**Hanna Michniewicz-Ankiersztajn[1,a], Dorota Nowicka[1]**

[1] Faculty of Geographical Sciences, Kazimierz Wielki University in Bydgoszcz
ORCID: [a]https://orcid.org/0000-0003-1285-0101
Corresponding author: Hanna Michniewicz-Ankiersztajn, email: hanka@ukw.edu.pl

# The role of tourism assets in virtual space – ways of implementation and functions performed

**Abstract:** Owing to the development of modern technologies and digital tools, contemporary cyberspace is becoming a kind of 'warehouse' of objects, places, and spaces implemented in it from the real world. Owing to the ever-increasing number of digitally mapped features of objects, places, and spaces, users navigating in virtual space have the opportunity to explore existing or digitally reconstructed tourist attractions. The present study attempts to define the role and function of cyber tourist assets in a virtual space. The study also presents methods and tools for their implementation in cyberspace. Nowadays, tourism assets in cyberspace are not only identified with virtual tourism or education. Digitally reconstructed tourist assets are increasingly used for entertainment purposes (computer games and films). They are a tool for content marketing and promotion in the broadest sense of the term and also provide the background for interpersonal interactions.

**Keywords:** tourism assets, functions of tourism assets, virtual space

## 1. Introduction

The rapid development of digital tools and technologies allows for better representation of the reality around us in a virtual space. Cyberspace is perceived and defined differently. William Gibson, the creator of the first definition of cyberspace, defines it as something unreachable by the human eye, which can be put as a kind of hallucination in which most people participate, every day, in everyday activities (Gibson, 1984, p. 44). According to Wasilewski (2013, p. 231), it is "a kind of parallel environment that is a new dimension for human activities". It is an abstract space devoid of physical dimensions (Retkiewicz, 2014), created by the combination of computer networks and information systems (Marczyk, 2018). Asanowicz added to this definition: an interaction between machine and human, indicating that without a 'machine', that is, electronic equipment, we will not establish communication with cyberspace (Asanowicz, 2012).

A key feature of cyberspace is vastness and territoriality. It is a space without borders (Zeler and Żydek-Bednarczuk, 2009; Marczyk, 2018), extending globally and encompassing the entire global virtual system. Regardless of the geographical location, all users with access to the network can interact with and explore this space. Cyberspace is also an area where people can create, communicate, exchange information, transact, conduct research, and undertake many other activities (Retkiewicz, 2002). This gives people the freedom to express themselves, establish relationships, share, and use knowledge, and provides opportunities for collaboration.

The indispensable elements of cyberspace are browsers, programmes, and applications (Siwak, 2016; Mazurkiewicz, 2016), which, through data collection and ICT

processes (data communication processes), create a logically separate virtual space that does not exist physically (Wasilewski, 2013, p. virtual reality (VR) and augmented reality (AR) (Laskowski et al., 2013).

As users of cyberspace explore the virtual universe, they perceive more and more similarities between the reality around them and the world of games and visualisation. Cyberspace is also becoming a permanent 'warehouse' of objects, places, and spaces implemented in it from the real world.

The aim of this study is to attempt to classify virtual tourism assets in terms of the functions they perform in cyberspace and to indicate the cyberspace in which they are present. Considering advances in digital tools, the diversity of virtual space, and the role that

229). This space can be explored by the user through, among other things, websites, mobile apps,
cyberspace plays in the lives of modern users, it was assumed that tourism assets in cyberspace increasingly perform functions other than those of virtual tourism sensu stricte.

In this study, the authors attempt to answer the following questions: Is the implementation of tourism assets into cyberspace related only to the development of virtual tourism? Does the selection of tools, because of which the process of transformation of real tourist places and objects into their virtual form takes place, determine the functions performed by natural and cultural tourist 'cyberassets'?

## 2. Methods and sources of data

Considering the progress in digital tools, the diversity of virtual space, and the role that cyberspace plays in the lives of modern users, it has been assumed that tourist attractions in cyberspace increasingly serve functions other than those of virtual tourism in the strict sense.

Using the method of secondary data analysis (desk research) and the increasingly popular Internet analysis tools known as online research methods (ORMs) (Webb, 2017), the authors collected information on the presence of tourist attractions in cyberspace (including methods of their implementation, availability in virtual space, and functions performed). This study used both scientific publications and websites of companies and institutions

dealing with the functioning of virtual spaces. This choice of method is dictated by the frequent use of qualitative methods in tourism research due to the limitations of the positivist paradigm. Moreover, today's digital tools have become valuable sources of research data (Handbook of Research Methods).

