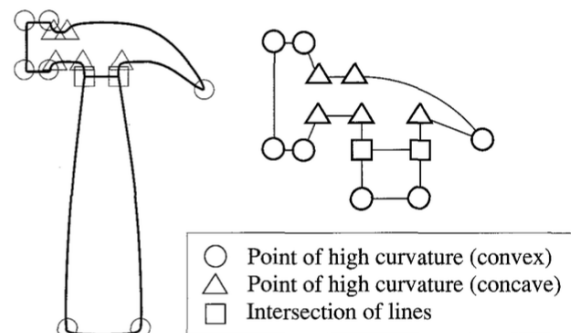
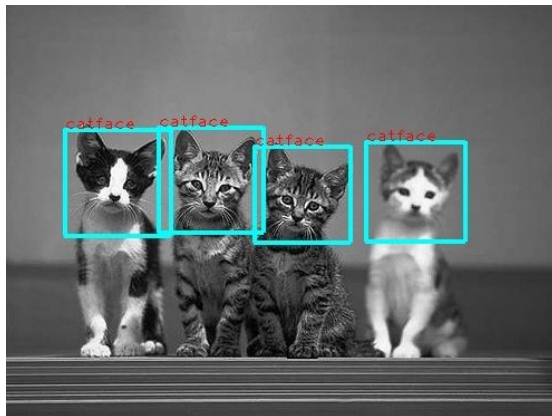


Project Proposal

We are interested in investigating Machine Learning algorithms for object recognition and classification through static image analysis. Ideally, we would be able to develop a generic algorithm that can learn three dimensional features of an object based on samples from different scales and orientations. This is a very difficult task, however, and so we may decide to restrict the space of the problem if we run into unforeseen issues. Current well known methods typically involve the use of SIFT features as a reliable means of matching related image patches, however, we are curious to find out if there are better ways of extracting features to identify matches and accurately differentiate between regions of interest. Some potential algorithms that we may survey include SVMs, Gaussian Mixture Models, and Neural Networks. These methods are known to work well as classification tools and we aim to be able to use MATLAB to prototype versions of these algorithms before deciding on a final implementation. We are still, however, contemplating on whether or not to use standard image features or to learn new features from a large dataset.

An application of this project that we are considering is the recognition of mechanical tools, such as a hammer or drill, as it would be very useful for instance for a robot to abstractly identify (and possibly use) such a tool in a human workspace. We plan on creating a database of sample images by web-scraping from sites like Google. Our main limitation might be obtaining a diverse enough set of images in order to avoid overtraining based on a small set of common features. The goal is that the algorithm can robustly differentiate between similar-looking objects and so this will require thorough training.



References:

- o <http://cbcl.mit.edu/cbcl/publications/ps/heisele-x3hei.lo.pdf>
- o http://www.cv-foundation.org/openaccess/content_cvpr_2014/papers/Erhan_Scalable_Object_Detection_2014_CVPR_paper.pdf
- o http://www.cse.usf.edu/~r1k/MachineVisionBook/MachineVision.files/MachineVision_Chapter15.pdf
- o <http://papers.nips.cc/paper/5207-deep-neural-networks-for-object-detection.pdf>