Probability estimation of change maps using spectral similarity

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Overview

- Introduction
- Study Area
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Introduction

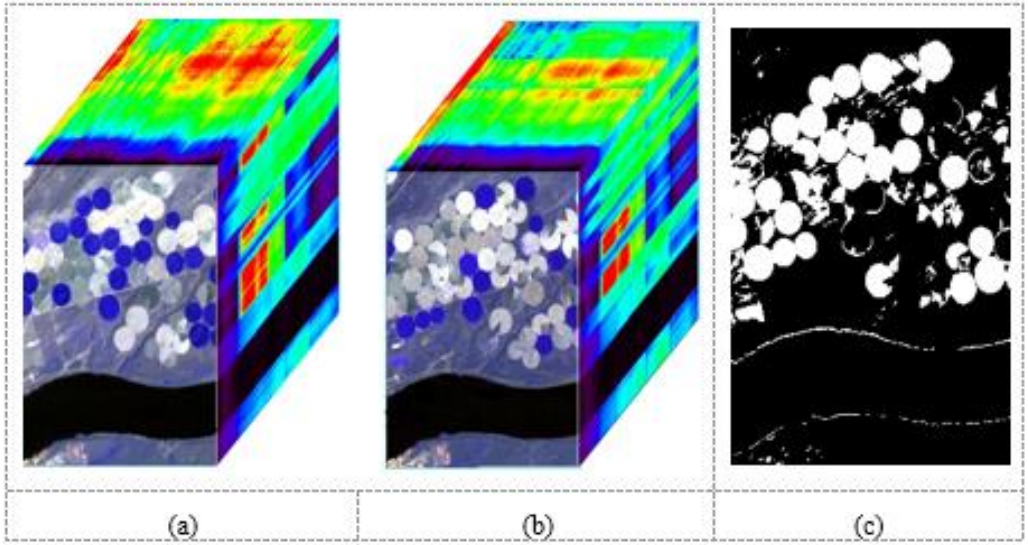
- ✓ Change detection is a fundamental and challenging subject of research, including remote sensing, monitoring and surveillance, civil engineering, mechanical engineering, medical diagnosis, and etc.

- ✓ Analysis of the changes by the remote sensing tool is necessary for the better management of natural resources, and preventing disasters.

- ✓ Evaluating and analyzing of probability/intensity of occurred changes and interpreting them, is essential task which leads to better monitoring of study area.

Study Area

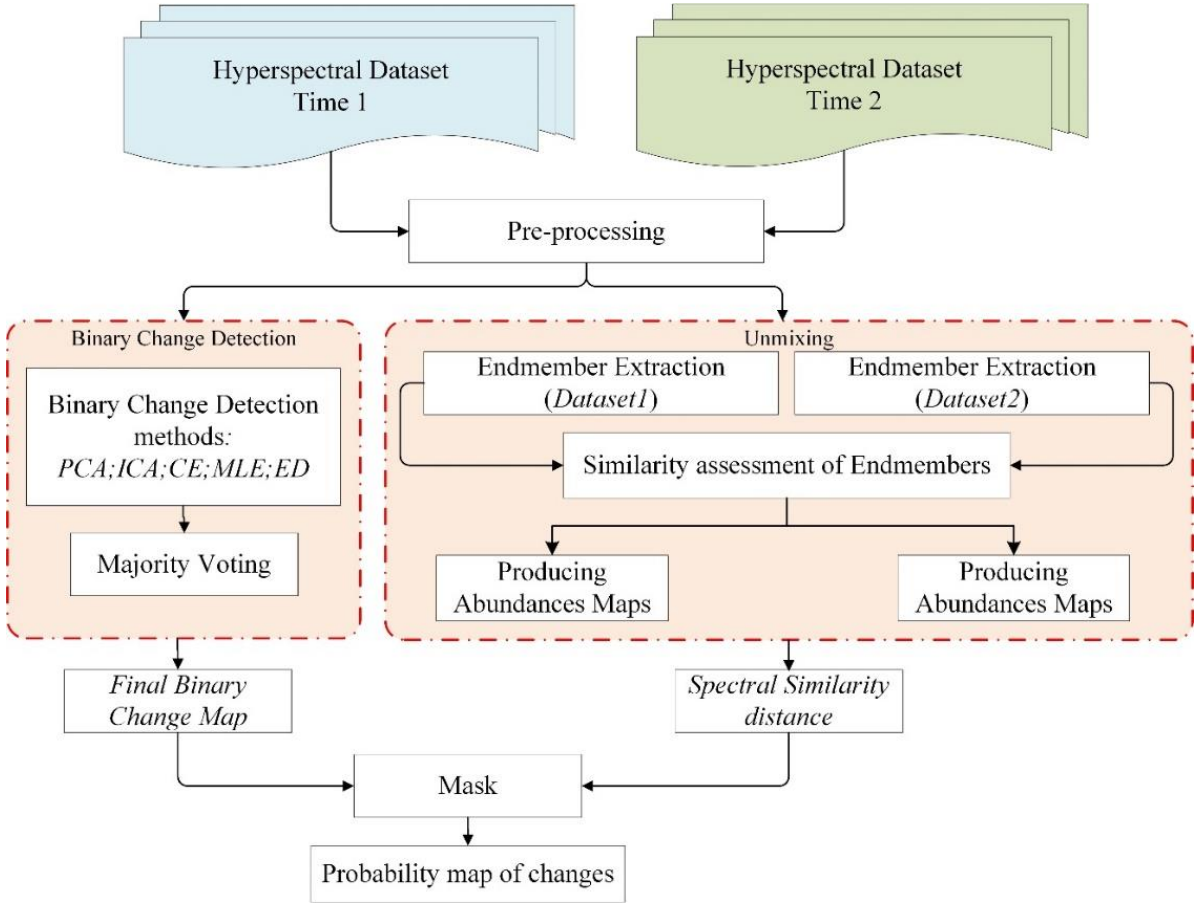
- ✓ We utilized a widely used real-world hyperspectral images to evaluate the performance of the proposed method.
- ✓ This data set can be found online in http://rslab.ut.ac.ir. The figure below shows the case study area that covers a range of 307×241 of an irrigated agricultural field in the city of Hermiston in Umatilla County, Oregon, USA. The data were acquired on May 1, 2004, and May 8, 2007.



