which represents valuable and unique specimens of the archeological, ethnological, collection of Jovan Dučić, art and natural history collections, has begun. The basic purpose in this way is to increase access to and use of the Museum's collection, to protect valuable specimens and to enable easier use of frequently used material. The criteria for selecting material for digitization are aligned with these objectives. The main goal of the digitization program is to display important content in digital format. Other goals of digitization are: protection of originals, improving the availability of materials, creating new products and services, completing the fund and cooperation, transforming materials from analog to digital form.

The methods used in the digitization process are based on laser triangulation and laser beam, and 2D scanning methods. Triangulation is a method that determines the position based on the location and angles between the light source and the photosensitive sensor. As a light source, as explained in [3], a laser or a projector of structured light is used, while at least one camera is used as a detector of projected points or lines. The principle of triangulation is as follows:

- the high energy light source is focused on the desired surface, previously projected at a certain angle;
- the photosensitive sensor collects the reflection from the surface, and then the position of the point on the surface relative to the reference plane is calculated by geometric triangulation based on known distances and angles.

For the purposes of this work, we used triangulation with 2 cameras. A device of this type also uses a laser or a structured light projector as a light source. Detection devices are two cameras that are located on opposite sides in relation to the light source [4].

The scanning method is also an important feature of the triangulation system and is a matter of choice. There are several methods, in which the basic difference is in the relationship between the movement of the object and the system. For the purposes of this research, the method with a stationary object and a mobile scanner was used.

After identifying, analyzing and selecting the material for digitization, the preparation of the material for recording began. The basic idea is to bring the exhibits to a state that is suitable for processing by a digitizing device. The next phase consisted of preparing and formatting metadata because some data is needed in the recording process and others to design and use the digital collection. Once the metadata is determined, the recording process is approached, ie the process of technical transfer to digital form and storage of the material. After storing the recorded material, the post-processing phase followed, ie obtaining digital objects (represents any set of data that is accessed and handled as a discrete object). We used Geomagic 12 software to process digital shapes

obtained by 3D scanning ("cleaning" unnecessary "spirit" surfaces, assembling the model into a single-consistent object, as well as "ironing" peaks, etc.). This phase consists of two segments: storing material in external disks as a permanent document (formation of a digital copy, ie digital collection) and transferring digital forms to a web form. Then, the procedure of checking and storing the digitized content follows, which implies confirmation that the individual objects in the collection are correctly formatted, as well as the collection as a whole. The second segment relates to the storage of a digital collection in a secure, accessible and sustainable information system. The last phase is the introduction of an electronic service that represents the provision of basic information about the resource so that the user can electronically access information about collections, its contents, possibilities of use, etc., and the presentation of collections and publication of selected parts of content.

## 5. Results and discussion

Institutions in charge of cultural and historical heritage, such as libraries, archives and museums, are the bearers of most cultural and scientific content. These are mostly non-profit organizations, with clearly defined goals that explicitly indicate that access to collections should be provided in order to simplify knowledge creation [1]. An important driver of these organizations is undoubtedly the adoption of new technologies that lead to increased and improved access to collections. Digitization and publication of collections online provide an opportunity to access content around the world, and thus unleash the untapped potential of knowledge. Understanding how users become familiar with digitized collections will allow those who create digital records to best understand what it is that should be available, and what the information is.

Digitized objects are mostly three-dimensional objects for the digitization of which a 3D scanner with accompanying equipment and software was used. The remaining amount of items, ie. artifacts that are digitized are "objects" that are mostly made of paper, canvas, parchment or similar materials and their digitization required the use of a flat-bed scanner or equipment that differs in its technical characteristics from the equipment used to scan three-dimensional shapes. ie. items.

Due to the given characteristics of the equipment (3D scanner Zscan 700) used in the process of digitization of cultural heritage of the Museum of Herzegovina - Trebinje, it is not possible to precisely define the time frame required and sufficient to transfer one of the parts of the collection into digital form. By this is primarily meant the configuration of the scanner. It is a mobile 3D scanner with 2 infrared cameras and a laser beam that is very sensitive to the conditions in the room where the scan is performed (light, arrangement of reflective surfaces, etc).

