COMBINATION OF HARD AND SOFT CLASSIFICATION METHOD BASED ON ADAPTIVE THRESHOLD

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1. INTRODUCTION

Hard classifiers and soft classifiers are two main methods used in classify vegetation and land-use/land-cover (LULC) classes. Hard classifiers such as ISODATA, maximum likelihood classification (MLC) or support vector machine (SVM) [1,2,3] typically develop a signature by combining the spectra of all pixels within a training set from a given feature. The resulting signature contains the contributions of all materials present in the training set [4]. Therefore, hard classifiers cannot effectively handle the mixed pixel problem. In order to reduce mixed-pixel effects, a variety of methods have been developed to unmix the pixels into different proportions of the endmembers [5,6,7,8]. As the LULC types appear to be small and continuous with no distinct boundaries, it is therefore desirable to unmix mixed pixel signatures, meaning that more materials are included within one pixel and therefore more mixing of material spectral signatures, to identify LULC types which are present at the sub-pixel level [9,10]. Previous studies have demonstrated that soft classification techniques such as linear spectral mixture modeling (LSMM) and fuzzy classification techniques are likely to give a more accurate map than hard classification techniques [11,12,13,14,15]. Of the available soft classifiers, the LSMM is an excellent approximation technique suitable for handling the spectral mixture problem. However, soft classifiers cannot effectively handle the pure pixel problem. Many pure pixels will be recognized as mixed pixels in the classing process, obviously, this will bring a huge error.

The objective of this paper is to evaluate the accuracy of combination of hard and soft classification method based on adaptive threshold, and to compare with the hard classification (SVM) and soft classification (LSMM) using ALOS imagery. The results from applying combination of hard and soft classification method were assessed by comparison with those produced by SVM, LSMM and with high resolution truth data, collected from manual digitized by the Quickbird imagery. The overall accuracy and RMSE show that combination of hard and soft classification method has a higher accuracy than hard or soft classification method.

2. STUDY AREA AND DATA

The study area containing three typical types (vegetation, water and ground) in the southern part of Beijing. It is lying between the coordinates of latitude 39.6-39.7 N and longitude 116.7-116.8 E (Fig. 1-A). The ALOS imagery has four spectral bands, and its resolution is 10m (Fig. 1-B). The QUICKBIRD imagery has four spectral bands, and its resolution is 2.4m (Fig. 1-C).

