the plot in such a way that the ideal height-to-weight relationship is a perfect circle. Someone who is overweight will be represented as a squashed ellipse, while someone who is very thin will be represented by a tall ellipse. On the left side of Figure 5.21, we can see at a glance who is overweight and who is underweight.

The right-hand side of Figure 5.21 shows the same data represented using two separable variables: red–green variation for weight and vertical size for height. This is a poor choice, as it is very difficult to see who is overweight and who is underweight.

We can also apply the lessons of integral and separable dimensions to data glyphs designed to represent many variables. Figure 5.22 shows a field of data glyphs from Kindlmann and Westin (2006) in which three variables are mapped to color and many more are mapped to the shape of the glyphs. Detailed knowledge of the application would be required to decide if this is a good representation, but this is not our concern here. The point of showing it is to illustrate how the color-mapped variables tend to be seen integrally and independently (separably) from the shape variables, which also tend to be viewed holistically, making up the lozenge shapes.

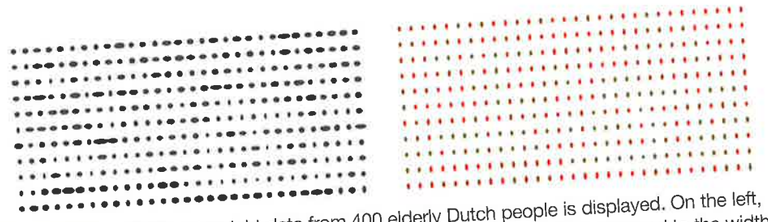

Figure 5.21 Height and weight data from 400 elderly Dutch people is displayed. On the left, height squared is mapped to the height of each ellipse and the weight is mapped to the width. On the right, weight is mapped to color and the width is held constant (red is more, green is less).

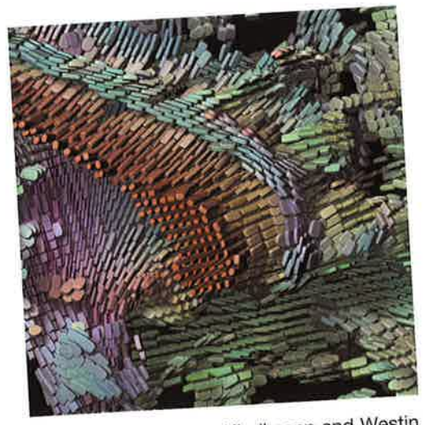

Figure 5.22 This map of a tensor field from Kindlmann and Westin (2006) has some variables mapped to the color of the lozenge-like glyphs and some variables mapped to their shape and orientation.

Integral–Separable Dimension Pairs

The preceding analysis presented integral and separable dimensions as if they were qualitatively distinct. This overstates the case; a continuum of integrality–separability more accurately represents the facts. Even between the most separable dimension pairs, there is always some interference between different data values presented using the different channels. Likewise, the most integral dimension pairs can be regarded analytically to some extent. We can, for example, perceive the degree of redness and the degree of yellowness of a color—for example, orange or pink. Indeed, the original experimental evidence for opponent color channels was based on analytic judgments of exactly this type (Hurvich, 1981).

Figure 5.23 provides a list of display dimension pairs arranged on an integral–separable continuum. At the top are the most integral dimensions. At the bottom are

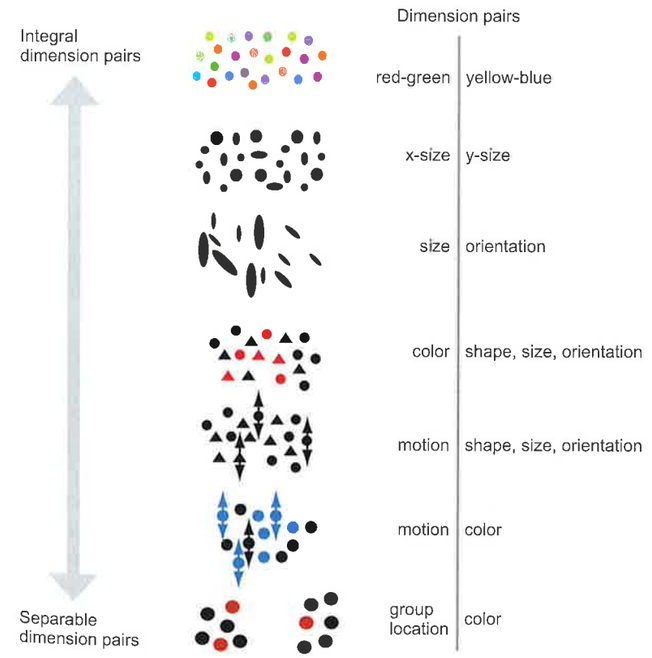

Figure 5.23 Examples of glyphs coded according to two display attributes. At the top are more integral coding pairs. At the bottom are more separable coding pairs.