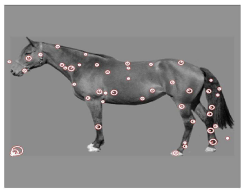
Computer Vision Methods Used to Measure Image Similarity

Appendix for *Unraveling the visual and semantic components of object representation. Leeds, Seibert, Pyles, Tarr*

SIFT (Scale-Invariant Feature Transformation)

Identify points of interest in picture and define scaled, rotated frame around each point. Features in each frame represent the presence of edges at multiple scales and orientations. Resulting representation exhibits invariance to spatial shift, rotation, and scale.

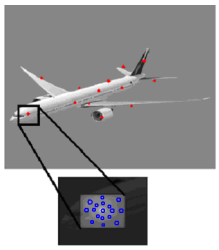


Circle size and line direction represent frame scaling and orientation

D. Lowe. "Object recognition from local scale-invariant features." International Conference on Computer Vision, 1999.

Geometric Blur

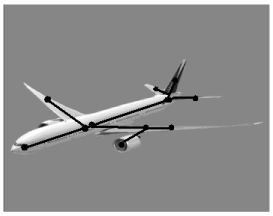
Select points along edges. For each point, features are obtained by blurring the portion of the picture around the point and taking samples evenly distributed across the blurred region.



A. C. Berg, T.L. Berg, and J. Malik. "Shape matching and object recognition using low distortion correspondence." IEEE Computer Vision and Patter Recognition (CVPR), 2005.

Shock Graph

Use a graph (set of nodes and edges) to represent the contours of each object's silhouette.



K. Siddiqi, A. Shokoufandeh, S. J. Dickinson, S. Zucker. "Shock graphs and shape matching." International Journal of Computer Vision, 35(1), 1999.

Scene Gist

Represent each picture as a weighted set of components (cf, PCA), where each component captures a common spatial frequency property of natural scenes. Features are component weights.

Image from Doi et al., 2003

A. Oliva, A. Torralba. "Modeling the shape of the scene: a holistic representation of the spatial envelope." International Journal of Computer Vision, 42(3), 2001.