Direct observation was also used to examine the occurrence of tourist attractions in virtual spaces. To this end, we explored the universe of computer games and selected films created using CGI. The games and films selected for the study were characterised by the use of specific locations known from reality (e.g. large cities and geographical regions).

## 3. Ways of implementing tourist assets into virtual space and their place in cyberspace

In this article, cyber tourist assets can be understood as a faithful or close-to-the-original reproduction in a virtual space (with the help of digital and online tools) of landscapes, places, objects, and events perceived in reality as a tourist asset (natural or cultural).

The most popular methods of reconstructing tourist assets in cyberspace are digitisation (3D scanning of objects) (Art Graphique et Patrimoine www.rtgp.fr), creation of objects (their 'reconstruction') thanks to computer programs and CGI technology, and digital photography. Digital

tools are also used in the reconstruction of objects in the real world (using augmented reality and assisted reality technologies). Owing to these procedures, natural and cultural assets implemented in cyberspace are available to users via websites, mobile device applications, computer games, and streaming platforms (Fig.1). It should be noted that with the progress in the development of digital tools, the representations of tourist assets in virtual spaces are becoming increasingly accurate, thus blurring the distinction between the original and virtual copies of objects and places.

The most common tools used in the process of converting real (analogue) objects into digital forms are high-resolution 3D scanners. The data collected during the scanning (digitalisation) process, in the form of point clouds and photographs of the highest quality, are archived on external digital media (Klak, 2011, p. 55). Laser scanning is a technology used to collect precise measurement data. The accuracy was 1 mm. The laser beam, which is sent towards the monument, poses no threat to its surface. The scanner collects the coordinates of millions of points within a scan time of a few minutes. These spatial data are enriched in the next step with images taken by a high-resolution camera built into the scanner head.
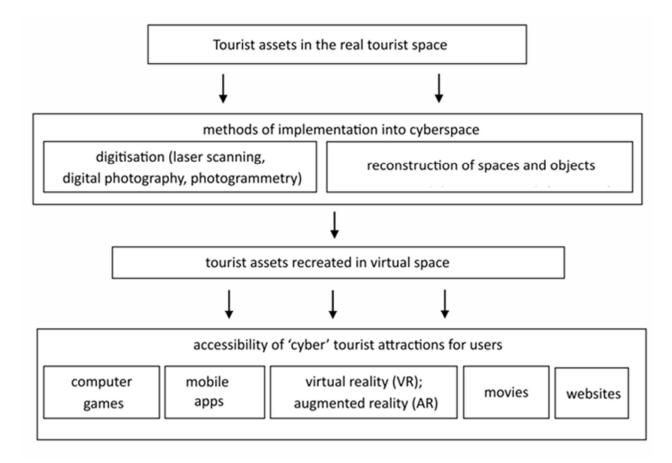


**Figure 1.** Methods of implementing tourist assets and their location in cyberspace. Source: Own study

Each point, already oriented in a three-dimensional space, contains colour information, allowing a realistic model of the object being scanned to be created. The scanner even captures the smallest details, including those that are not immediately visible or not very clear. Details were scanned regardless of the scale of the object, with a range of up to 350 m (https://vpi-polska.pl). It is a process that has been used since its inception to support conservation, not only in museums but also in archives (https://www.nac.gov.pl/wp). Nowadays, digitisation is not only used for basic

documentation but is also an excellent source for any research work that makes use of the latest computer technology (Klak, 2011, p. 54). On the other hand, space is digitised using Light Detection and Ranging (LIDAR) technology, which applies laser pulses that bounce off the surface of scanned objects and are captured by detectors. By repeating this process several times and analysing the data from different points, an accurate three-dimensional map of the terrain, objects, or buildings can be created. LIDAR technology is widely used in many fields, such as cartography, surveying, archaeology, environmental protection, transport, the film industry and many others. It offers precise data on the shape, topography, and structure of surveyed objects (www.geoportal.gov.pl).

