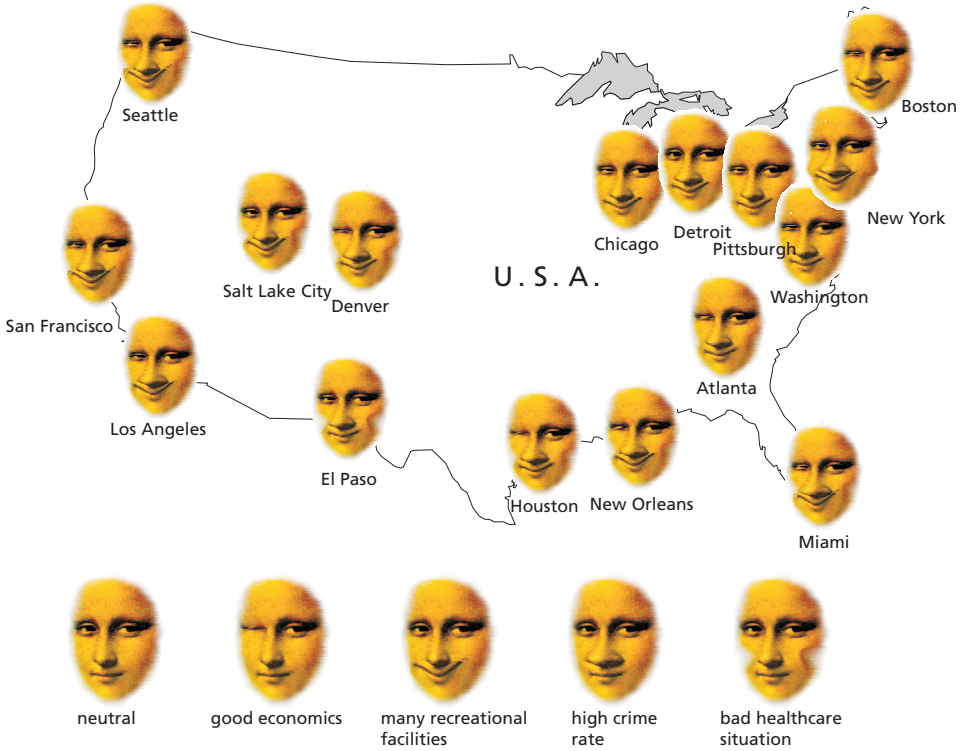

Figure 6.3: Mona Lisa faces as visual representatives of city rankings in the U.S.

6.2.1 Examples

Our visualization technique is based on the selection of a number of visual object attributes and the specification of visual prototypes representing a high data value against the global neutral object state. The visual prototypes are the base objects of the representation space. The correspondence between visual prototypes and data values induces a mapping from the data to coordinates, which are used to construct the actual visual representations.

We demonstrate the above procedure at application examples. In the examples we visualize data about U.S. cities from [Boyer & Savageau 1985] and the American Bureau of Concensus. Note that the examples are meant merely to demonstrate the technique of generating multivariate visual representations, and not to show the most effective way of communicating information.

In the first example we use warped images of Mona Lisa's face as base objects and visual prototypes (see figure 6.3). The idea of using faces as visual representations dates back to Chernoff [1973] and is advantageous due to human's native ability to recognize facial expressions. Note how morphing techniques add realism and additional degrees of freedom to this concept: An undistorted image is used as a representation of a neutral value. This image is distorted to represent good

economical situations (Mona blinks), many recreational facilities (Mona smiles), high crime rates (Mona's nose gets wider) and bad health care situations (Mona's cheeks tighten). Thus, the neutral face represents cities with bad economy, few recreational facilities, low crime rate, and good health care. In order to find data values that correspond to the intended meaning of the representations we simply scan the values for minima and maxima. The neutral face represents the smallest value in economics rating, recreation rating, and crime rating, but a high health care score. The other faces are based on the neutral face and add their specific characteristics (e.g.smile).

In the second example we use the 3D-model of a comic figure's hand (see figure 6.4). Note that navigating in the 3d-scene yields better access to the information than a single projection on 2D. The idea of using hands as glyphs is that, similar to faces, gestures are recognized intuitively by a human observer. However, we do not claim that this visualization is appropriate and effective for the given data. In this simple visualization example the neutral position is an open hand and each variate is represented by the flexion of one finger. A more sophisticated model could use hand gestures similar to those from sign languages. The process of connecting data values with objects is exactly the same as in the example above, as is the data set, now using the categories climate, economics, transportation and the arts.

