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DESIGN AND IMPLEMENTATION OF A WEB-BASED GEO-MULTIMEDIA EVENT MANAGEMENT SYSTEM

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Abstract: *This paper examines the design and implementation of a web-based geo-multimedia event management system that allows users to create, store, and visualize travel and performance events, enriched with multimedia content and precise geographic location.*

As a proof of concept, the system is applied to an interactive travel diary for performers, allowing them to document rehearsals, performances, and trips by placing geotagged photos, videos, and notes on the map.

The proposed platform uses HTML, CSS, and JavaScript for the frontend, Leaflet.js for interactive map visualization, and Firebase for data and multimedia storage. The system allows for rapid event entry with automatic GPS geocoding, text notes, and photo attachment.

Keywords: *geomultimedia, web application, location-based services, travel diary.*

INTRODUCTION

In the context of increasing digitalization and mobility, artistic activities are increasingly accompanied by a process of digital documentation. As a result, a variety of content is generated – text notes, photos, video and audio recordings, which are usually stored fragmentedly across different platforms and devices. This makes it difficult both to personally organize creative materials and to present a comprehensive and structured digital diary of the activity.

This report examines the concept, design and initial implementation of a web-based geo-multimedia event management system. The main goal is to develop a lightweight, accessible and functional prototype that combines text notes, multimedia content and interactive cartographic visualization. The development is inspired by the practice of artists to document their travels and performances and demonstrates the potential of geo-multimedia as a tool for integrating cultural and creative activity into the digital environment.

Existing tools such as social networks, blog platforms and travel diaries offer only partial functionality. They usually do not provide deep integration of geographic information with multimedia elements, and when they do exist, they are limited to basic functions. Furthermore, they lack focus on the specific needs of artists who are looking for visually and emotionally enriched ways to present their work (Table 1).

The proposed system aims to overcome these limitations by integrating geo-multimedia data into a web-based platform that is both accessible, intuitive and visually appealing. The main

contribution of the study is the presentation of a concept and prototype combining an interactive map, multimedia content and textual information in a single functional environment.

Table 1. - Comparative characteristics

Application / system	Main idea	Geo-functionalities	Miultimedia	Limitations
Instagram	A popular social network for visual sharing of photos and videos.	✅ Geotags, base maps	✅ Photos, Videos, Stories	There are no road maps, timelines, or event maps; there is no context for artistic performances.
Google Maps Timeline	A tool for tracking and visualizing routes and places the user has visited.	✅ Location history, interactive map	❌ Lack of any	There is no social and creative element, no multimedia or personal events.
Eventbrite	Platform for organizing and promoting events (concerts, exhibitions, workshops).	✅ Map with event locations	✅ Photos, descriptions, comments	It's not a personal diary; the focus is on sales and organization, not on creative journeys.
FindPenguins	Digital travelogue – automatically documents trips with maps, photos, and statistics.	✅ Automatic GPS tracking, route map	✅ Photos, descriptions, meta-data	Oriented towards tourists, it does not support artistic events or cultural context.
Suggested solution	A personal diary that focuses on artistic events and their implementation and promotion.	✅ Events location map	✅ Photos, videos, descriptions	There is no ticket sales system - future development.

EXPOSITION

Geo-Multimedia system

The term geo-multimedia refers to digital multimedia content – text, images, audio and video files that includes or is associated with geographic information, such as location data. Geo-multimedia combines different types of data to present and interact with spatially localized phenomena in new and intuitive ways. This approach facilitates both specialists and the general public in exploring diverse geographic environments – natural landscapes, urban areas, routes and cultural sites. Over the past decade, geo-multimedia technologies have found increasingly widespread application in areas such as tourism, education and the digitization of cultural heritage.

With the development of modern software and hardware technologies, cartography has undergone a significant transformation, actively using geovisualization tools and integrating interactive multimedia. The so-called multimedia cartography can be defined as a cartographic application of new media technologies. It includes a variety of platforms for presenting and

distributing spatial information - among them the World Wide Web, interactive digital media, mobile Internet solutions and hypermedia services connected to large national or global databases.

