Feature-Based Salience Detection

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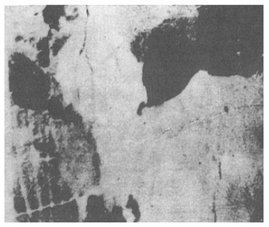
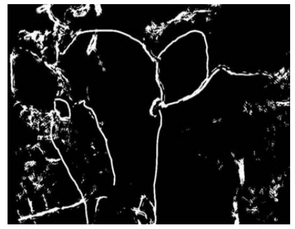
Salience

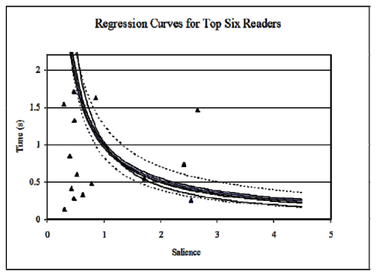
Salience is defined as the extent to which an object catches the eye of the viewer or the amount an object in an image "pops out". An object may have several different features, which make it salient. For example, an object with a markedly different color or orientation may be salient when compared to its environment. Currently, several software packages exist, which calculate salience using a wide range of models and implementations.





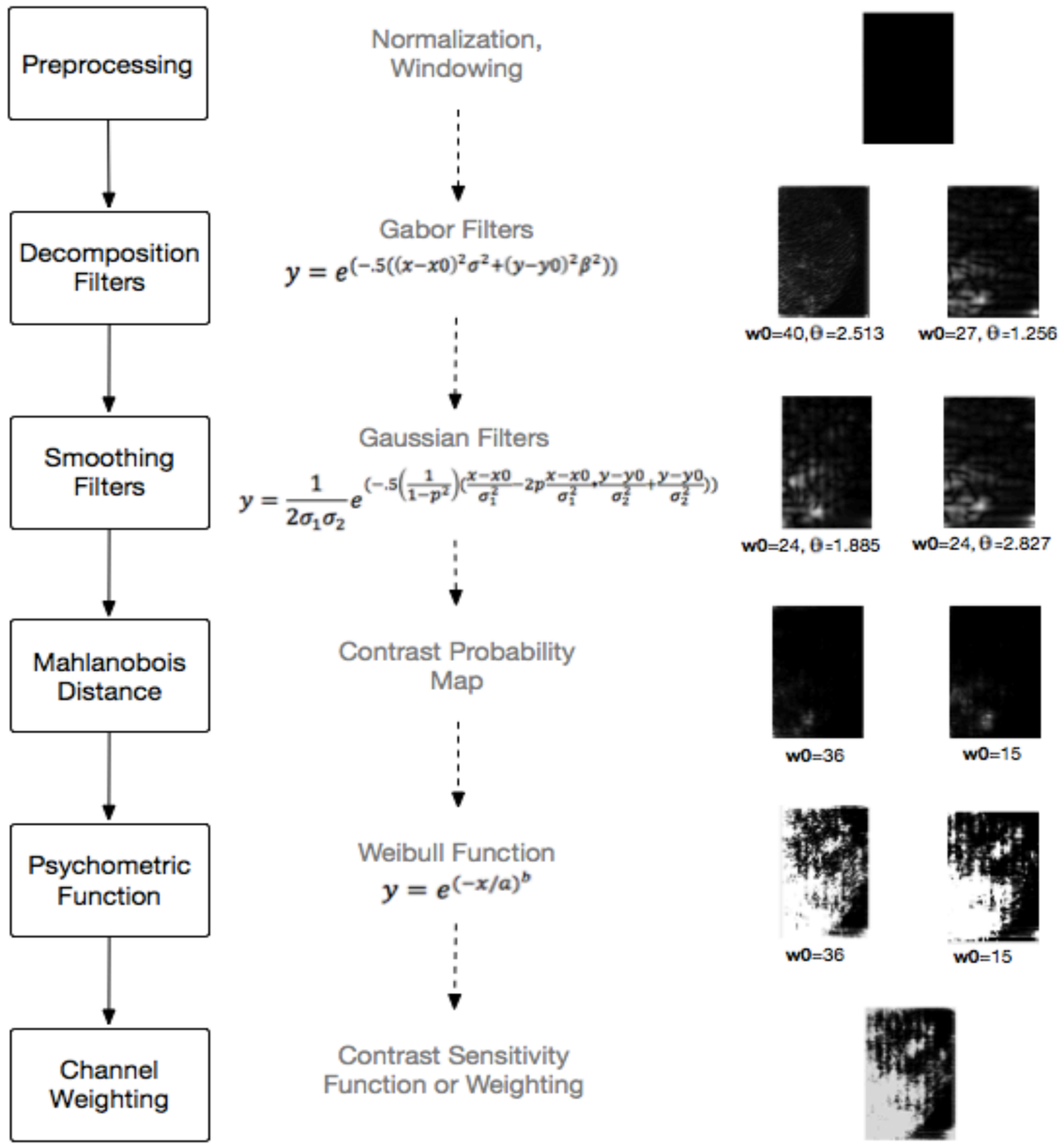
SALIENCE AND MAMMOGRAMS

For experienced mammographers, the time until a region of a picture is first viewed is correlated with the salience of that region. Furthermore, salience has been correlated with instances of malignancy in mammographs. Here we are attempting to recreate and refine software originally created by Perconti [2], which uses salience to analyze medical images and, eventually, to detect tumors. Our neurobiological model creates a series of maps for individual salience features based on orientation and frequency and, then, combines those individual feature maps into an overall map of salience for the entire picture.



SALIENCE SOFTWARE

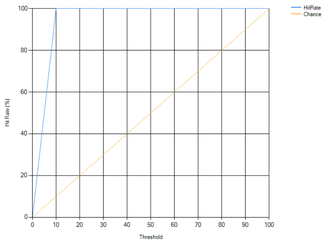
Salience Software Flow Diagram



Salience Output

RESULTS

Currently, our software shows a high AUC of 1.0 and relatively low Kullback-Leibler divergence, indicating that all of the salient points identified by our software were also identified as salient points in the ground truth eye-tracking data. Additionally, all points identified by our software as salient are included within the top 10% of the thresholded ground truth fixations as seen below.



POTENTIAL APPLICATIONS

This software could be used as an aide to mammographers attempting to identify benign and cancerous tumors. Additionally, it could be used to supervise abnormal surgeries and to train medical students. Also, this software could potentially be expanded by temporal salience, where it could be used as an aide when analyzing medical video clips like cardiac MRI.

REFERENCES

[1] Daly, Scott. "The Visible Differences Predictor: An Algorithm for the Assessment of Image Fidelity." *Human Vision, Visual Processing, and Digital Display* 1666 (1992): 179-206.

[2] Perconti, Phil, Loew, Murray H.. "Salience measure for assessing scale-based features in mammograms." *J. Opt. Soc. Am. A.* 24.12 (2007): 81-90.

[3] Watson, Andrew B., Solomon, Joshua A. "Model of visual contrast gain control and pattern masking." *J. Opt. Soc. Am. A* 14.9 (1997): 2379-2391.