ABSTRACT

Many image processing applications often require comparing or combining information provided by multiple images. Image matching and registration are the fundamental steps towards attainment of such tasks. The primary aim of this work is to understand and implement concepts of various image matching and registration methods. Image registration is the process of overlaying images (two or more) of the same scene taken at different times, from different viewpoints, and/or by different sensors. The registration geometrically aligns two images (the reference and sensed images). Reference image remains unchanged and sensed image is to be transformed. The transformation should be selected such that sensed image is aligned with the reference image. The methods used for registration should be selected based on the various criteria like application area, dimensionality of data and computational cost.

In this thesis, the image matching and registration techniques (feature based and intensity based) have been implemented on various images such as license plate, books, natural, MRI medical images, and satellite images. Intensity based methods have been implemented using mutual information and correlation methods, whereas feature based methods have been implemented using scale invariant features and stroke width features.

Medical image registration can be applied to images of the same person acquired by different modalities like MRI, CT, PET (multimodal image registration) or at different time interval (multi temporal image registration). Mutual information based MRI image registration has been carried out in this thesis.
Image matching has been implemented using increment sign correlation and M – Estimator correlation coefficient. Correlation based methods finds correspondence for a pixel in the sensed/template image is done by searching of same size window in the reference/ target image. M – Estimator based correlation makes the registration algorithm robust to occlusion, clutter, illumination changes and noise by suppressing the influence of outlier points.

Image matching and registration is one of the most crucial steps for the analysis of satellite images. Satellite image registration requires intensive computation attempt because of continuous increase in image size and spectral bands. High performance computing algorithms are required to register satellite images. High performance can be achieved by reducing the search space, search data and parallel processing. In the present work, the reduction in search space has been implemented using Particle Swarm Optimization (PSO) for multi view image registration. So this method will save the time compared to correlation based method which will find correlation at each and every position. Also a quality assessment parameters like RMSE, PSNR, CC, SSIM between transformed sensed image and registered image is been computed.