There are a number of solutions focused on sharing trips – social networks, blog platforms and travel diary applications. However, most of them do not offer integrated presentation of content on a map. They are mainly aimed at instant publishing of photos and notes, without the possibility of systematic documentation of routes and events. Moreover, specialized applications usually do not provide artistic personalization or rich multimedia visualization.

The approach proposed in this study is distinguished by the integration of geographic information, multimedia materials (photos, videos, audio files) and text into a single web-based interface, tailored to the specific needs of creative individuals and cultural figures.

System goal and tasks

The main goal of the developed system is to create a web-based environment that will assist artists in documenting their participations, travels and performances by integrating text, multimedia and geographical information. Such an approach aims to unify different types of content into a single, easy-to-use and visually appealing platform.

To achieve this goal, the following sub-goals have been formulated:

providing an intuitive and accessible interface for entering, editing and visualizing events;

implementing an interactive cartographic component that allows visual tracking of artistic participations according to their geographical location;

providing the ability to add multimedia elements – images, videos and text notes – to each individual event;

creating a visual design that combines aesthetic expressiveness and functional readability, tailored to the specifics of creative users.

The system follows the concept of a geo-multimedia diary, where each event is represented as a geographical point associated with rich multimedia content. This approach provides not only functionality and convenience in documentation, but also high emotional value for users, turning their routes and experiences into a visual and interactive narrative.

System Architecture

The proposed system is implemented as a web-based application that includes three main components – the user interface (front-end), a mapping module, and cloud data storage.

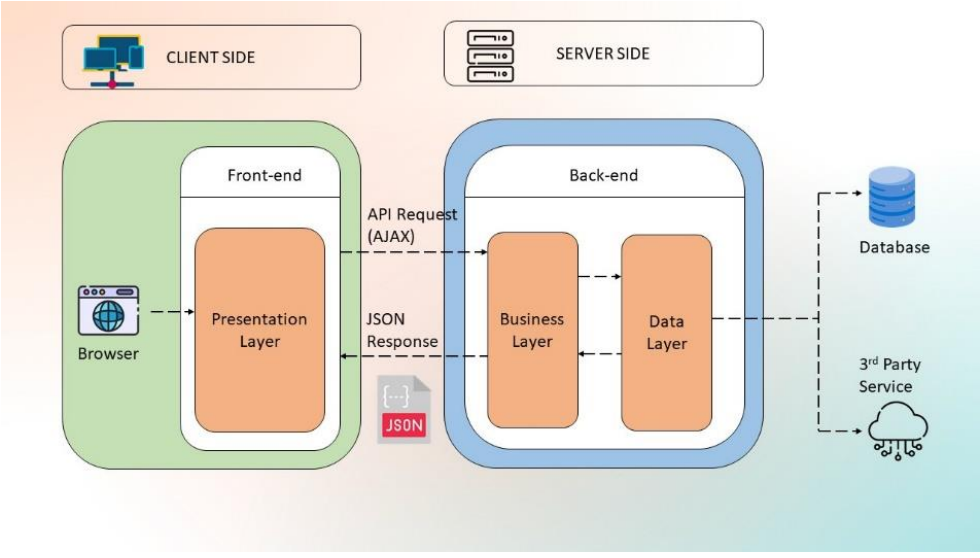

Figure 1: Single-Page Application (SPA) architecture – client-server interaction through dynamic content updating

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The Single-Page-Application (SPA) architecture is a relatively new model that has been widely adopted in web application development (**Figure 1**). Using SPA is a common practice when building large-scale web applications. Before SPA, AJAX technology introduced a way to update only some parts of a web page without having to reload the entire page. The SPA architecture is largely used in client-side rendered web applications, but it is also possible to use SPA in a server-side rendered application. One reason to use the SPA pattern is to develop a web application that feels more like a native desktop or mobile application. The program is responsive and looks as if it is installed on the device. An application developed with SPA redraws parts of the screen immediately, without waiting for a new file from the backend server (Choi, 2020).

The name "Single-Page Application" comes from the fact that the entire application resides on just one HTML page. This means that the first page is the only page that is ever loaded on an SPA (Choi, 2020).