Another way of reproducing tourist assets in cyberspace is through the use of specialised computer programs. These include Blender, a 3D graphics creation program that offers a wide range of functions, such as modelling, animation, rendering, and special effects creation; Cinema 4D, a professional program for 3D graphics, animation, and visual effects; and AutoCAD, a program commonly used in the field of engineering design and architecture. It enables the creation of accurate 2D and 3D models, drawing, design, and technical documentation; Unity, a popular environment for creating games and interactive applications in 2D and 3D; and Unreal Engine, an advanced program for creating games, architectural visualisations, animated films, and other interactive experiences. It offers advanced tools for 3D modelling, rendering, animation, and programming. These tools are also applicable to computer-generated imagery (CGI) technology. This digital technology was developed using three-dimensional (3D) computer graphics. Similar to computer-aided design (CAD) systems that came along with computer graphics, computer-generated animation technology in its early stages was 'design support' (Sun, 2023). The term CGI encompasses everything from the use of

algorithms to generate fractals, or complex, endless visual patterns, to computer programs that generate two-dimensional (2D) and three-dimensional (3D) animation and special effects. (https://www.techtarget.com) With this, objects, places, landscapes, and characters are created from start to finish in the virtual space. Objects (including those that often no longer exist) can also be reconstructed in the real world using augmented reality (AR). In this case, virtual elements containing data, often in the form of multimedia, are implemented in the surrounding reality (Laskowski et al., 2013). Behind this technology are several procedures such as: 'archival and bibliographic research; field research; historical and retrospective analysis of the territory and object; development of a 3D model of the object that illustrates the appearance of the object during periods of its life; creation of an augmented reality of the object and export of its animated model to an available digital platform' (Tomilina et. al., 2020, p. 2). VR technology allows users to interact with an environment simulated by a computer system. VR allows users to enter a state that is visualised as if it were real or is happening in front of them. AR, on the other hand, is a technology that can link two- or three-dimensional (virtual) objects to the real world. This technology allows users to display virtual objects as if they were real' (Nur Fitria, 2023), and technological stimulation in AR/VR manipulates the real world to engage users' imagination (affective/cognitive) and interactivity captures their attention, providing an unparalleled tourism experience (Verma et al., 2022 p. 2). Used together, they form what is known as Mixed Reality (MR), which is a kind of metaverse enhancement of the real world. (Buhalis and Karatay, 2022).

A recent and very popular tool for exploring objects, places and areas perceived as tourist assets (attractions) in virtual space is digital photography (e.g. images posted online by private Internet users) and satellite photogrammetry (satellite images made

available to commercial companies by NASA and ESA), which allow for the documentation of places and objects and their optional enhancement' with filters and overlays.

## 4. Contemporary functions of tourism assets in cyberspace

Tourist assets play an important role in tourism. According to Gołębski (2002) and Seweryn (2003), in the real world, natural and cultural assets are a backdrop to, or in themselves contribute to, the physical and mental well-being of tourists (leisure function). They contribute to a better understanding of the environment (sightseeing function) as well as being a tool (specialised function) to support the planning of tourist trips (Gołembski, 2002; Balińska, 2009; Wyrzykowski, 2010). The functions performed by tourist assets in cyberspace are similar to those performed in the real world. However, it should be noted that in spatial virtual reality, the possibilities of using individual tourist assets are much greater and are not always strictly related to tourism (Fig.2).
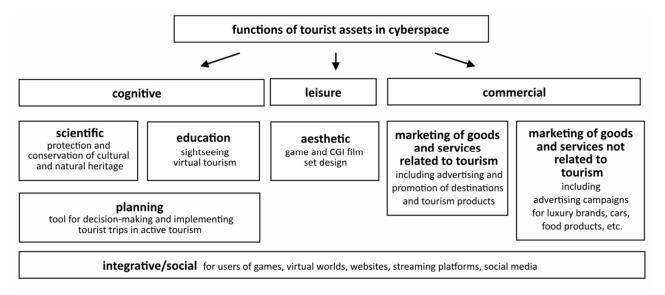


**Figure 2.** Functions of digitised tourist assets. Source: own elaboration

Thanks to the digitalisation of tangible (e.g. monuments, museum artefacts) and intangible (e.g. music) cultural assets, it is possible to use them for scientific and educational purposes and to popularise and protect cultural heritage (cognitive function) (https://sketchfab.com/NHMWien). The same situation applies to natural assets as well Thus, objects and places that are temporarily or permanently inaccessible to visitors can be virtually 'visited' (https://www.nhm-wien.ac.at). This function is closely linked to the development of virtual tourism, supports education at various levels, and is linked to the development of scientific research, for example, in the fields of conservation, archaeology, geography, etc. (Gołda – Sobczak, 2013; Pawłowska and Matoga, 2014; Pilarska and Tomczykowska, 2018; Pabian, 2020). In cyberspace, digitised assets (landscapes, places, and objects) are used in computer games (as scenery for adventure and strategy games) and can be the setting for feature films and documentaries (use of CGI technology). Thus, they can be seen through the prism of their leisure function, which provides people with entertainment, positive emotions, and aesthetic impressions (Fontaine, 2020; Kühne et al, 2020). As already mentioned, tourism assets can also be described as specialised. It seems appropriate to define their function in a virtual space as a

