

Image Informatics using Invariant Features

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Invariant features that summarize images, including SIFT and SURF, have been used very extensively to good effect in the field of computer vision, mostly in the analysis of 2D images. Invariant features summarize the contents of images by first localizing a collection of salient keypoints in scale space, and then summarizing local image contents. The extracted features are of general utility and provide a rich summary of the image contents that can be used for many analysis tasks, they serve to substantially reduce the size of the data, enabling large studies.

We developed a 3D SIFT-RANK method that augments standard SIFT by applying a rank transformation on the histogram contents, this serves to increase robustness. I will describe applications of this technology in a variety of applications, including image registration and disease characterization, highlighting the prediction of clinical COPD (GOLD) status in a 10K subject CT data set.

Several themes appear in this research. After feature extraction, which can take minutes per scan, subsequent analysis usually proceeds quickly, typically seconds per subject. Empirically, good results are obtained in multiple domains using these generic features and simple algorithms.