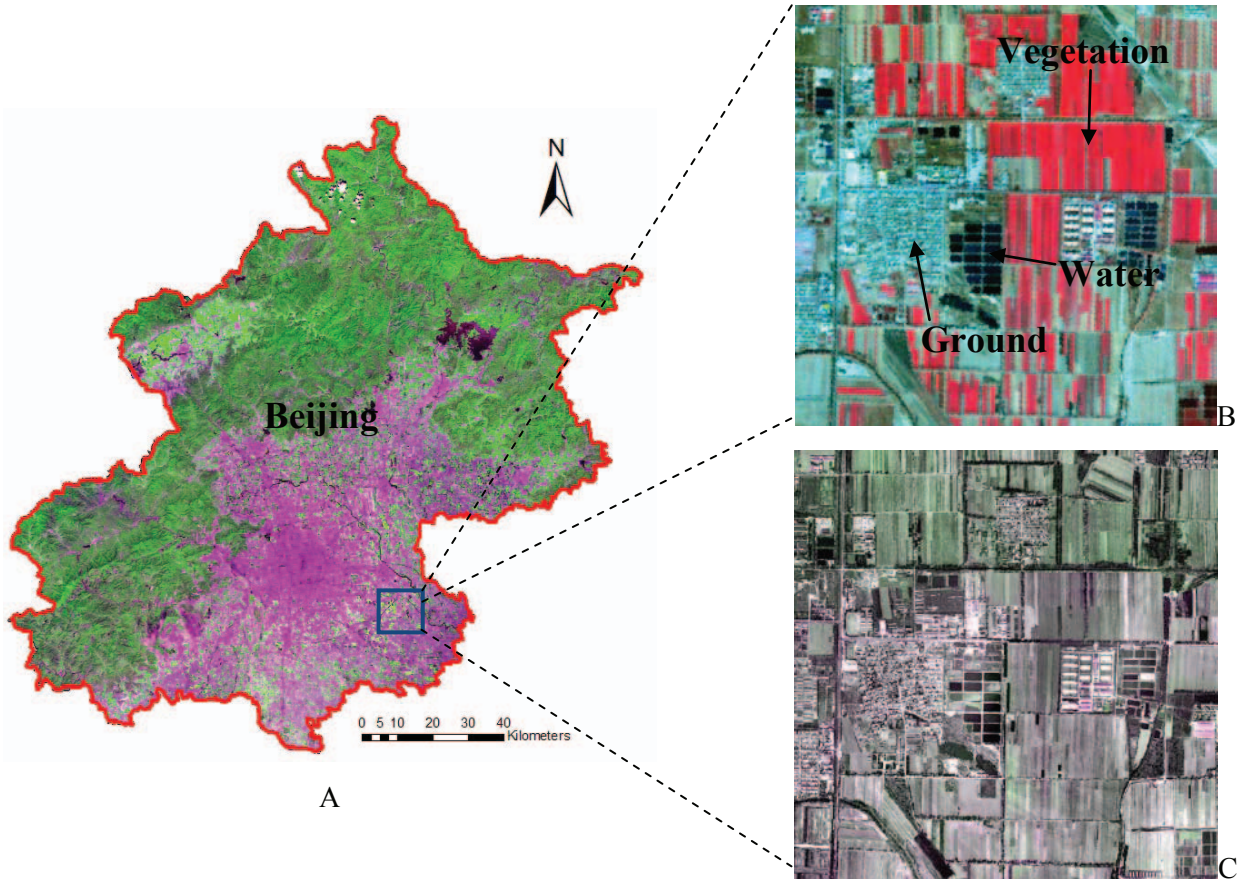

Fig. 1 (A) the site of study area, (B) ALOS imagery (Red: band-4; Green: band-3; Blue: band-1), (C) QUICKBIRD imagery (Red: band-1; Green: band-2; Blue: band-3)

3. METHODOLOGY

The proposed method contains three steps. Firstly, data preparation; Secondly, combination of hard and soft classification; Finally, accuracy assessment (Fig.2).

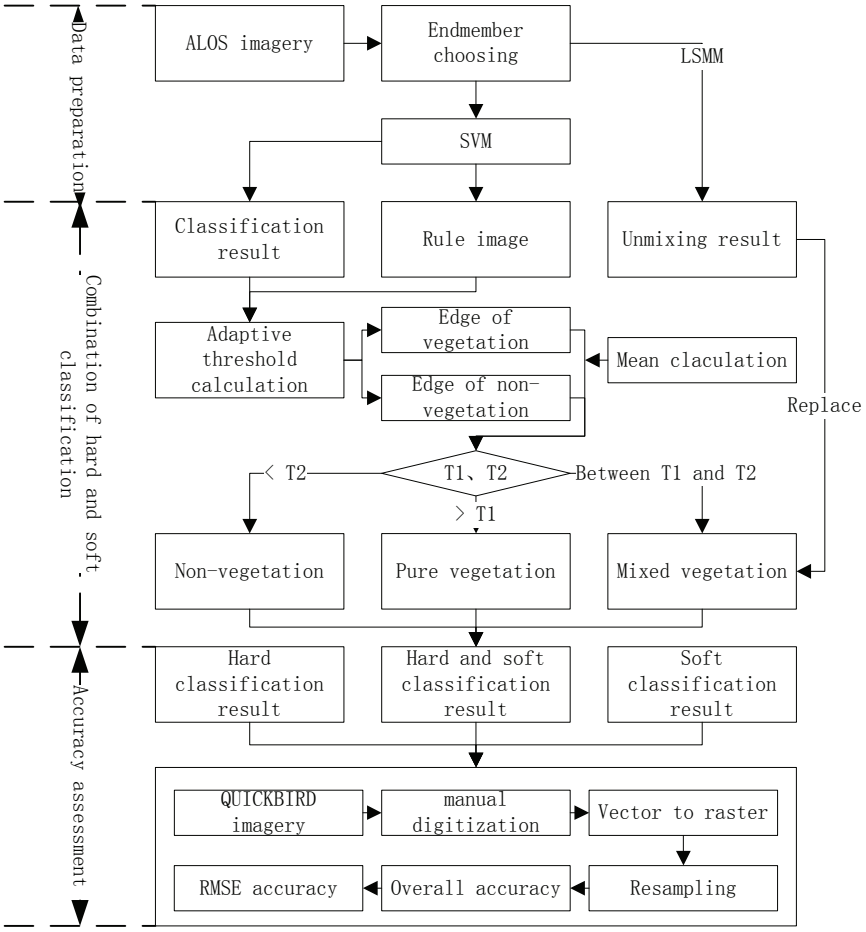

Fig. 2 Flow chart of the proposed method

4. RESULTS

4.1. Overall accuracy

Table 1 Overall accuracy

Classification method	Accuracy (%)
Hard classification(SVM)	94.69
Soft classification(LSMM)	69.57
The proposed method	95.48

4.2. RMSE accuracy

Table 2 RMSE accuracy

Classification method	RMSE
Hard classification(SVM)	0.241
Soft classification(LSMM)	0.231
The proposed method	0.202

5. REFERENCES

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