planning tool (helping to make the right choices and decisions). The presence of objects places, or digitised spaces in the virtual space, regarding the place of departure, the way to reach it, and the stay (means of transport, available routes, choice of hotels). Tourist cyber assets can also be useful in planning trips which are available to the tourist even before he/she starts his/her tourist activity, can support decision-making related to active/qualified tourism (terrain analysis based on visualisation, satellite images, land cover, altitude points, and orientation in space). (Table 1).

**Table 1.** Examples of tourism assets implemented in virtual space and their functions. Source: own elaboration based on an internet search

| Function | Examples of sites and facilities, and location in cyberspace | Sources of data |
|---|---|---|
| **Leisure (entertainment)** | ✓ **Paris, Florence, London** – game series Assassin's Creed (UBISOFT)<br>✓ **Eiffel Tower (Paris)** animated movie Ratatouille (2007)<br>✓ **Sydney Opera House** (Australia), Finding Nemo (2003) animated movie, Forza Horizon 3 (game)<br>✓ **Grand Canyon** USA Microsoft Flight Simulator<br>✓ **The Crane in Gdańk and the Biskupin settlement** The Witcher (game)<br>✓ **London Tower Bridge** – Minecraft | https://www.ubisoft.com<br><br>https://www.pixar.com/ratatouille<br><br>https://www.disney.pl/<br>https://playground-games.com/projects/forza-horizon<br><br>https://www.xbox.com/pl-pl/games<br><br>https://www.cdprojekt.com/pl/<br><br>https://www.planetminecraft.com/project/london-tower-bridge |
| **Cognitive function (scientific, educational, sightseeing, planning)** | ✓ **Machu Picchu** *(Peru)* 360° VR tour, Virtual reality tourism campaigns.<br>✓ **Metaverse & Virtual Travel** allow users to explore cities virtually before booking trips.<br>✓ **Wirtualne muzea Małopolski** (Virtual museums of Małopolska– project )<br>✓ **Notre-Dame de Paris** (digital reconstruction) Art Graphique & Patrimoine (France) – access and promotion of cultural heritage<br>✓ **The Colosseum (Rome), St Paul's Cathedral (London)** popular science documentary series such as **Time scanners** (PBS 2014)<br>✓ **Grand Canyon** (USA) National Park Service VR experience,<br>✓ **Mount Everest** *Steep, Climber: Sky is the Limit*<br>✓ Geolocation of objects and sites in **Google Earth, Google Maps** | https://machupicchu360vr.com<br><br>https://www.ipsos.com<br><br><br>https://muzea.malopolska.pl/<br><br>https://www.artgp.fr<br>https://www.notredamedeparis.fr<br>https://images.cnrs.fr<br><br>https://www.natgeotv.com/za/shows/natgeo/time-scanners<br><br><br>https://www.meta.com/pl<br><br>https://art-games.com<br><br>https://www.esa.int<br>https://www.google.com/maps<br>https://earth.google.com/web / |
| **Commercial** | ✓ **Times Square in New York** – Digital billboards & VR ads,<br>✓ **Las Vegas** AI-Powered Gamified Marketing**.**<br>✓ **Vietnam – Louis Vuitton's The Spirit of Travel Campaign (2019)**<br>✓ **virtual gallery with images of Rome, Buenos Aires, Rotterdam,** Magnum ice cream campaign 'Pleasure Imagined' | https://www.meta.com<br>https://www.timessquarenyc.org<br>(Pfeifer, 2023)<br><br>https://www.youtube.com/watch?v=inarhG1jgso<br><br>https://www.magnumicecream.com |
| **Integrative, socialising** | ✓ reconstruction projects of tourist attractions by the Minecraft community<br>✓ social media (Instagram, Facebook, Tik-Tok, YT) posting of photos and videos from travels<br>✓ outdoor games and applications based on VR and AR technology – sharing tourism Tropimy.pl; Turystyczny Lublin (application) | https://www.planetminecraft.com<br><br>https://www.360visio.com<br>https://www.facebook.com/<br>https://www.instagram.com/<br>https://www.youtube.com/<br>https://lublin.eu<br>https://tropimy.pl |

