Perspective forward enhancement in boundaries of satellite image via BO-TDyWT for precise delineation and accurate measurement

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Delineation of vegetation and water body regions on the earth's surface plays a vital role in the development and planning of an area. For delineation, traditional algorithms and classifiers require more training datasets and interpretation time. For accurate delineation, geometric distortion and mixed pixels in satellite images need to be removed. Geometric distortion is due to various factors such as relief displacement, variations in the satellite altitude and attitude, and curvature of the earth's surface. Mixed pixels arise due to different types of land cover in an area. In this study, the Bayesian optimized transverse dyadic wavelet transform (BO-TDyWT) algorithm enhances the edges and curvatures of a region in an image. BO-TDyWT classifies the vegetation and water bodies in LANDSAT image, which consists of different terrains such as hilly, land and coastal regions. BO-TDyWT removes the geometric distortion and mixed pixels in the hill area water body. Performance of proposed BO-TDyWT algorithm is compared with dyadic wavelet transform and TDyWT. From the results, BO-TDyWT accurately delineates hill areas, vegetation and water body areas than dyadic wavelet transforms and TDyWT. BO-TDyWT results are ground truth verified. The BO-TDyWT algorithm accurately delineates vegetation and water bodies for precise measurement with an accuracy of 96%, which is higher than TDyWT.

Keywords: Dyadic wavelet transform, geometric distortion, mixed pixels, satellite images.

energy and obtain the earth's surface as an image. Passive sensors use sunlight and obtain the earth's surface as an image. LANDSAT satellite uses passive sensors to create images[1]. Satellite images are processed with various algorithms to improve their quality. Satellite image processing algorithms reduce different types of noise such as Gaussian and speckle, in an image and remove geometric distortion and mixed pixels for precise classification of various classes.

Geometric distortion is an error in an image due to the difference between actual and ideal image coordinates. Geometric distortion is classified as internal and external. Internal distortion is due to scanning optics rotation. External distortion is due to the shape of the object on the earth's surface and the altitude of the sensor on the satellite. Internal distortion is a systematic distortion because of the correction values. External distortion is a non-systematic or random distortion. Random distortion removal is more difficult than systematic distortion because of its unpredictability. Geometric distortion needs to be reduced before delineation of an area and for the extraction of information such as vegetation and water bodies from satellite images. Pixels in an image are classified as mixed and pure. Pure pixel consists of any single class, such as coastal, water bodies and vegetation, while mixed pixel is a combination of classes. Mixed pixels differ from each other. Categorization of classes from satellite images is difficult due to the mixed pixels. Furthermore, mixed pixels lead to inaccurate delineation of subclasses such as vegetation and water