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Modeling Assignment Proposal 2
February 18, 2004

Seeing is Believing?

Purpose:

We attempted to show younger students that the visual system perceives pieces of our environment and must integrate them into a meaningful whole. This integration is not very well understood and so is termed the binding problem. Our take-home message was that during visual processing the brain has to make sense of pieces of the environment and although it usually gives us an accurate picture of the world, it can make mistakes. In our explanations we used a poster to illustrate segmentation and binding, a hands-on activity using Lego models as a metaphor of binding, and a poster of visual illusions.

Methods:

Features segmented by the visual system include color, line orientation, contour, texture, depth, and motion. The poster will lay out these fundamental concepts of visual processing and how information is taken in by the retina, segmented into parallel visual pathways, and integrated back into a coherent picture of the world. The image of a 'T' will be used to illustrate this concept (see poster 1).

The second part of the presentation will include two Lego models that the younger students will be instructed to assemble. They will be split into two groups and each group will assemble one model so they all have a chance to contribute. Each student will be a neuron pathway in charge of certain features (pieces), and work together to assemble a whole object. This is meant to show how the brain, with the right pieces, is quite accurate at binding, or integrating, features into an understandable whole. When finished, the two models will look a little different, perhaps radically so if the students decide to get really creative. The bottom line at this point is that the brain somehow (nobody really knows how yet) the brain puts together pieces of the world to give us a complete picture of what it looks like. Sometimes the brain even mistakenly puts a picture together that doesn't really make sense, as in a visual illusion.

If there is enough time allotted per presentation, a series of common visual illusions can further demonstrate the concept of binding and mistaken interpretation (see poster 2). What one sees in the illusions is a complete picture that must involve binding, yet upon careful inspection, one can tell that it does not make coherent sense.

The model's limitations include, of course, that the concept of visual integration is greatly oversimplified. The synchrony theory of how binding occurs explains why we see what we do by analysis of frequency information. This is something that is extremely difficult to model in an interactive and understandable format. Lego models seemed ideal to illustrate just that the brain does bind to help us understand the features of a whole object in our environment.

Materials:

- Poster board or large-scale printout of how visual pathways segment information
- Two small Lego sets

- Visual illusions
- Table/easel for poster presentation and Lego setup