However, it seems that in addition to the functions mentioned above, commercial functions are becoming increasingly important, especially in virtual reality. Digitised tourist attractions (in the form of photographs, scans, digital reconstructions) can serve as a tool for advertising goods and development of artificial intelligence and the use of digital distribution channels have introduced new opportunities to increase the sales, profits, and productivity of tourism destinations (Florido-Benítez and Alcázar Martínez, 2024). Examples of such activities in the tourism industry include videos and spots promoting tourist destinations or social media campaigns (including interactive campaigns) in which web users co-create content by sharing their travel experiences. Another form of advertising and promotion of tourist destinations is travel blogs or activities of influencers and event marketing, that is, the promotion of local attractions and festivals by posting recordings and live reports online.

The use of tourism assets in online marketing is not limited to the tourism industry. Increasingly often, companies not related to tourism use tourism assets implemented in virtual space to encourage customers to purchase luxury goods (e.g. advertisements for cars, perfumes, real estate), everyday objects, or food (https://www.istitutomarangoni.com).

In light of the above, it also appears that cyber tourism assets indirectly perform social functions by integrating network users. It is worth noting at this point that the users of social media, sharing photographs and films of places they visit, as well as gamers sharing game universes or carrying out projects related faithfully, so that they are also recognisable to modern visitors to these cities (Aroni, 2019). Films produced using CGI technology provide increasingly realistic images of places and objects (Martínez-Cano, 2024). In the case of digitised tourist assets used in online services, promoting destinations (marketing of places), and branding actions (i.e. content marketing in its broadest sense) (Karczewska et al., 2019). This involves two-way communication with the customer through the creation of unique content for a selected target group (Skrobich, 2016). Moreover, the to the reconstruction of tourist attractions in games such as Minecraft. Applications are also being developed, e.g. using VR and AR technologies, thanks to which tourists can jointly explore and discover tourist attractions (e.g. the Turystyczny Lublin application, the Tropimy.pl).

One should also consider whether the degree of fidelity of copies of tourist assets reconstructed in virtual reality determines their suitability for specific functions.

The technology of accurately scanning cultural assets (e.g. historic sites and museum artefacts) and depositing them in cyberspace has contributed to the spread of the term 'digital heritage' in academic circles. This can be seen as a further step towards digital transformation applied to the protection and conservation of historical and cultural heritage (Van Nguyen et al., 2022, p. 255), as well as the promotion of cultural assets in wider circles (Dzięglewski et al., 2017). However, it turns out that it is not only scientists who benefit from finely reproduced objects in a virtual space. Real-world objects and landscapes are being reproduced with increasing fidelity in the universe of computer games. This is the case, for example, in the Assassin's Creed series of games (Tokarev, 2017; Politopoulos et al., 2019), where Ubisoft has ensured that the cityscapes of Renaissance Florence or 18th-century Paris are reproduced fairly marketing, the way in which they are shown and presented is also important. The attractive/interesting message counts, and the image becomes an attractive background for selling goods and services.

## 5. Conclusions

With the development of digital tools and technologies, an increasing number of elements in geographical space are penetrating virtual spaces. This also applies to tourist space elements such as tourist assets. The process of implementing tourism assets into cyberspace, the selection of digital tools, and the quality of their representation are determined, among other things, by the functions performed in relation to users of virtual space. As mentioned, earlier, the implementation of natural and cultural assets in cyberspace is carried out for the following purposes: scientific, educational, and popularisation, as well as entertainment and marketing. Thus, the depiction of tourist assets should not be viewed only through the prism of virtual tourism, although they are an integral part of it. Game users move around in virtual universes saturated with 'familiar', 'tourist' settings (e.g. Gran Turismo, WRC Generations, Assetto Corsa games). Values can form the backdrop for interpersonal interactions (sharing of experiences, emotions, and opinions through photos and videos posted on social media) and are also part of advertising and promotional online campaigns (https://www.wirtualnemedia.pl). Finally, it seems that the reconstructed tourist assets present in cyberspace become elements of a specific Metaverse, a parallel virtual universe that is created on the basis of physical reality and Mixed Reality (AR and VR) (Buhalis and Karatay, 2022).

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