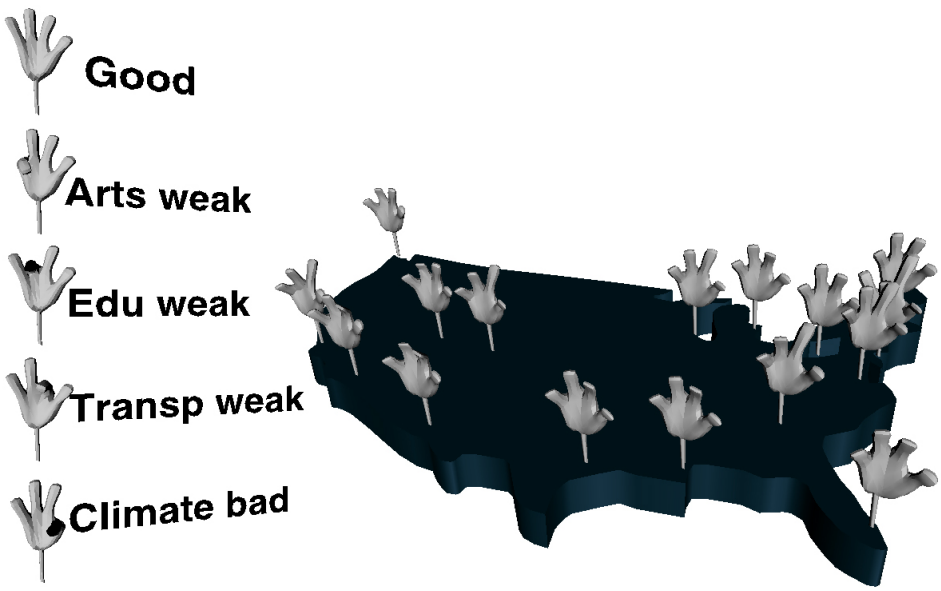

Figure 6.4: 3D hand glyphs generated by shape interpolation for the visualization of city rankings.

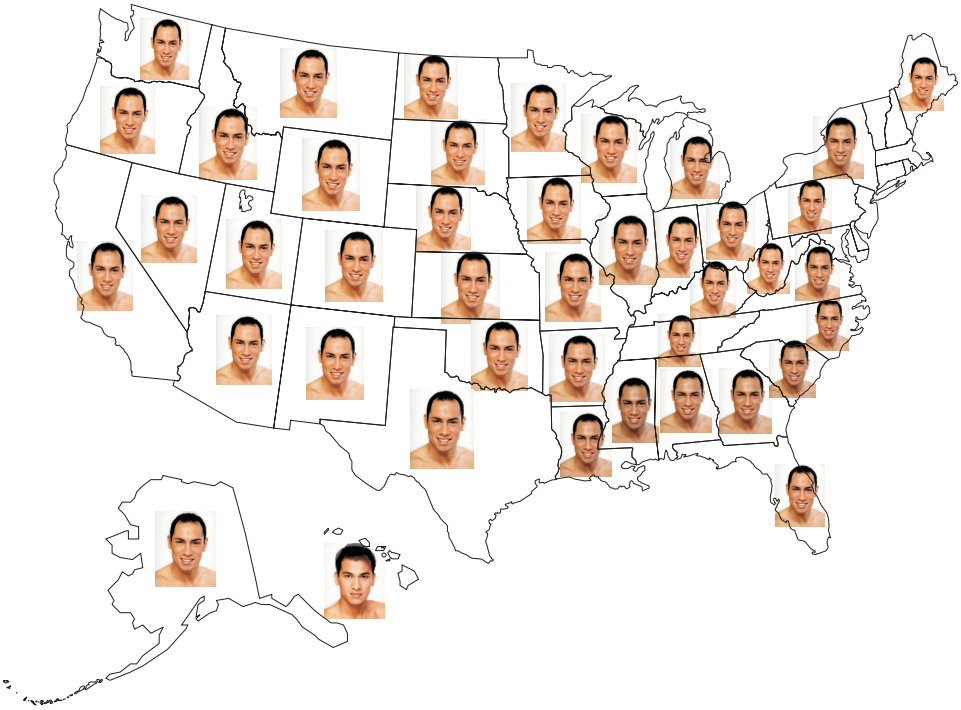

Figure 6.5: Ethnic distribution in the USA.

The third example shows the distribution of ethnic in the USA (see Figure 6.5). For each type of ethnical origin one prototype faces was used. Mergers of these faces represent the relative amount of people living in a particular state. This example shows how meaning of data could be connected directly to the visualization primitive being used.