Coding Rubric for "Acquired Codes of Meaning in Data Visualization and Infographics: Beyond Perceptual Primitives Composition"

The following describes the coding rubric for the content analysis reported in the paper:

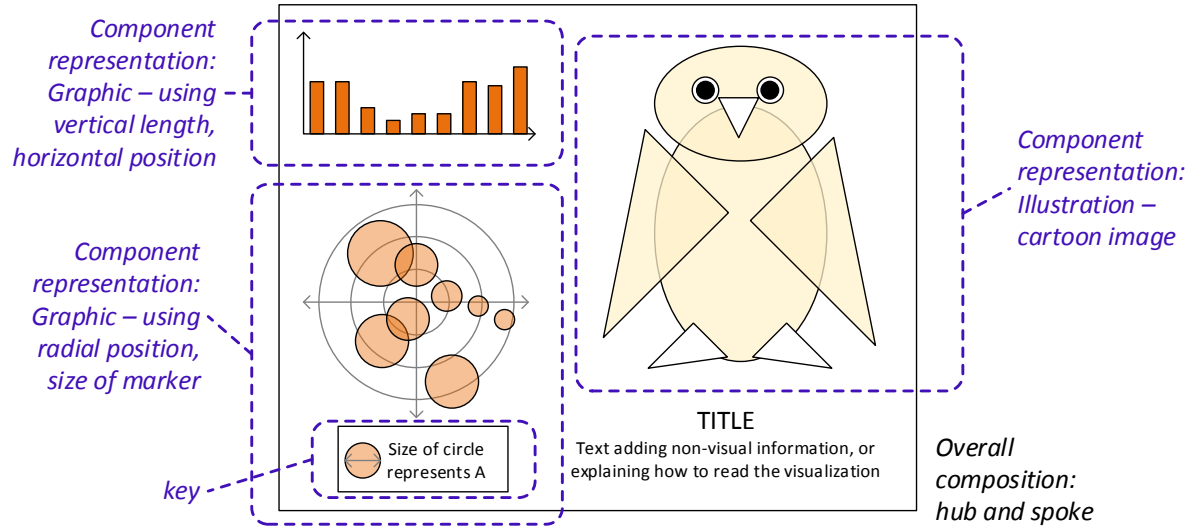
L. Byrne, D. Angus, and J. Wiles, "Acquired Codes of Meaning in Data Visualization and Infographics: Beyond Perceptual Primitives," Visualization and Computer Graphics, IEEE Transactions on, vol. PP, pp. 1-1, 2015.

Composition of Each Visualization

Coding direction: Classify the overall composition into one (and only one) of the following:

- **Central** - a single component visualization (cannot be broken into smaller pieces without losing meaning). Guides don't count as a separate panel.
- **Linear or panel** – Made up of 2 or more component visualizations, where there is no clearly larger representation. Cutting the visualization along either the vertical or horizontal would leave each component visualization intact.
- **hub & spoke** – Made up of 2 or more component visualizations, where one is clearly larger than the others.

Example for recognising component visualizations:



Elements in each Visualization

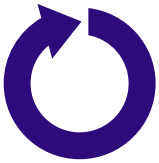
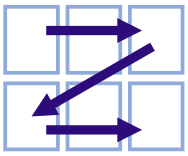
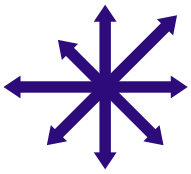
The remaining codes are elements which a visualization might contain, in 5 different groups:

- Time
- figurative roles
- figurative conventions
- graphic elements
- linear layouts not including time
- area markers

Coding direction: Looking at all the different components of a visualization, do any of them contain ***at least one*** example of the listed element?

Time

A visualization can contain elements from multiple time categories (e.g. 2 axes one of which is circular and the other horizontal), but each example belongs in only one category in each group (e.g. an axis can be circular or curved, but not both).

					
Horizontal	Vertical	Circular	Curve	Panel	Radial

- **horizontal** – time runs along a horizontal axis (if only 2 time steps it is not an axis, it is a panel)
- **vertical** – time runs along a vertical axis (if only 2 time steps it is not an axis, it is a panel)
- **circular** – units of time are separated by different angles around a circle. Must be a circle and not an arc
- **radial** – time radiates outwards (or inwards) from a point
- **panel** - 2 or more panels each one showing. Each panel can be graphical or figurative.
- **curve** (including non-circular arcs)
- **animation** – time is a different frame of the image
- **area** – the area of a shape stands for the length of time

Figurative roles

An illustration, photo or cartoon in a visualization belongs to one (and only one) of the following categories:

- **Frame**: An background/border image which provides context or reinforces the subject
- **Context**: An image in the body of the visualization which does not provide new information to the reader, but emphasises/communicates the subject of the visualization as a whole
- **Icons**: images used instead of or alongside text identifying a specific graphic element or component representation within the visualization.
- **Content**: Illustrations are part of the content of the visualization when they show what an object is or contains or how a process works. The distinguishing feature of content figures is that they contain new information which the viewer does not already know.

In addition to the above, is the image a map?

- **Maps**: A geographic illustration which is a city, country, region or world. Maps can be an example of content, context or caption.

Figurative conventions

These questions apply to content illustrations:

- **Cut-away**: does the figure cut an organic object into a geometric shape to show the contents of the object?
- **Magnifying glass**: is an enlarged image of an area or region (of an object including but not limited to geographic maps) linked to a broader view of the object? There needs to be an explicit link to the smaller scaled version.
- **Outline**: is the figure shown using outlines and either partial shading or transparent shading?

Graphic elements

- **Graphic**: Does the visualization contain a graphic representation – the use of points, lines, areas, volumes, size, position, shading, colour, angle, or shape to encode information. Networks are a graphic representation, as are isotypes (see area marker notes), bar charts, pie charts etc. The graphic representation may contain or be embedded in figurative elements.
- **Colour meaning:** Does the visualization contain conventional colour meaning? Not including images like maps and photos where the image is shaded according to the object colour. Colour meaning is the use of colours where the colour has a meaning relating to the subject (e.g. pink for girls, blue for cold or water).

Area markers

This category applies to visualizations which have area markers: multiple shapes (of the same type), where the area of each shape indicates the value of a data point. Area markers are different from graphics where a single shape is divided into portions (pie charts and similar). Shapes of the same size stacked up to represent a single quantity (isotypes) are also ***not*** counted as area markers. The key criteria is whether an area or volume judgement is needed to determine the values (area marker) or a distance, position or angle judgements could be used to provide accurate results (not an area marker).

Does the visualization contain at least one instance of the following shape being used as an area marker?:

- **Circles**
- **Squares or rectangles** (including treemaps)
- **Other geometric** (ovals, triangles, hexagons etc)
- **Icons**

Numbers on markers: are the values annotated on or near each marker? If the visualization contains more than one use of area markers, are any of them annotated?

Linear Layouts (not time)

This category applies to visualizations which have a horizontal or vertical axis where the unit is not time. In the case of 2D axes where one axis is time, the non-time axis should be considered. An axis with negative values runs in the direction from its lowest to highest value (i.e. -140 → -2).

Does the visualization include an example of data running along a:

- **horizontal (left to right)** axis
- **horizontal (right to left)** axis
- **vertical (bottom to top)** axis
- **vertical (top to bottom)** axis