

Usefulness of WebXR technology in the 3D geovisualization of topographic data

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Abstract:

WebXR technology offers a powerful paradigm shift in the way cartographic information — particularly topographic data — can be visualized and analyzed. By blending virtual and augmented reality within standard web environments, WebXR allows users to explore rich, three-dimensional landscapes (Figure 1) without installing specialized software or being tethered to high-end hardware. Users only need Internet connection and access to mobile web browser. This novel approach to cartography makes complex topographic 3D geovisualizations more accessible, enabling immersive interaction with terrain models, real-time elevation data, and geospatial annotations.

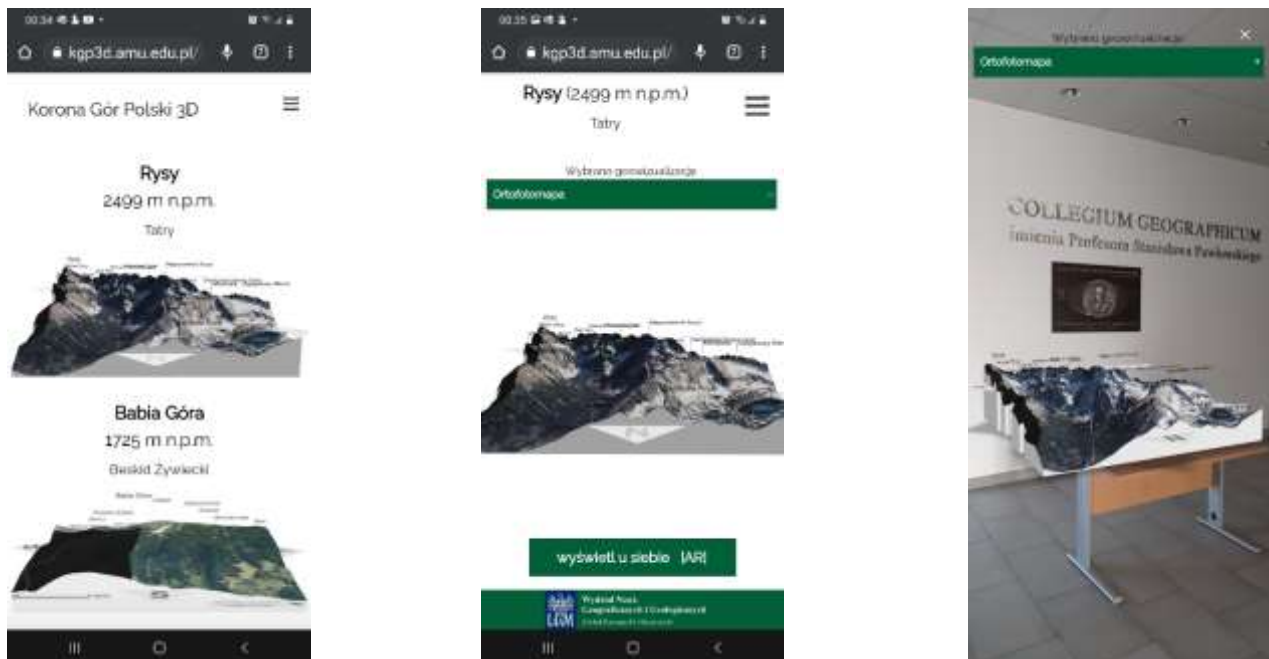


Figure 1. “The Crown of Polish Mountains in 3D” website. Start screen (left), selected mountain (middle), WebXR experience (right)

In practice, WebXR-based cartographic applications can offer interactive features such as adjustable perspective views, user-driven overlays, and dynamic elevation profiles. These tools enhance spatial understanding and support better-informed decisions in fields ranging from environmental management and urban planning to tourism and education. Additionally, the capacity to integrate real-time data streams — such as satellite imagery or sensor readings — further augments the relevance and impact of WebXR-enhanced maps.

One example of mobile WebXR 3D app may be “The Crown of Polish Mountains in 3D” (Halik and Wielebski, 2023). This app was developed – <https://kgp3d.amu.edu.pl> (Figure 1) to show 3D geovisualizations of Polish mountain peaks. User can choose a mountain and view it in 3D in two modes: aerial imagery and viewshed. On ARcore and ARkit

enabled smartphones users can explore augmented reality view of the mountain directly in mobile web browser. It is possible to interact with 3D object by rotate, pan, and pinch-to-zoom the 3D model in the user's own space.

The aim of this presentation is to analyse current WebXR tools and indicate their strengths and weaknesses in terms of creating 3D geovisualization of topographic data. Overall, employing WebXR technology in topographic mapping expands the possibilities of cartographic communication by providing an engaging, medium for both expert and non-expert users. By bringing advanced 3D visualization and interaction capabilities to the browser, WebXR paves the way for truly immersive, collaborative, and impactful geospatial experiences.

References

Halik Ł., Wielebski Ł., 2023, Usefulness of Plane-Based Augmented Geovisualization — Case of “The Crown of Polish Mountains 3D”, ISPRS Int. J. Geo-Inf., 12, 38, DOI: 10.3390/ijgi12020038.