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Visualisation of a three-dimensional (3D) object's optimal reality in a 3D map on a mobile device (Article)

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Abstract

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Prior research on the subject of visualisation of three-dimensional (3D) objects by coordinate systems has proved that all objects are translated so that the eye is at the origin (eye space). The multiplication of a point in eye space leads to perspective space, and dividing perspective space leads to screen space. This paper utilised these findings and investigated the key factor(s) in the visualisation of 3D objects within 3D maps on mobile devices. The motivation of the study comes from the fact that there is a disparity between 3D objects within a 3D map on a mobile device and those on other devices; this difference might undermine the capabilities of a 3D map view on a mobile device. This concern arises while interacting with a 3D map view on a mobile device. It is unclear whether an increasing number of users will be able to identify the real world as the 3D map view on a mobile device becomes more realistic. We used regression analysis intended to rigorously explain the participants' responses and the Decision Making Trial and Evaluation Laboratory method (DEMATEL) to select the key factor(s) that caused or were affected by 3D object views. The results of regression analyses revealed that eye space, perspective space and screen space were associated with 3D viewing of 3D objects in 3D maps on mobile devices and that eye space had the strongest impact. The results of DEMATEL using its original and revised version steps showed that the prolonged viewing of 3D objects in a 3D map on mobile devices was the most important factor for eye space and a long viewing distance was the most significant factor for perspective space, while large screen size was the most important factor for screen space. In conclusion, a 3D map view on a mobile device allows for the visualisation of a more realistic environment. © 2015 NSP Natural Sciences Publishing Cor.

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