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DIGITAL TOURISM: DEVELOPMENT OF 3D MODELS OF HISTORICAL PLACES IN BUKHARA

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Abstract
This article presents statistical information about the activities being carried out in the tourism sector of Uzbekistan and discusses the development of 3D tourism in order to increase this information, including the development of the Bukhara 3D website under development and its potential in the tourism sector.

Keywords: 3D tourism, digital tourism, digital places, opportunity of tourism, GDP, Uzbekistan – 360.

Introduction

It is known throughout the world that the tourism sector is one of the most important factors affecting the GDP of any country.

In recent years, tourism exports in Uzbekistan have increased by 1.6 times, reaching $3.5 billion, and more than 2,000 new entrepreneurs have started working in this sector. In 2024, the number of foreign tourists will exceed 10 million for the first time.

Tourism and service infrastructure in the regions of Uzbekistan is developing very rapidly. In particular, over the past 8 years, $6.5 billion has been invested, and 130,000 guest rooms have been opened. Today, 20 tourist villages are operating. A new international ski zone is being built on the "Golden Belt" peak of the Parkent district.

In fact, based on the history, culture, and nature of our country, it is possible to increase the number of tourists by another 2-3 times. Currently, a single National Tourism Platform is being developed. Now it will also be connected to the processes of issuing electronic visas and obtaining tickets. A "single tourist card" will also be introduced, which will allow access to all historical monuments.

In recent years, due to increased attention to domestic tourism, the number of domestic tourists has reached 23 million. Another direction in the tourism sector is cultural heritage sites, and 327 such complexes have been restored and conserved in the last 4 years. Now another 485 objects are in need of repair. If Uzbekistan can use its potential, the tourism sector alone can attract 15 million tourists by 2025 and increase exports to $4 billion [1].

Main Part

Of course, the use of 3D technologies in tourism will be very effective in implementing these works. Bukhara is one of the most ancient and sacred cities of Uzbekistan; each of its streets is imbued with history and spirituality. This beautiful city is considered one of the important centers of the Islamic world and is known throughout the world for its ancient architectural monuments, famous scholars, and rich cultural heritage. Bukhara is not only of historical importance but is also valued as the birthplace of various religious and scientific traditions.

Every year, thousands of tourists, pilgrims, and researchers visit this place and visit historical and religious monuments. They are impressed not only by the architectural monuments but also by the unique atmosphere of Bukhara. Therefore, it is important for every guest to have reliable and detailed information about the historical monuments of the city.

For a tourist interested in the shrines of Bukhara, one of the best resources in this direction is the Bukhara-Tourism website. Through this site, you can get detailed information about the most famous shrines of Bukhara, their history, and information about them, and the most interesting thing is the opportunity to view the shrines in 3D.

The site serves as an excellent guide for those planning a trip to Bukhara, those interested in history and culture and pilgrims.

The Bukhara-Tourism website is developed on the basis of modern and convenient technologies, providing a fast and intuitive interface for users. The following technologies were used in the development of the site:

Frontend. The main user page of the site was developed using the React.js library [2]. React is used to quickly and efficiently manage interactive elements of the web application. The site used the Axios library to work with various API data [3]. It allows you to connect to the server and get data quickly and easily.

The site used the Zustand global state management library [4] to manage language switching and other common states. This library helps the site work easily and efficiently. The site design was developed using Tailwind CSS, which allows you to create a fast and flexible UI (User interface) [5]. Responsive design (adaptation for mobile, tablet, and computer screens) was implemented using Tailwind. The React Hook Form library was used to make it easy and convenient to work with various forms on the site [6]. This simplifies the process of optimizing and validating the data filled in by users.

Admin panel. The admin panel is also built on React and Tailwind CSS, which are used to manage the site's content and input data. The admin panel also uses Zustand for global state management, which makes it easier to manage data between pages. It was used to optimize the process of entering and updating new data through forms designed for administrators.

Backend (Server part). The backend of the site is developed on the Nest.js framework [7]. Nest.js is built on Node.js, which is an ideal choice for creating a fast and secure backend. It is used to store, process, and deliver data to users.

Hosting and Deployment. The frontend of the site is hosted on the Netlify platform. It provides fast loading, security, and automatic deployment capabilities. The backend based on Nest.js is hosted on a special server and is optimized for secure delivery of data to users.

The site has detailed information about 15 holy places in Bukhara, beautiful, and understandable design, easy navigation, useful tips and travel guides, fast loading and safe operation, user-friendly interface and the ability to manage data through the admin panel.

The presented site consists of the following sections:

Home page - provides basic information about the shrines. (Figure 1).

Figure 1. "Top Shrines" section on the home page

The main page provides brief information about the most visited shrines. By clicking on the “More” button, you can go to the general page of shrines. By clicking on the “Details” button, you can go to the page with information about the selected shrine.

Shrines - detailed information about each shrine is provided (Figure 2).