The user interface is developed using standard web technologies – HTML, CSS, JavaScript, ensuring compatibility with all modern browsers and facilitating future expansion of the project. For the visualization of geographic information, the Leaflet.js library was used, which allows adding interactive maps, markers and information windows. Cloud storage and data management are implemented through Firebase, which provides easy database integration, user authentication and storage of multimedia files such as photos, videos and audio recordings.

This architecture provides flexibility, low technicality, complexity and the ability to be upgraded in the future - for example, by adding features for sharing events, tracking purchased tickets and seats in the hall, as well as the ability for user interaction with the system such as comments, online reservations or mobile adaptation.

The WebSocket protocol was developed to replace HTTP technologies such as short polling and long polling and is an abstraction of the TCP socket application layer (Hribernik and Kos, 2020). Like HTTP, it also uses the TCP protocol in the transport layer of the OSI model. However, transmission delays are reduced when using WebSocket, thanks to the combination of a single connection and appropriate optimizations. (Karla and Tarnawski, 2019) WebSocket can be used for two-way communication between a client and a server over a single TCP connection, using a "so-called" socket (Kulshrestha, 2013; Karla and Tarnawski, 2019). However, the socket used in WebSocket technology is not the same as a TCP socket. WebSocket technology is fully supported by all major browsers (The WebSocket API (WebSockets), 2022). The WebSocket connection is established using the HTTP protocol. Once the connection is established, the two connected services can send and receive data independently and without any agreements (Hribernik and Kos, 2020) (Figure 2).

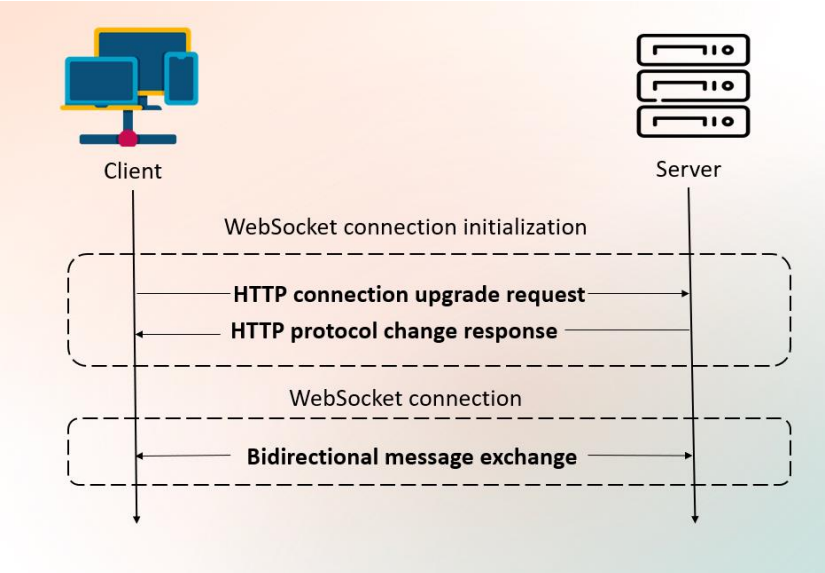

Figure 2: WebSocket connectivity workflow

Interface prototype of the web-based system

The figure shows the interface prototype of the system, which demonstrates the placement and visual layout of the main elements of the user interface (**Figure 3**).

