

Data Processing - Readings 3

Vincent Erich
10384081

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Questions

1. Ware (2008) describes two kinds of processes that are involved in perception: bottom-up processing, which is an information-driven process, and top-down processing, which is an attention-driven process. Bottom-up processing is influenced by top-down processing, and this can lead to a potentially wrong interpretation of “reality” by the viewer.

First, I will briefly explain bottom-up processing and top-down processing. Then, I will show an example in which top-down processing influences bottom-up processing.

Ware (2008)[p. 10-12] describes bottom-up processing as a three-level process. At the first level, millions of features are extracted simultaneously from the information that comes from the optic nerve. These features range from size and orientation information, to elements of motion and stereoscopic depth.

At the second level, the feature information from the first level is used to construct increasingly complex patterns (e.g., continuous contours). These patterns allow us to organize the visual space.

At the third level, the feature information from the first level and the complex patterns constructed at the second level are used to form objects. These objects are retained in the visual working memory and have both visual and non-visual attributes (e.g., concepts associated with the object). The visual working memory can retain about three objects at a given time.

Top-down processing involves a number of processes that influence bottom-up processing. These processes are driven by the need to accomplish a (cognitive) goal, and, as a result, cause a bias in favor of signals (e.g., features, or patterns) we are seeking or anticipating in order to achieve that goal. Therefore, we sometimes subjectively perceive to world, and

this can lead to a potentially wrong interpretation of “reality”.

Figure 1 shows a shape in a box. If you look at this figure, your brain engages in bottom-up processing, and you see two thick vertical lines and three thin horizontal lines. Since you are not trying to accomplish a (cognitive) goal, top-down processes do not cause a bias in favor of certain signals (e.g., features, or patterns).



Figure 1: A shape in a box. If you look at this figure, your brain engages in bottom-up processing.

Figure 2 shows the shape from Figure 1 surrounded by letters (left) and numbers (right). If the shape from Figure 1 is surrounded by letters (the left side of Figure 2), you expect the shape to be a letter and you are trying to complete the sequence (i.e., you are trying to accomplish a cognitive goal). In that case, top-down processes influence bottom-up processing, and you perceive the shape as the letter “B”. On the other hand, if the shape from Figure 1 is surrounded by numbers (the right side of Figure 2), you expect the shape to be a number and you are again trying to complete the sequence. In that case, top-down processes again influence bottom-up processing, causing you to perceive the shape as the number “13”.



Figure 2: The shape from Figure 1 surrounded by letters (left) and numbers (right). If you look at these figures, your brain engages in top-down processing.

This example shows how top-down processing influences bottom-up processing, and how this influence can lead to a potentially wrong interpretation.

tation of “relaity” by the viewer¹.

References

Ware, C. (2008). *Visual Thinking: For Design*. Morgan Kaufmann Publishers Inc., San Francisco, CA, USA.

¹The example has been adopted from the following website: <http://openpsyc.blogspot.nl/2014/06/bottom-up-vs-top-down-processing.html>