Figure 2. List of Holy places

This page displays images and brief information about 15 shrines: Khoja Abdulkhaliq Gijduvani, Khoja Muhammad Orif Revgari, Khoja Mahmud Anjir Faghnavi, Khoja Ali Romitany, Khoja Muhammad Boboi Samosi, Khoja Sayyid Amir Kulol, Khoja Bahauddin Naqshband, Chashmai Ayup, Magoki Attar Mosque, Abu Hafs Kabir Bukhari, Samaniylar Mausoleum, Char Bakr,

Sayfiddin Bokharzi, Bibi Orifa Mausoleum, and Mir Arab Madrasah. This image shows the hover view of the cards. In this view, the card moves up and the text "More" appears below it. After clicking the "More" button, you will be taken to a page with detailed information (Figure 3).

Figure 3. Information about of Holy places

After clicking the "More" button, you will be taken to this page. Here you will find information about the history and tourist attractions of the shrine. After the texts, you can see a 3D view of the shrine in the Google Maps application by clicking the "3D" view button below (Figure 4).

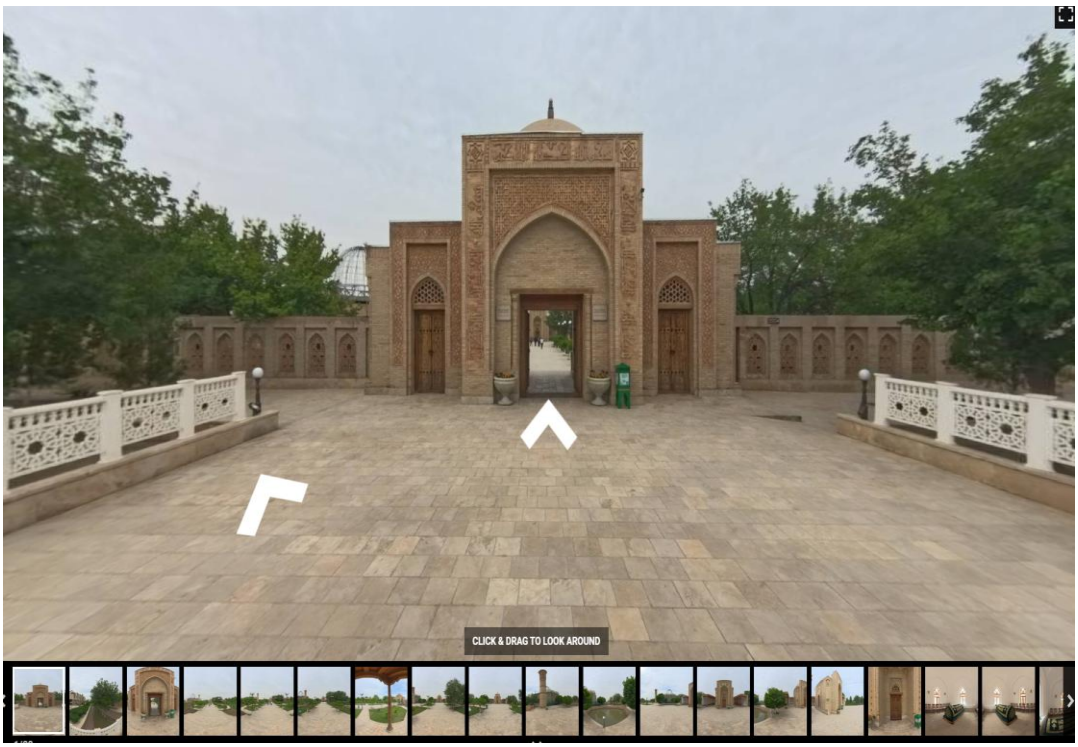

Figure 4. 3D views of Holy places

There is an opportunity to freely navigate the shrines through the 3D section. Similarly, a 3D view of all shrines is developed and can be viewed through the 3D view menu (Figure 5). The 3D section

looks like the one above. The buttons here are linked to Google Maps, that is, the 3D view is provided through Google Maps.

Figure 5. List of 3D views of Holy places

This page also provides a link to a YouTube video about each shrine and its location (Figure 6).

