

Modelling the allocation of visual attention using a Hierarchical Segmentation Model in the augmented reality environments for airport control tower

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Abstract

Augmented Reality technology allows the incorporation of computer generated graphical and textual information into a real visual environment. Augmented Reality (AR) applied to the Air Traffic Control domain is expected to enhance the performance of tower controllers. However, the introduction of additional information to the visual scene must be conducted with care in order not to increase the clutter, saturation or complexity of the scene. The Hierarchical Segmentation Model (HSM), based on contextual categorisation, and expressed by the mathematical formalism Galois Lattice, provides a visual complexity index derived from the distribution of the features over the objects. The model can be used to calculate the efficiency indicator for particular objects in the scene that represents the strength of the object in the given context to attract the visual attention of the observer. This paper presents the predictions derived from HSM compared to the experimental result of the eyes gaze data of sixteen participants scanning the controller's devices and the view out of the tower's windows. The results, expressed as frequency and dwell time of visiting the areas of interests (AOI), indicated that augmenting the objects with additional superimposed information attracted the visual attention of the observer to those objects.

Augmented reality for airport control tower

Controlling the aircraft at the airport surface requires complex operational knowledge exercised under time pressure. Introducing new technology to the safety critical domain like Air Traffic Control (ATC) should be carried out with special care.

The analysis of the activity of tower controllers showed that the major occupation of tower controllers is to monitor airport surfaces by looking out of the window (Hilburn, 2004a, 2004b; Pinska, 2007). Other activities are scanning the strips, synthesised flight plan and searching for various information provided through the