ABSTRACT
Gungor, Oguz. PhD, Purdue University, May, 2008. Multi Sensor Multi Resolution Image Fusion. Major Professor: Jie Shan.

Panchromatic and multispectral images are very useful for the acquisition of geospatial information about earth surface for the assessment of land resources and environment monitoring. Panchromatic images usually have a better spatial resolution than the multispectral images of the same sensor while the multispectral images provide spectral properties of the objects. Image fusion methods are needed to find and transfer the missing spatial detail into the multispectral images without distorting their spectral contents. This dissertation categorizes the image fusion methods as color-based, wavelet transform-based, and statistical image fusion methods based on how they extract the missing spatial detail from the panchromatic images. The mathematical and physical properties of representative methods are described thoroughly. Based on the advantages and the limitations of the existing fusion methods, studies are made either to enhance the performances of the existing methods or to provide new solutions to the image fusion problem. The performances of the existing and the proposed methods are tested using four satellite image sets of the same and different sensors. Fusion results are evaluated both visually and quantitatively with discussions on the properties of the representative fusion methods.