Fraud in Trademarks

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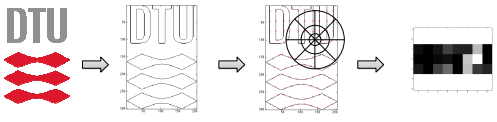
Abstract

Companies use trademark logos to market their services and products, and the logo is of significant value to them. For this reason, companies want to avoid illegal use of similar trademarks by other companies. In this project, we investigate methods of automatically comparing trademarks to assist companies' legal departments in detecting fraud. We investigate three different image similarity measures and evaluate their performance.

Shape Context

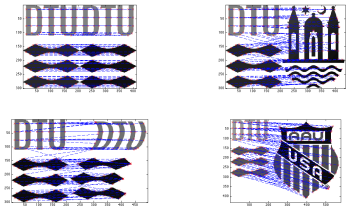
For each logo, a number of points representing the shape is found. For each point, a log-polar shape context histogram is calculated. The correspondence problem between points in two images is solved by comparing all histogram pairs and matching points using the Hungarian algorithm. Logos with low matching costs are assumed to be the best matches.

Steps in extraction of shape context descriptors



Original | Edge filter | Point samples | Shape context histogram

Results



Self-Similarities

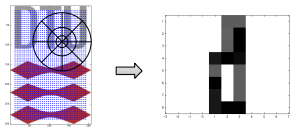
Self-similarity descriptors are computed for a grid of points in each logo. The descriptors are log-polar histograms, describing internal geometry of local self-similarities. This method is suitable for extracting similarities based on color, edges, texture and repetitive patterns.

From all descriptors computed from our database of logos, we use the k-means algorithm to find 50 clusters of descriptors. Then, for each logo we count how many descriptors belong to each cluster, resulting in a 50-bin histogram for each image.

Based on this, we can compare trademarks by simply comparing histograms.

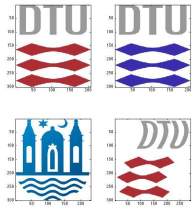
To improve this, methods for filtering out non-informative descriptors, and algorithms for selecting a good "ensemble of descriptors" can be used, as suggested by Shechtman and Irani [1].

Computing descriptors



Grid of points for descriptor computation | Histogram descriptor

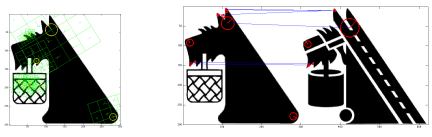
Results



SIFT

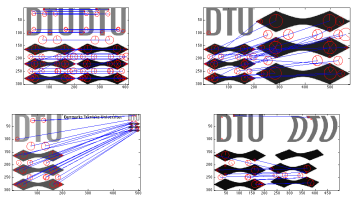
SIFT descriptors are found using the VLFeat library [2]. Descriptors are found where the second order derivative is high, meaning a high variation in a local region, and the descriptors contain a signature of that region.

Descriptors in two images are compared by their distance to each other using a matching algorithm from the VLFeat library. Trademarks with many matching descriptors with the same orientation are assumed to be good matches.



SIFT descriptors | Matching

Results



Conclusion

Shape context has a great potential for tredemark fraud detection, as trademarks in general have more shape than texture. However, our algorithm need to be made more robust.

Matching of local self-similarities is a flexible method, providing good results for trademarks with similar geometrical features, even if they have siginificantly different image properties.

SIFT descriptors got less attention in this project, but looks promising. SIFT seems to work good for photos, but our results suggest it is also a plausible solution for the trademark problem.

References: [1] Eli Shechtman and Michal Irani: Matching Local Self-Similaritiesa across Images and Video, [2] Andrea Vedaldi and Brian Fulkerson: VLFeat, www.vlfeat.org