After completing the entire collection of digitized items, the post-processing phase in various software was approached in order to obtain quality results that will be optimized for storage and display on various media. Geomagic 12 software was used to post-process the raw digitized files. One of the selected media for the display of digitized objects will be the website of the "Museum of the Herzegovina Trebinje" where the digitized objects will be arranged according to the collections to which they belong, and within these collections will be enabled their virtual 360° view with all details about each object individually. In the pictures below we can see the process of digitization of selected exhibits from the regional collection.

Figure 2. Digitized museum exhibit (fibula)



Figure 3. Digitized museum exhibit (traditional leather footwear - opanak)
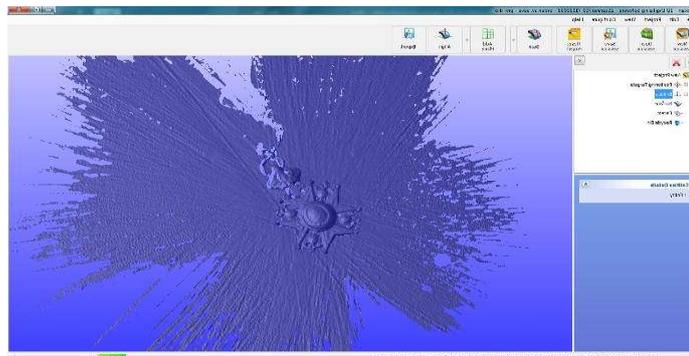


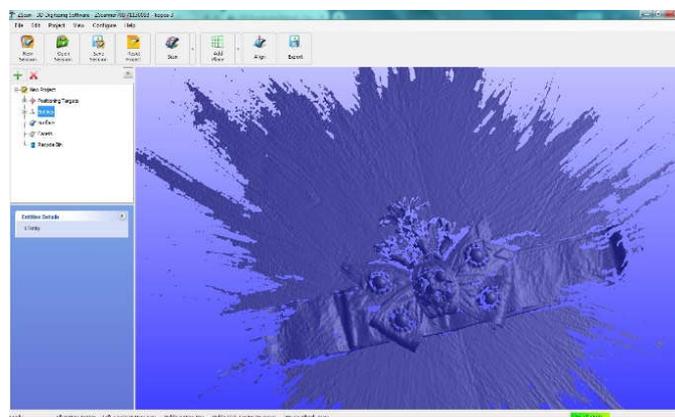Figure 4. Digitized museum exhibit (Order of Saint Sava)



Figure 5.  Digitized museum exhibit (metal belt buckle - pafta)

## 6. Conclusion

The realized research shows that in Bosnia and Herzegovina and Republic of Srpska, digitization started without a developed strategy, ie plan and program at the state level. Some museums, including the Museum of Herzegovina Trebinje, have partially started some kind of digitization, which is reflected in the production of digital records of objects with digital photography and the register of inventory books in digital form.

This research is only an initial step in examining the state of practice in museums in Republic of Srpska and can serve as a basis for more detailed research. When it comes to contributions, this research is one of the pioneering works in studying the importance and effectiveness of digitization of museum material in the area of Eastern Herzegovina, ie Republic of Srpska.

In addition, in practical terms, the research results provide some guidelines for developing a strategy and plan for digitization of material, documenting selection criteria and reasons, as well as for developing a list of priorities for digitization that will ensure better long-term planning and coordination of digitization at the national level. By offering its content in this way, the museum can count on: increasing access; improve services to a growing group of users by providing better access to information sources held by the institution for the purposes of education and lifelong learning; reduce the handling and use of sensitive and frequently used source material, and the creation of backup or backup copies of compromised material such as fragile books and documents; provide opportunities for the institution to develop its technical infrastructure and human resources; develop common resources, establish partnerships with other institutions in order to create virtual collections and increase global access. Incorporating cultural heritage digitization projects into sustainability, especially in tourism and entrepreneurship, and the use of digital content in education, further research is needed to define key strategic issues and goals to be achieved in the future with the funds available. The digitization of museum material opens the door to the expansion of knowledge sharing. Online collections should not only encourage people to virtually visit the website, but also attract people to come to the institution. So, it is necessary to carefully choose those contents that will be published online from individual collections.                                                    Digital cultural heritage is becoming an important segment of society. Museums that use computer and digital technologies seek not only to connect with the world, but also to offer their users the dissemination of knowledge about different cultures, peoples and their artificial and natural environment.