The (a) and (b) false color composite of the original hyperspectral images
(c) binary change map ground truth.

Methods

- ✓ Step1: To distinguish change/no-change pixels, we used five binary change detection methods: PCA, ICA, CE, MLE, ED
- ✓ Step2: In this work: endmembers are extracted using the SISAL method. Similarity assessment of endmembers is adopted based on SAM algorithm, and finally, FCLS method is used to estimates the fraction of abundances.



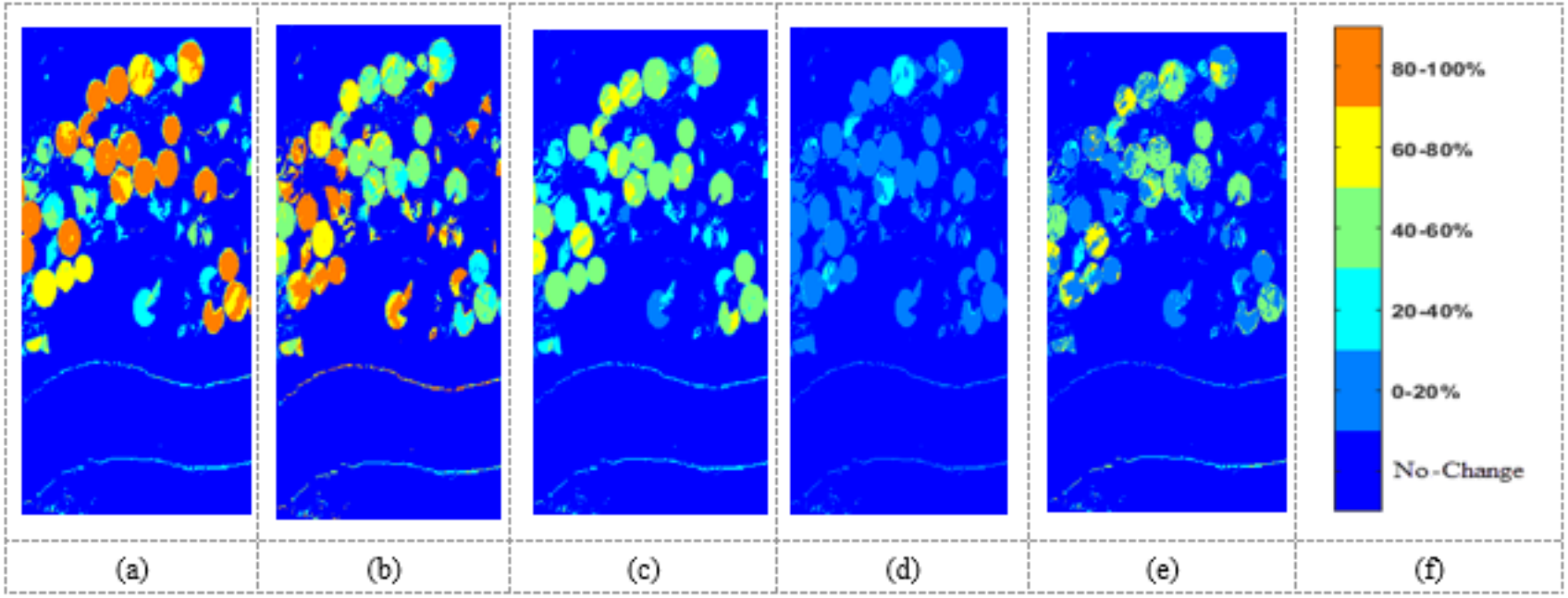
Methods

- ✓ Step3: The objective of this step is to make an analysis of four similarity metrics to produce change probability/intensity map.

- ✓ The selected metrics are Spectral Angle Mapper (SAM), Pearson Correlation Coefficient (PCC), Bray-Curtis dissimilarity (BCD) and Jeffries-Matusita Distance (JMD).

- ✓ Step 4: In order to produce the probability/intensity map, the results of step 3 masked by binary change map obtained in step 1.

Results



Result of probability estimation of change maps using spectral similarity metrics.
(a) SAM, (b) PCC, (c) BCD, (d) JMD, (e) final probability map of changes, and (f) Legend.

Discussion & Conclusion

- ✓ The probability estimation can be widely used in hyperspectral CD applications.

- ✓ Probability/intensity analysis was applied to analyze changed pixels. According to Figure (f) changes' probability is on a scale from 0% to 100%. Figure (e) shows that, probability of the most of changed pixels in the study area is in the range of 40-60%.

- ✓ In this study, an approach for analyzing detected changes is proposed. Utilizing the nature of occurred changes along with the probability/intensity of changes is a strategy that can be taken for better management of study area.

Thank you for your attention

For any questions please contact us:

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