

How Natural are Natural Scenes?

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Human observers are capable of detecting animals within novel natural scenes with remarkable speed and accuracy. We successfully used linear discriminant analysis to classify a set of 11.000 images into "animal" and "non-animal" images based on their individual amplitude spectra only, however evidently humans do not use this kind of representation in classification tasks (Drewes, Wichmann, Gegenfurtner, VSS 2005 & 2006).

We present a new approach, representing the images from our database by means of frequency, orientation and location. While we were able to improve our general classification performance to 78%, we discovered what appears to be a photographically induced artifact in the animal images of the Corel Stock Photo library: the consistent use of depth of field causes upper image regions to be out of focus, while the image center is always well focused. This affects the distribution of high-frequency energy within an image, explaining why simple classifiers can reach relatively high classification accuracy. However, this does not correlate to human performance. When comparing the well-known Corel Stock Photo library [CSPL] to the newly introduced Tuebingen Natural Image Database [TNID], we recognized comparatively small differences in the accuracy of both our algorithmic classifier (CSPL:78% vs. TNID:73%) and our human subjects (CSPL:89% vs. TNID:81,0%), yet a large difference in the accuracy of the artifact-independent computer classification (CSPL:74% vs. TNID:62%). A detailed analysis of the distribution of relevant information revealed a strong bias towards the upper image half with the center depressed in the Corel database, as opposed to a strong bias towards the lower image border and image center in the Tuebingen database.

These results show a strong effect in a popular image database, greatly affecting algorithmic classification while barely affecting human performance.