## References

[1] Bakhshi, H., Throsby D., New Technologies in Cultural Institutions: Theory, Evidence and Policy Implications. *International Journal of Cultural Policy*, 18:2(2012), 205–222. doi: 10.1080/10286632.2011.587878.
[2] Bauk, S., Danilović, R., Kovač, N., & Pejović, S. The Central Electronic Maritime Catalogue–A Segment Of Montenegrin Cultural Inheritance Digitization. *Review of the National Center for Digitization*, *14(2009)*, 38–42.
[3] Boehler, W., Heinz, G., Marbs, A. The potential of non-contact close range laser scanners for cultural heritage recording, XVIII. *CIPA Symposium*, Potsdam, Germany, Proceedings, 2001
[4] Boehler, W. Marbs, A., 3D Scanning Instruments. *Proceedings of the CIPA WG 6 International Workshop,* Corfu, 1-2 September 2002, 9–12.

[5] Cameron F., Kenderdine S., Theorizing digital cultural heritage: a critical discourse. Emerald Group Publishing Limited, 2008

[6] Ćosović, M., & Janković, R. CNN Classification of the Cultural Heritage Images. In *2020 19th International Symposium INFOTEH-JAHORINA (INFOTEH)* (pp. 1-6). IEEE, 2020

[7] Eiselt, I., Newspapers in the National and University Library in Slovenia – Access Model. *Review of the National Center for Digitization*, 26(2015), 77–85.

[8] Filipović, V., Zagarčanin, M., Tošić, D., & Stanišić, S. Digitization in the Bar County Museum–Pilot Project. *Review of the National Center for Digitization*, *23(2013)*, 57–66.

[9] Golubović, D. Digitization of BIH National Museum's Glasnik (Herald), Its Presentation and Digital Preservation. *Review of the National Center for Digitization*, 15(2009), 73–76.

[10] Henriksson, A. Digitalizing World Culture. Modes of Digitization within the Museum of World Culture, *Master theses,* Göteborgs universitet, Sweden, 2008

[11] Internal documentation of the "Museum of the Herzegovina Trebinje".

[12] Jovanov M., Mihova M., Stankov E., Micev M., Promotion of Macedonian Traditional Folk Songs through Modern Music Videos, *Review of the National Center for Digitization*, 24(2014), p. 101–107.

[13] Jones-Garmil K. The Wired Museum: Emerging Technology and Changing Paradigms, Washington, DC: *American Association of Museums*, 1997

[14] Kotrošan D., Bečević-Šarenkapa A. Stanje, problemi i pravci u digitalizaciji muzejske građe Zemaljskog muzeja Bosne i Hercegovine, 2010, http://elibrary.matf.bg.ac.rs/handle/123456789/2031?locale-attribute=de.

[15] Liao, H. T., Zhao, M., & Sun, S. P. A Literature Review of Museum and Heritage on Digitization, Digitization, and Digital Transformation. In *6th International Conference on Humanities and Social Science Research (ICHSSR 2020)*, 2020, 474–477 Atlantis Press

[16] Maksimović, M., & Ćosović, M. (2019). Preservation of Cultural Heritage Sites using IoT. In *2019 18th International Symposium INFOTEH-JAHORINA (INFOTEH)*, 1–4. IEEE.

[17] Moljković M., Malbašić D. . Digitization of Serbian Heritage in Village Osredak in Bosnia and Hercegovina, *Review of the National Center for Digitization*, 28(2016), 32–42.

[18] Maravelias, C., Sakki, Z., Loutsidis, G., Stefanidou, M., Athanaselis, S., & Spiliopoulou, C. (2011). Documentation and Digitization of the Museum of Criminology of the University of Athens.

[19] Martinovikj, D., Mihova, M., Jovanov, M. Characteristic attributes for recognition of traditional macedonian folk dances, *Review of the National Center for Digitization*, 25(2014), p. 81-90.

