KWANG SOO YANG

Scale Invariant Feature Transformation (SIFT)

Since the time of Harris's corner detector, a lot of methods to detect the distinctive features were devised. SIFT is also a widely used algorithm to find the invariant features and it has efficient mechanism to match the two images with different views. SIFT has special characters to maximizing the matching ratio. The first one is that SIFT could find the invariant features as scale, rotation, differing view and illumination. The next one is that SIFT could find a lot of distinctive features with small images.

To detect distinctive features, SIFT has 4-step processes. First, it creates an image pyramid with Gaussian function. With the Gaussian kernel method, we can give differing scales and views to an original image and make a hierarchical structure with octave. And then we could get the different value between each pyramid images (DOG). With this difference of Gaussian images, we can calculate the local maximum and minimum against 26 neighbors points. It is because that the local extrema is a distinctive invariant feature to scale. Second, the local extrema may contain the unstable points. Thus noise-sensitive and edge responsive points should be removed. Third, with the gradient and orientation magnitude, we can compose the histogram to find the invariant features against affine changes. Histogram is an important matching tool to find the same point among a different images and the size of histogram affects the performance in the image matching. Finally, with these features, we can compose the keypoint descriptor.

With known keypoint descriptor, we can compute the matching with database system. Actually, it has a good performance in image matching. However, since the author has a patent to the algorithm, it is hard to use and propagate in commercial industries. Furthermore, because SIFT has several steps to find the invariant features, it could be slow in poor performance computers. In my opinion, it may be expensive to implement the SIFT algorithm to real-time systems.

To sum up, SIFT is a well-devised algorithm to find the invariant features with scale, rotation, differing views. And if we can reduce the computing time, it could be applicable to various purposes.