

# Observer Effects in 3D Search from Classification Images

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**Rationale:** In this study we examine search performance for 3D localization tasks in Gaussian random textures in which subjects are able to freely scroll through the image as part of their search for the target. We investigate two target sizes, corresponding to 1mm and 4mm diameter spheres that have been blurred with a system MTF. Targets are embedded in two different noise textures (white noise and  $1/f^3$  power-law) for a total of four conditions.

The classification image technique directly estimates the weighting function used by observers for this task, and allows us to probe the depth direction, which is not directly views in our display, relative to the lateral directions which are viewed. We are particularly interested in whether subjects can efficiently integrate across multiple slices in depth as part of performing the localization task.

**Methods:** We have adapted the classification image technique to 3D search tasks. Our particular task is a 3D forced localization task, in which a subject searches a 3D volume, and indicates the location of a target signal. Subjects know that only one target is always present in an image at an unknown location. They make a single localization response indicating the position of the target. The image display we use allows subjects to freely scroll through the volumetric image, and a localization response is made through a mouse-click on the image. Localization responses are considered correct if they are close to the target center (within 6 voxels).

The classification image methodology uses noise fields from the incorrect localizations to build an estimate of the weights used by the observer to perform the task. The basic idea is that incorrect localizations occur in regions of the image where the noise field matches the weighting profile, thereby eliciting a strong internal response.

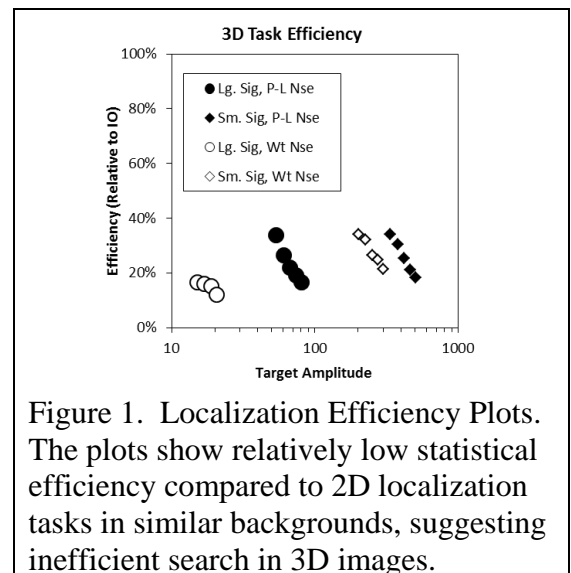


Figure 1. Localization Efficiency Plots. The plots show relatively low statistical efficiency compared to 2D localization tasks in similar backgrounds, suggesting inefficient search in 3D images.

**Results:** Our results consist of reporting on observer performance through statistical efficiency with respect to the ideal observer, and showing the weighting schemes estimated by the classification images. An example of subject efficiency in the 3D task is plotted in Figure 1

**Conclusions:** At this stage the main conclusion is that the classification image technique can be used to investigate the spatial weighing – including weighting across slices – used by observers in 3D free-search tasks. At the meeting we will describe more fully the 3D classification images derived from our experiments.