SHADOW DETECTION OF VERY HIGH RESOLUTION SATELLITE IMAGES USING SUPPORT VECTOR MACHINE

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INTRODUCTION

- Shadows are undesired information that strongly affect to images.

- Shadows presents false colour tones and distorts the shape of objects.

- They produces error in classification or interpretation of biophysical parameters.

- This paper the shadow of very high resolution images is detected with MATLAB and LIBSVM software.
REVIEW OF LITERATURE

- Thresholding method
- Invariant colour spaces approach
- Property based approach
- Radiance measurement method
- Three Dimensional Modeling method
PROBLEM DEFINITION

- The previous research of shadow detection gives better results but also has some drawbacks such as given below.
- The colour spaces model depends on illuminations conditions and scenes layout.
- In thresholding threshold value can be changes according to resolution of particular satellite image.
- The creation of accurate city 3D model is major problem in three dimensional modeling.
- While considering above facts, the mixed methodology is developed which takes advantages of each and give best results.
PROPOSED METHODOLOGY

- In the propose method thresholding is done at first step, as thresholding is popular approach in shadow detection.

- To separate shadow and non-shadow area, classification is done by using support vector machine.

- Then morphological filtering and border creation is done.

- After that multi-classification is used.
BLOCK DIAGRAM

1. ORIGINAL IMAGE
2. PRE-PROCESSING
3. THRESHOLDING
4. CLASSIFICATION OF SHADOW – NON SHADOW
5. MORPHOLOGICAL FILTERING
6. BORDER CREATION
7. CLASSIFICATION OF SHADOW AREAS
8. CLASSIFICATION OF NON SHADOW AREAS
Aircraft image taken by Satellite
MORPHOLOGICAL FILTERING AND SHADOW DETECTION OUTPUT
Cohen's kappa coefficient can be stated as,

\[ \kappa = \frac{\Pr(a) - \Pr(e)}{1 - \Pr(e)} \]

Kappa Agreement value is given as,

- \(< 0\) less than chance agreement
- \(0.01–0.20\) Slight agreement
- \(0.21–0.40\) Fair agreement
- \(0.41–0.60\) Moderate agreement
- \(0.61–0.80\) Substantial agreement
- \(0.81–0.99\) Almost perfect agreement
CONFFUSION MATRIX AND RESULTS

<table>
<thead>
<tr>
<th></th>
<th>SHADOW</th>
<th>NON-SHADOW</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHADOW</td>
<td>255</td>
<td>17</td>
</tr>
<tr>
<td>NON-SHADOW</td>
<td>43</td>
<td>275</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>User’s Accuracy</th>
<th>Producer’s Accuracy</th>
<th>Kappa Coefficient</th>
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<tbody>
<tr>
<td>First Image</td>
<td>93.4</td>
<td>85.57</td>
<td>0.87</td>
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CLASSIFICATION OUTPUT AND RESULT

<table>
<thead>
<tr>
<th>Classification Accuracy</th>
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</thead>
<tbody>
<tr>
<td>First Image</td>
</tr>
<tr>
<td>82.3524</td>
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</table>
All shadow detection approaches make different contributions and all have individual strengths and weaknesses.

Even if there are considerable differences in the computational load across the various shadow detection methods, support vector machine can be optimized to meet real-time requirements and better accuracy.

In the coming work, we will be concentrating on the study of the kernel choice in order to determine the appropriate one, for various type of image classification.
REFERENCES

Liu Wen and Yamazaki Fumio, 2010, Shadow Extraction and Correction from QuickBird Images 978-1-4244-9566 5/10/$26.00
Scott Papson and Narayanan Ram M., 2012, Classification via the shadow region in SAR imagery in IEEE transactions on aerospace and electronic systems vol. 48, no 2.

To be continued...
Song Huihui, Huang Bo and Zhang Kaihua, 2013, Shadow Detection and Reconstruction in High-Resolution Satellite Images via Morphological Filtering and Example-Based Learning in *IEEE transactions on geosciences and remote sensing* 0196-2892/$31.00.


THANK YOU