VISUALISATION OF A THREE-DIMENSIONAL (3D) OBJECTS OPTIMAL REALITY IN A 3D MAP ON A MOBILE DEVICE

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ABSTRACT

Prior research on the subject of visualisation of three-dimensional (3D) objects by coordinate systems has proved that all objects are translate (eyespace).The multiplication of appoint in eye space lead stopper spective space, and dividing perspective space leads to screenspace. 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.

Keywords: 3D-Map, Eye-space, Perspective space, Screen-space

INTRODUCTION

The introduction of Global Positioning System (GPS) technology for navigational assistance has had a profound effect on the ability to find physical locations with ease, transforming the social dynamics involved in traveling on the road. However, people still become lost or are unable to follow directions to reach a specific destination. In certain unfortunate situations, a wrong turn can mean the difference between life and death. A three-dimensional (3D) map is a 2D or 3D visualisation of a 3D representation of a physical environment, which emphasises the 3D characteristics of the environment that are intended for navigational purposes. Technically, the role of 3D maps is to provide more detailed information than is available from conventional 2D maps. Although 2D maps can represent any real or imagined space without regard to context or scale, they have the following limitations:

(1) The representation of landmarks entails symbols, legends and contour lines, which requires map-reading awareness;

(2) The representation of route or road networks typically lacks orientation;

(3) Such maps do not represent a realistic view (reality as it exists), requiring the translation of added legends that may require a certain level of expertise on the part of the user. The key benefit of a 3D representation is that it has a higher potential for accuracy in presenting spatial data. Additionally, it offers a better platform for multiple cues and small-scale features, which are better suited for locating and identifying unknown places. Creating a navigation tool on mobile devices with the help of a 3D model is undoubtedly a complex task but is certainly worth the investment. It is tempting to also believe that moving from 2D to 3D visualisation will enhance user performance through natural support for spatial memory.

Conceptualisation of a 3D mapview on mobile devices

As stated by, visualisation amplifies cognition. Our visual systems are designed to perceive 3D surfaces and the shapes of the environment in which humans operate. Blinn showed that the eye can never have too much visualisation from screen space componen e XL and e ZL yield a straight line when one hyperbola is plotted against the other in the expression e

XL = A+B α E+F α ,e ZL = C+D α E+F α (1) whereA,B,C,D,E and F are 3D vectoridentities. Because eyes see shapes as parametric curves with two coordinates generate d b y hyperbolic functions of α forbothe XL ande ZL, it is important to note that bothe XL ande ZL have the same denominator in equation 1, which causes the asymptotes ofe XL ande ZL to coincide because α =− E F (2) When both asymptotes move to the origin when the parameterisation is altered by replacement, it becomes α ′ = E+F α (3)

This is then represented by the following straight line expression: e XL = A+B(α ′−E F) α ′ =(B F)+ 1 α ′(AF−BE F) (4) e ZL = C+D(α ′−E F) α ′ =(D F)+ 1 α ′(CF−DE F) (5) The proposition then results in the parametric equation of a straight line segment. Therefore, the representation conforms to equally spaced points in eye space that are equal in steps with α , and α ′, and these are transformed to non-equally spaced points in screen space. Prolonged viewing of mobile devices and other stereo 3D devices leads to visual discomfort, aided by differing vergence and eye focal stimuli. Humans are accustomed to the potential of momentarily seeing things with asingle punctate eyeto indicate anatural perspective. Personal awareness, however, shows that the eye is not in the space, and imaginary spaces are subjective relative to the present in personal awareness. For this reason, the subjective assessment of a 3D presentation within any medium is necessarily based on personal awareness. The provision of 3D maps on mobile devices will improve users interactions with them and, thus, provide location information more accurately.

CONCLUSIONS

This paper presents an empirical investigation into the use of 3D maps on mobile devices to determine the factors that influence their usage via a quantitative survey and DEMATEL analysis. This approach was chosen to uncover users perceptions of the 3D map view on mobile devices. We utilised the proven theory regarding the visualisation of 3D objects by coordinate systems. Eye space, perspective space, and screen space were used as the key variables for the empirical investigation. They were further subdivided to find the key factor(s) of visualising 3D objects in 3D maps on mobile devices.

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