SALIENT CHARACTERISTICS OF VIRTUAL TREES

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Recent research on the design of virtual environments has focused on the important perceptual characteristics of man-made "carpentered" environments, rather than on VEs of natural environments. The present research examines memory for characteristics of natural settings consisting of virtual trees. Participants viewed either a symmetrical or asymmetrical virtual tree and then re-created it using custom-designed tree editing software. Memory was more accurate for the symmetrical tree. Across trees, participants were most accurate re-creating gross structural dimensions of a tree such as height and leaf size, and were particularly inaccurate at re-creating the curvature of tree branches. Our conclusion is that the design of virtual environments should focus on accurately representing gross structural properties of trees, rather than on using high levels of detail to accurately portray trunk and branch curvature.

The use of virtual environments for training and experimentation has proliferated in recent years, and many of these VEs have been created to mimic natural wooded environments. However, human factors research on the design of virtual environments has focused primarily on urban VEs which feature "carpentered" straight lines and corners, rather than on VEs designed to capture the more free-form shapes that are encountered in a natural outdoor environment.

Even research on the perception of non-virtual wooded environments has been limited, primarily focusing on the perceptual cues that aid in making assessments of tree height (Bingham, 1993a, 1993b), This situation has led researchers to argue that more work needs to be done on the perceptual salience of natural features (Darken & Banker, 1998; Cutting, 1997; Wann & Mon-Williams, 1996). Furthermore, because computing power may be limited and not all features of a complex virtual scene may be rendered using a high level of detail, it is important to understand which features of a natural environment are most noticed and recalled by participants (Hughes, Moshell, Sims, &Yu, 2000; Reddy, Watson, Walker, & Hodges, 1997).

The purpose of the present research is to examine memory for virtual trees so that VEs may be designed to focus on the salient features that are most remembered by a participant in a virtual world. An assumption of this work is that given the complexity of a typical VE, a user cannot attend to all visual features equally. Thus, some features become more salient than others. Furthermore, because users may have pre-existing knowledge of actual trees (schemas), they may be more likely to notice certain aspects of virtual trees. The research design is based on classic memory research (c.f., Bartlett, 1932) in which a participant is asked to view a virtual tree stimulus, is given a distractor task, and then is asked to re-create the virtual tree from memory using specially designed tree editor software. Based on this classic memory research paradigm, memory distortions are argued to reflect what the participants noticed (salient features) and failed to notice about the original stimulus (For more on this argument, please see Bransford & Johnson, 1972). Additionally, the present research evaluated memory for a typical symmetrical tree that might easily fit a participant's schema for a tree, as well as memory for a highly asymmetrical tree featuring a great deal of trunk and branch