[20] Mihalić, T. Safeguarding the Musical Heritage. Sounds of the Past: a Digitization Project of the National and University Library in Zagreb, *Review of the National Center for Digitization*, 26(2015), p. 37-46.

[21] Mijajlović, M., Novaković, Ž. Digitalizacija muzejskih zbirki Muzeja grada Beograda, *Pregled Nacionalnog centra za digitalizaciju*, 1(2004), pp. 43-47.

[22] Muzej grada Beograda - Beograd na starim kartama, gravirama i fotografijama, http://www.mi.sanu.ac.rs/muzej.beograd/

[23] Muzej Grada Beograda, http://www.mgb.org.rs/

[24] Nacionalni program digitalizacije arhivske, knjižične i muzejske građe. (2006). Ministarstvo kulture republike Hrvatske, Zagreb, available at: http://www.kultura.hr/content/download/590/7857/file/nacprogramdigit.pdf [2020-07-23]

[25] Nacionalni projekt „Hrvatska kulturna baština" Digitalizacija arhivske, knjižnične i muzejske građe, Smjernice za odabir građe za digitalizaciju, ZG, (2007). available at: https://bib.irb.hr/datoteka/590089.smjernice_odabir.pdf [2020-07-23]

[26] Ognjanović Z., Marinković B*., Prikaz doprinosa Matematičkog instituta SANU i Matematičkog fakulteta u Beogradu digitalizaciji kulturne i naučne baštine od 1990-tih do danas*, (the paper has not been published yet).

[27] Ognjanović, Z., Marinković B., Šegan-Radonjić M., Masliković D. Cultural heritage digitization in Serbia: Standards, policies, and case studies, *Sustainability*, 11:14(2019); 3788.

[28] Pkhakadze, V., Tsintsadze, V., Tsotselia, M., Snegovaya, N., Giorgobiani, N., Intskirveli, M., ... & Svanadze, S. , Restoration, archiving, and digitization of the Museum collections (The

case of Zoological Collections, Georgian National Museum). *Ukrainian Journal of Ecology*, *9*:3(2019)., 138–141.

[29] Podzharaya, N., & Sochenkova, A., The Concept of Smart Tourism Based on Museum Digitization in Montenegro. In *2020 9th Mediterranean Conference on Embedded Computing (MECO)*, 2020, 1–4. IEEE.

[30] Pretraživač kulturnog nasleđa Srbije, available at:  https://www.kultura.rs/.html

[31] Serbia-Forum: Projekat digitalizacije i očuvanja srpske kulturne baštine, http://www.serbia-forum.org/

[32] Solter, A., & Gajski, D., Project "Towards the Virtual Museum"–Exploring Tools and Methods for 3D Digitization and Visualization. *Opvscvla archaeologica*, *39*:1(2018)., 117–124.

[33] Spomenici kulture u Srbiji, http://spomenicikulture.mi.sanu.ac.rs/

[34] Stanković B., Radošević N., Selecting a Right Method of Digitization, *Review of the National Center for Digitization*, 11(2007), 21–25.

[35] Stanković, R., Tatić, D., A Scenario for Application of Information Technologies in Representation of Archaeological Parks, *Review of the National Center for Digitization*, (36) (2020),  1–12.

[36] Tatić, D., Stošić, M., Manoilov, Đ., Stanković, R., Universal Mobile Cultural Heritage Guide Based on Android Technology, *Review of the National Center for Digitization*, 27 (2015)., 43–51.

[37] Veltman, K. H., Syntactic and Semantic Interoperability: New Approaches to Knowledge and the Semantic Web, *The New Review of Information Networking*, 7(2001), 159–183.

[38] Vodopivec, N., Lazarević, Ž. SIstory: Digitalizacija istorijskih sadržaja, *Review of the National Center for Digitization*, 11(2007), 31–36.

[39] Vukićević V. Digitalizacija kulturnog nasleđa u funkciji ostvarivanja ciljeva kulturne politike, *Kultura: časopis za teoriju i sociologiju kulture i kulturnu politiku*, 130(2011), 165–182.

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