Standing out in a Crowd: Motion Perception in Data Visualization

Visual motion is a feature that is preattentively processed, and it can be detected during the early stage of perception (Ware, 2012). Employing motion when displaying data can enhance the communication of essential information. Understanding the motion perception would allow a presenter to deploy movement more effectively, i.e., use it to highlight the data that needs to be perceived at a glance.

Motion in the form of animation can be used in statistical graphics. As such, animation facilitates the perception of presented information. Such motion could be utilized as transitions in statistical graphics in many different ways (Heer & Robertson, 2007). Motion can be employed when presenting data to depict how changes involved take place over a certain period of time (e.g. the demographic shifts in population). A scatter plot, for example, can become far more illustrative of reality when animated, especially when tracing several changing data points over time. Each circular plot might be animated to grow or shrink as it represents the increasing or decreasing population. Those data points can also move upward, downward, right, and/or left to show changes along the axes of information (e.g., x-axis might show average income, y-axis might show life expectancy). By animating the changes, the presenter would not need a new graph for every year. Although such techniques can effectively attract viewer attention and increase the level of engagement, the designer should consider the number and the speed of animated graphics that occur simultaneously. The overuse of motion can be a detriment to comprehension of the data while rapid motion might have the adverse effect of annoying the viewer.

The advantage of animation can be extended to serve educational goals. Teachers often rely on diagrams to simplify concepts and to help learners extract information of depictive representations. Compared to static diagrams, animated ones increase interest and motivation, and direct the learner's attention to process the content sufficiently, especially when the diagrams involve complex types of dynamics. For example, using animation to depict plate tectonics from Pangaea to the current age can encompass the true dynamic of the theory. The original landmass didn't simply break apart and settle into the continents we have now; rather, land masses drifted apart and came back together through the ages. In such complex diagrams, animation can offer a more detailed representation and help the learner to construct a more accurate mental model of the displayed data (Lowe, 2017).

The effectiveness of a display goes beyond attracting the interest of potential viewers, it also can enhance safety in things like digital dashboards in cars. The instrument cluster is a key component displaying current and accurate information, including urgent matters which require the immediate attention of the driver, like an overheating engine or the sudden proximity of an obstacle. A simple change in color of an icon may not be enough to draw the driver's attention, especially if the target is small and in the periphery of the visual field (Ware.2012), which would be the case when the driver is paying attention to the road. For information outside the central parafoveal region of vision, the use of motion would be a more appropriate technique in attracting the driver's attention and to reducing the cognitive load on processing critical information.

The process of data visualization transforms written information into images making it easier to be explored, discovered, and analyzed (Huber & Healey, 2005). As the amount of visual information increases to the extent that it exceeds our capacity to process all at once, motion helps guide the viewer's attention to the most salient points in a vast sea of data.

References:

Heer, J., & Robertson, G. (2007). Animated transitions in statistical data graphics. *IEEE transactions on visualization and computer graphics, 13*(6), 1240-1247.

Huber, D. E., & Healey, C. G. (2005). Visualizing data with motion. *In Visualization, 2005. VIS 05. IEEE* (pp. 527-534). IEEE.

Lowe, R. (2017). Designing static and animated diagrams for modern learning material. In Black, A., Luna, P., Lund, O., & Walker, S. (Eds.). *Information design: research and practice*. Taylor & Francis.

Ware, C. (2012). *Information visualization: perception for design*. Elsevier.