9.1 Scene Perception: applications to visual design

What is a scene? And how does our brain represent a scene? A scene is defined as "a semantically coherent view of a real-world environment comprising immovable background elements and multiple manipulable discrete objects arranged in a spatially licensed manner" [3]. We as human being have an impression that our brain creates a coherent, stable, detailed representation of the real-world scene. However, results from various experiments have provided strong evidence against this impression where people fail to detect changes that occur in images of real-world scenes during an eye saccade, or blink [5]. To explain this change blindness, Rensink proposed the coherence theory of attention which says "..focused attention provides spatiotemporal coherence for the stable representation of one object at a time……the allocation of attention can be coordinated to create a "virtual representation"……a stable object representation is formed whenever needed, making it appear to all higher levels as if all objects in the scene are represented in detail simultaneously" [5]. Therefore, in order to see changes in an object, focused attention at the object is needed at the time of the change. This essay illustrates some examples of how scene concepts could be applied to visual designs.

Our first example is related to the definition of a scene provided above. A simple example of a scene is a statistical graph or what is known as the X-Y graph (figure 1). The X and Y axes, and the coordinate field are the background elements of the scene, while the dots are the discrete objects. When viewing such a graph, we perceive it as a whole scene rather than individual objects such as axes, dots, and coordinates. However, by focusing our attention in specific elements (e.g. dots) we start to retrieve more details about these elements (e.g. x and y values). The scene conveys information to help viewers to interpret the placement of objects. It triggers the viewer to retrieve certain knowledge, and set up in their mind some expectations about objects type and placement in the scene [1].

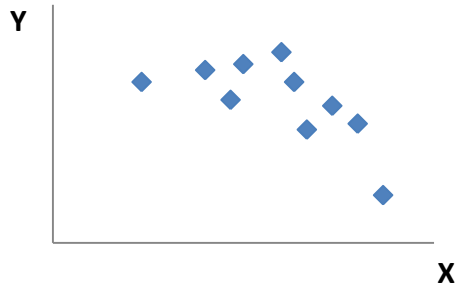

Figure 1: An X-Y graph

The second example is Gaze-contingent multiresolutional displays which use our visual limitation in seeing detailed representation of scenes to lower the requirement needed in displays. As indicated by the coherence theory, we retrieve detailed information about the scene only for those parts that get focused attention. These displays use this approach by tracking the eye movement to determine where the viewer is looking, and provide the highest image resolution wherever the viewer is looking, with lower resolution everywhere else (figure 2) [4]. Thus it saves processing resources and computational efforts needed to render scenes in those displays by just rendering high resolution for small portions of the scene at a time. This approach has

many potential applications in driving, flight and medical simulators; virtual reality; and video conferencing [4].

Figure 2: A gaze-contingent multiresolutional imagery with the center of high resolution at the viewer's gaze position

Taking the advantages of "change blindness" to make unattended changes invisible within a design is an example where disturbances could be eliminated. This could be achieved by many ways such as making changes during eye saccade or blink, or by making the change gradual [6]. This change blindness can be good for web developers, as it can help make gradual improvements, upgrades or changes unnoticeable so that it does not grab viewers' attention. It can be bad, however, if the marketing updates are not noticed [2].

In conclusion, this essay have shown how scene perception could be used to perceive statistical graphs, and how our brain limitation in the amount of details got from a scene could be used to reduce resources needed for rendering. It also shows how change blindness could be used effectively in web design.

References:

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