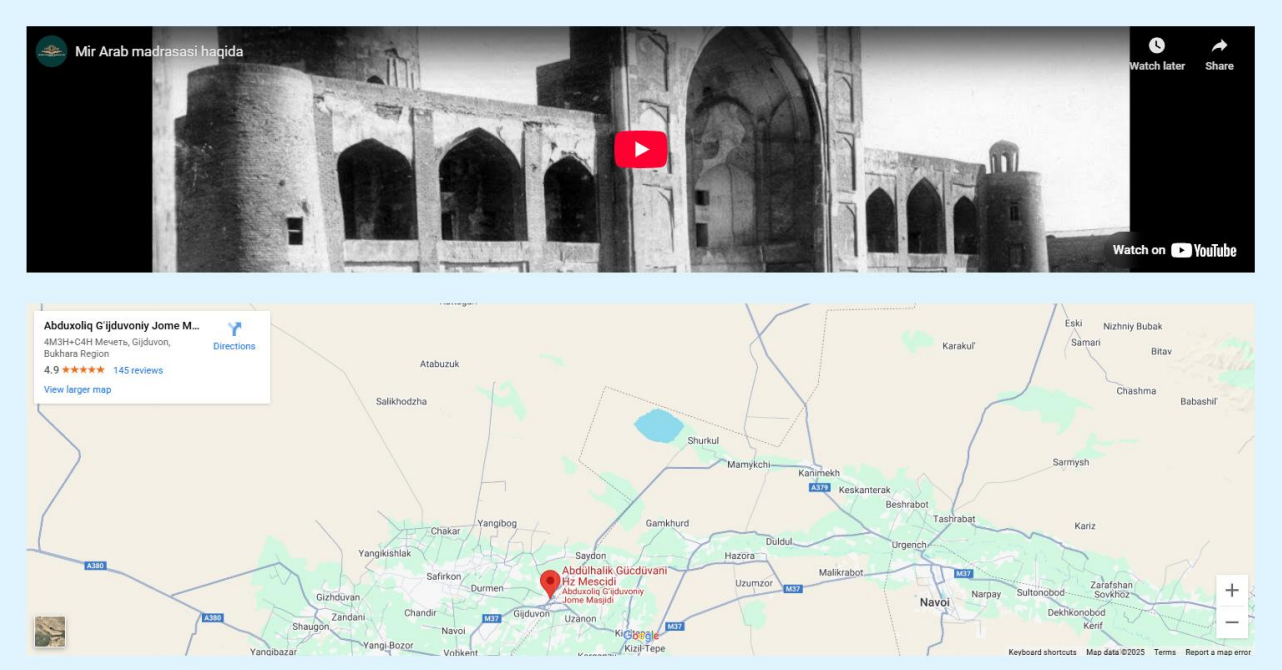

Figure 6. YouTube video and location about Holy place.

A video of the shrine and its location on the map are attached to this page. The video is linked via YouTube, and the location is linked via Google Maps.

Of course, many software tools can be used to create 3D representations of shrines. For example, krpano Panorama Viewer is a software platform for displaying 360-degree panoramic images and virtual tours on websites and other digital environments [8]. krpano Panorama Viewer allows users

to create and view interactive panoramas, supporting a variety of media formats such as images, videos, and audio.

In fact, 3D visualization applications should provide the following capabilities:

- 360-degree views - support spherical and cylindrical panoramas, allowing users to view 360-degree images;
- interactive controls - offer navigation tools such as zoom, tilt, and rotate to work with 3D shapes;
- virtual tours - allow users to create virtual tours by stitching together multiple panoramic images, simulating the experience of walking through them;
- cross-platform compatibility - be able to work on different platforms, including desktop, mobile, and VR devices, using HTML5, WebGL, Flash, and other technologies.
- customization options - allow the user to customize their interface, add hotspots, animations, and other interactive elements.

For example, GoThru is a platform that allows the users to use their panoramic images for publishing them in the form of Google Street View. The platform offers its own 360 video tool through which users can upload their panoramic photos into a kind of a video. It enables the users to embed these videos on various social media platforms such as Facebook and their websites.

The 360 Video allows the users to add a customized logo and background music to their panoramic images and make a video of it. Moreover, it also enables them to pick a slide time for every photo. The platform also offers a separate place for hosting users' tours.

GoThru allows the users to select a displaying style template which they can easily embed on their website. Moreover, it also provides various tools for editing and managing virtual tours and other panoramic images. Lastly, it only offers a paid version.

Also we can use a lot of programs, Pano2VR, HoloBuilder, Tourweaver 7, Kuula, RIO Genesis, WalkInto, Ocurus, Viewplex, My360 and others [9].

For creating 3D views of 15 holy places we used Kuula. Kuula is the most popular, award winning 3D 360 virtual tour software that makes it easy to create virtual tours for any business [10]. Process of creating 3D views of poly places (Figure 7).

Figure 7. Process of creating 3D with Kuula.

Kuula is used by over 500,000 of professionals, artists and companies from all over the world. Our users have uploaded over 15,000,000 panoramic photos and created more than 1.5 million virtual tours, which have been viewed over 2 billion times.

Conclusion

Currently, 3D models of 15 shrines are being developed. After the launch of this site, travelers will be able to remotely view 15 shrines of Bukhara. This, in turn, will lead to an increase in the number of tourists visiting Bukhara. Of course, after the successful implementation of this project, by presenting 3D views of other historical sites and attractions of Uzbekistan to the whole world, the number of tourists can be increased to 20 million by 2030. Of course, each 3D model will be added to the Uzbekistan - 360 platform.

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