Summary of Pereption In Visualization

* **Perception in Visualization**

This Section outlines four sub-sections (or what the article calls perceptual properties) and describes how they have been used in visualization. These properties are color, texture, motion, and nonphotorealism.

* **Color**

We see color used all the time in visual designs.

**This section talks about techniques that attempt to control the difference viewers perceive between different colors, as opposed to the distance between their positions in RGB space.**

**This allows for:**

1. Perceptual Balance: A step anywhere on the color scale produces a perceptually uniform difference in color. (A change in color that I see is meant to be seen and is purposefully done). Not perceptually balanced would mean that blue transitions to teal then to green. Instead of blue to green.
2. Distinguishability: each color can be identified.
3. Flexibility: Colors can vary (doesn’t have to be all red hues)

They talk about how these techniques can be combined to result in a set of colors that is easier for viewers to visualize. While also giving more control over the color in your visualization.

* **Texture**

Can be broken down into several different perceptual dimensions.

These properties, or texture features include regularity, directionality, contrast, size, and coarseness.

Studies show that many of these features are perceived by the low-level visual system. They also show that size and density are most noticeable.

Studies on relief textures show interesting results of isotopic textures (all following a common direction). anisotropic (i.e., following different directions based on a property at that point on the surface).

They showed that if you choose either direction for an isotopic texture, that surface perception was as good or better than either principal direction alone.

* **Motion**

Motion in visualization is extremely noticeable.

It’s used in the animation of particles, dye, or glyphs to represent the direction of magnitude of a vector field (fluid flow visualization).

Motion can be used to highlight changes in a dataset across time.

This section outlines three properties of motion: flicker, direction of motion, and velocity of motion.

**In this section they are mostly interested in Flicker Frequency.**

Flicker frequency: The frequency of repetition measured in cycles per second that are perceived as flashed by the viewer.

Experiment that outlines the effectiveness of motion. Shows that when searching for a red circle in a visualization of red squares and blue circles, it can be extremely difficult to find the red circle. But if you move the red squares and blue circles in opposite directions, it become really easy to identify the red circle.

Motion allows for the viewer visual system to categorize/ separate the different groups and search them independently.

This really outlines how the properties of motion can be used in visual design to direct the viewers visual system and allow them to view the data effectively.

* **Nonphotorealism**

Researchers have studied the problem of producing photorealistic images, images that are in-distinguishable from photographs, for many years.

This section suggests researchers have a different approach. They feel that in certain situation, non photorealistic renderings are often considered more effective, appropriate, and even more expressive than an equivalent photograph.

We can see how different techniques from non photorealistic rendering can be used to improve the expressiveness of the data being displayed.

Fig 20 shows how a tone enhancement, sketching, color, boundary and silhouette enhancement, tone shading can take a photorealistic image and better outline/detail different parts of the photo.

Questions:

1. Does figure 17 show any relation to the previous topic discussed: feature Hierarchy? That is, how can the representation of color in these visuals be used to characterize and understand the data while also serving as a basis to classify/cluster the collection of this dataset? Which of the two visualizations most accomplishes this relation? **The first one because we learn that the visual system favors color over shape.**
2. Figure 18 uses what’s called relief mapping: a technique used to render surface details of three-dimensional objects accurately and efficiently. The use of different texture types and orientation has been studied and gives evidence that this can help show the shape of an underlying 3d object. What types of visualizations could benefit from the use of different texture types in this context? Specifically in changing the perception of the viewer towards the visualization. **Maybe a topological map, or a map of the ocean floor? This would show that certain areas of the map are deeper/taller than others.**
3. Which preattentive processing theories do you find most credible and convincing? Why?
4. Which types of data visualizations would preattentative processing theories be helpful in creating? How would they help guide your decision making while creating these visualizations?
5. How can our knowledge of postattentative processing (the idea that previewing a visual does not improve our time in searching for a target) guide our creation of data visualizations?
6. Does figure 17 show any relation to feature Hierarchy?  That is, how is color in these visuals used to characterize and understand the data? What can we infer from the color changes? Which of the two visualizations most accomplishes this relation?
7. What are some examples of change blindness we commonly see? How can change blindness be used to better visualize data? (or) How can knowing about change blindness affect how we model data?
8. Figure 18 uses what’s called relief mapping: a technique used to render surface details of three-dimensional objects accurately and efficiently. The use of different texture types and orientation has been studied and gives evidence that this can help show the shape of an underlying 3d object. What types of visualizations could benefit from the use of different texture types in this context? Specifically in changing the perception of the viewer towards the visualization.