

'Clutter detector' could cut confusion

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MIT student Lisa Nakano, left, a senior in brain and cognitive sciences; Ruth Rosenholtz, principal research scientist; and graduate student Yuan Zhen laugh at the clutter in an office. The three have identified a way to measure visual clutter. Photo / Donna Coveney

The danger of clutter--especially on a visual screen--is that it causes confusion that affects how well we perform tasks. To that end, visual clutter is a challenge for fighter pilots picking out a target, for people seeking important information in a user interface, and for web site and map designers, among others.

Now, a team of MIT scientists has identified a way to measure visual clutter. Their research, published Aug. 16 in the *Journal of Vision*, could lead to more user-friendly displays and maps, as well as tips for designers seeking to add an attention-grabbing element to a display.

"We lack a clear understanding of what clutter is, what features, attributes and factors are relevant, why it presents a problem and how to identify it," said Ruth Rosenholtz, principal research scientist in MIT's Department of Brain and Cognitive Sciences (BCS) and the paper's lead author.

The fact that one person's clutter is the next person's organized workspace makes it hard to come up with a universal measure of clutter. Rosenholtz and colleagues modeled what makes items in a display harder or easier to pick out. They used this model, which incorporates data on color, contrast and orientation, to come up with a software tool to measure visual clutter.

To be useful, such a tool has to capture the effect of clutter on performance. In their paper, Rosenholtz and her colleagues-- MIT BCS graduate student Yuanzhen Li and BCS undergraduate Lisa Nakano--tested the influence of clutter on searching for a symbol in a map, like an arrow indicating "you are here." They found good correlation between the time it takes to find a symbol in a map and the amount of clutter according to their measure.

In earlier work they also showed that their clutter detector correlates well with human subjective judgments of clutter. In that case, the team asked 20 people to rank 25 maps of the United States and San Francisco in order from most cluttered to least cluttered. The maps ranged from a gray and green map of the 50 states to a San Francisco Bay area map overlaid with lines, words and colors.

Although there was a fair bit of disagreement among the people being tested about what constituted clutter, when the researchers compared results from their clutter measure to those of their human subjects, they found a good correlation.

Rosenholtz next plans to offer this visual clutter tool, as well as other tools developed in her lab, to designers as part of a user study. She hopes to learn what insights designers get from knowledge of how a user will likely perceive their designs, and how best to present this information to the designers.

Rosenholtz provides free software written in MATLAB to anyone interested in generating color and contrast "clutter maps" to gauge the clutter level of a display. The tool is available at web.mit.edu/ruth/www

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Source: MIT

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