Abstract

Road extraction from very high resolution remotely sensed images is crucial in many urban applications. Acquiring automatically up-to-date and accurate information about roads is significant for various intelligent applications such as smart vehicle navigation, planning urban areas, roads monitoring and traffic management for intelligent transportation systems, and leading proper military operations. All possible knowledge about roads properties must be incorporated in designing intelligent systems that interpret and decide with high precision the existence of roads in remote sensing images. Various extraction techniques rely on mathematical morphology (MM) that detects desired road structures through a sliding standard and empirically chosen structuring element (SE) over the input image. In this paper, we design an intelligent process that not only combines spectral and spatial properties of roads but also impacts significantly the flexibility in retrieving spatial information. Indeed, we propose an adaptive algorithm that supplies tailored and most adequate *arbitrary structuring elements* for every image at hand. It has the significant impact of providing flexibility since every arbitrary generated SE is exclusively dedicated to the processed image. The processing consists of two major steps: a) we use the particle swarm optimization algorithm to look for the adaptive SEs; b) we introduce a priori knowledge based on human visual interpretation of roads characteristics and define some spatial indices to refine the results. We evaluated our method over many remotely sensed images; accuracy results show that the proposed method outperforms standard approaches which are limited to utilize only empirically chosen and standard SEs