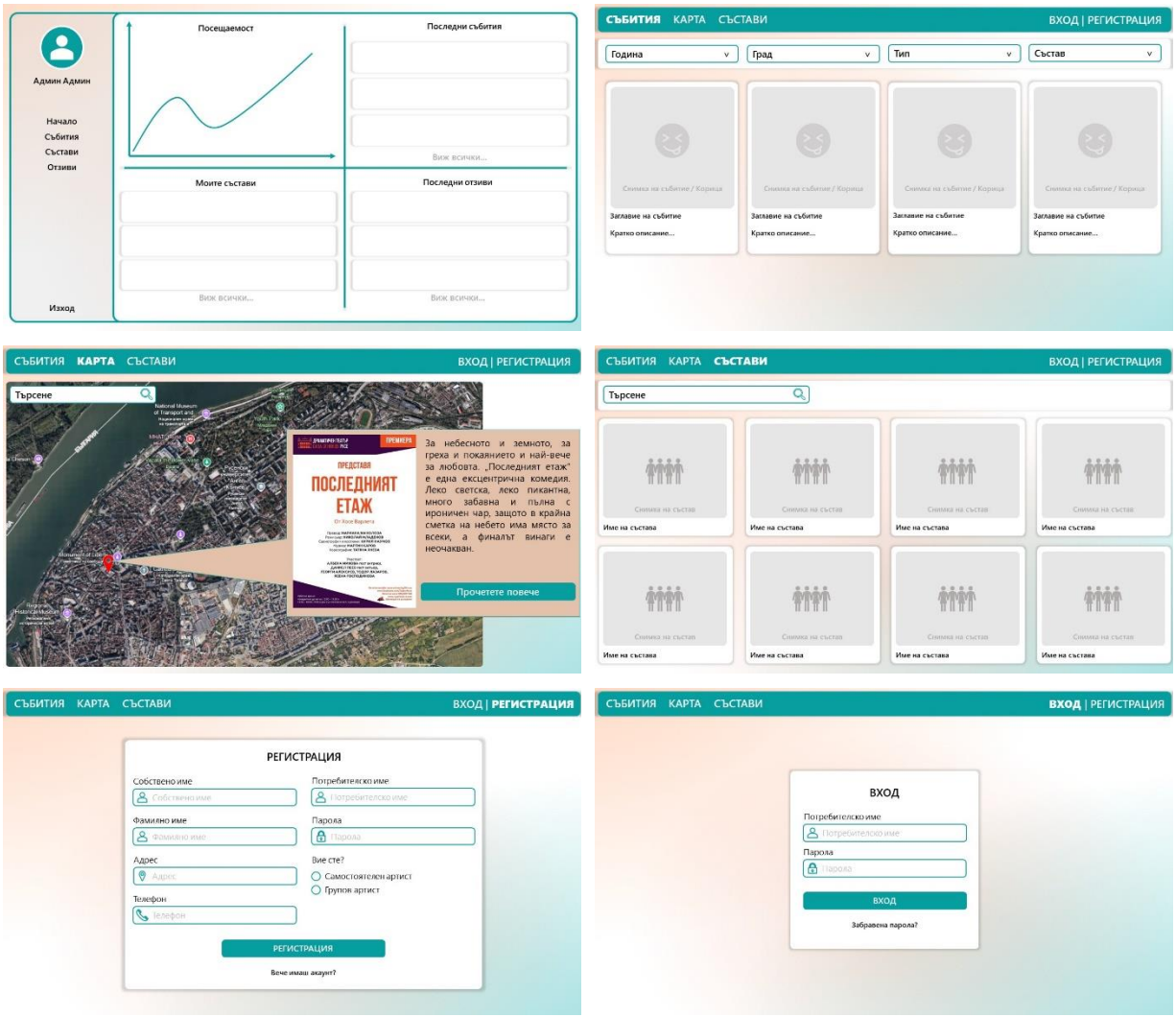

Figure 3: Interface prototype of the web-based system

CONCLUSION

The research conducted and the prototype implemented confirm that the integration of geographic information with multimedia elements in a web-based environment offers new possibilities for the presentation and analysis of events, routes and experiences. The developed framework for such a system shows how geo-multimedia approaches can be successfully applied outside traditional spheres such as tourism and education, entering the cultural and creative sector.

Using technologies such as Leaflet.js, Firebase and the Single Page Application + WebSockets architecture – they ensure fast performance, real-time operation, ease of use and extensibility of the application. The platform can be further developed by adding social features, interactive comments, integration with other services and a mobile version.

In a broader context, the project contributes to the development of innovative digital solutions that connect technology with art, helping artists document and share their work in a visually engaging and accessible way. This affirms the importance of geo-multimedia as a tool for digital storytelling and cultural documentation.

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