The Mountain Habitats Segmentation and Change Detection Dataset

Documentation and Information about the Dataset

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Contents

1 Introduction

This is the documentation for the dataset presented in the paper *The Mountain Habitats Segmentation and Change Detection Dataset* accepted for publication in the *IEEE Winter Conference on Applications of Computer Vision* (WACV 2015). The full-sized images and masks along with the accompanying files and results are hosted on ZENODO: http://dx.doi.org/10.5281/zenodo.12590. The size of the dataset is about 2.1 GB.

2 Dataset

The dataset consists of the following files:

File	Description
repeat-images.zip	The 60 *repeat* images in TIFF format.
historic-images.zip	The 60 *historic* images in TIFF format.

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File	Description
repeat-segmentations-color.zip	The 60 *repeat* color masks obtained from manual segmentation; PNG format.
historic-segmentations-color.zip	The 60 *historic* color masks obtained from manual segmentation; PNG format.
repeat-segmentations.zip	The 60 *repeat* ID masks obtained from manual segmentation; PNG format.
historic-segmentations.zip	The 60 *historic* ID masks obtained from manual segmentation; PNG format.
dataset-info.zip	Information on each image pair, including acquisition year, image size, survey, surveyor, station name, location, and latitude/longitude.
habitats-all.zip	Information on the 8 categories, including name, description, ID, and color.
habitats-forest.zip	Information on the *forest* and *non-forest* meta-categories, including name, description, ID, and color.
results-best-experiments.zip	Per image pair results for the best experiments desbribed in the paper.
results-overall.zip	Overall results for each of the 42 experiments described in the paper.
CHECKSUM.sha256	SHA256SUM to verify the integrity of each ZIP file.
LICENSE.txt	Information on the dataset license.

2.1 File Name Notation

Each image pair in the dataset has been assigned a number from `0001` to `0060`. The file name notation is described below, with `XXXX` denoting the image pair number:

File name	Description
`hi-XXXX.tif`	Historic image
`ri-XXXX.tif`	Repeat image
`hs-XXXX.png`	Historic manual segmentation (category ID)
`rs-XXXX.png`	Repeat manual segmentation (category ID)
`hsc-XXXX.png`	Historic manual segmentation (category color)
`rsc-XXXX.png`	Repeat manual segmentation (category color)

2.2 Segmentation Masks

For each repeat and historic image, the manual segmentation is provided as two masks: a color mask and a ID mask. The color masks are mostly useful for display purposes. The pixel format for the color masks is RGBA (Red-Green-Blue-Alpha, 32 bits per pixel), where the alpha channel is equal to 0 (transparent) for pixels that have not been categorized in the image (e.g. sky), and to 255

(opaque) otherwise. The uncategorized pixels have been assigned the color *black*, so these pixels will be black if the color mask is stripped off of its alpha channel.

The ID mask is an 8 bits per pixel image where the value of a pixel corresponds to the ID of the habitat category. The ID 0 is used for uncategorized pixels. The ID mask is useful for selecting the pixel for a specific category or group of categories. Here are some examples that show how to obtain a binary mask for a category or a group of categories:

- **Example in Python**

```python
import numpy as np
from PIL import Image

# Load ID mask
id_mask = np.array(Image.open("mask.png"))

# Get binary mask for category ID 2
id2_mask = np.bitwise_and(id_mask, 2).astype(bool)

# Get binary mask for group of category IDs: 1, 8, and 32
# 1 + 8 + 32 = 41
id_group_mask = np.bitwise_and(id_mask, 41).astype(bool)
```

- **Example in MATLAB:**

```matlab
% Load ID mask
id_mask = imread('mask.png');

% Get binary mask for category ID 2
id2_mask = logical(bitand(id_mask, 2));

% Get binary mask for group of category IDs: 1, 8, and 32
% 1 + 8 + 32 = 41
id_group_mask = logical(bitand(id_mask, 41));
```

For more information about the categories, see the section Habitat Categories.

2.3 Dataset Information

Information about each image pair, including acquisition year, image size, survey, surveyor, station name, location, and latitude/longitude is available in the file `dataset-info.zip`. The dataset information is provided in CSV (comma separated values), YAML[1], and JSON[2] file formats for easy manipulation in computer programs. The same information is also provided in Open Document Spreadsheet (ODS), Microsoft Excel (XLS, XLSX), and PDF file formats for easy reading.

2.4 Habitat Categories

The files `habitats-all.zip` and `habitats-forest.zip` provide information about the 8 habitat categories and the *forest* and *non-forest* meta-categories, respectively. Available information

[1] http://www.yaml.org

[2] http://www.json.org

includes category name, description, ID, and color. This information is provided in CSV (comma separated values), YAML, and JSON file formats for easy manipulation in computer programs. The same information is also provided in Open Document Spreadsheet (ODS), Microsoft Excel (XLS, XLSX), and PDF file formats for easy reading.

2.5 Baseline Algorithm Results

The file `overall-results.zip` provides a complete table with the results for all of the 42 experiments. This table is related to Table 2 in the paper, which only presents the results of the first best 20 experiments. The table contains the Matthews Correlation Coefficient (MCC) and the F_1-score of the *forest* and *non-forest* meta-categories computed for each experiment over all the test images. The table is available in Open Document Spreadsheet (ODS), Microsoft Excel(XLS, XLSX), and PDF file formats.

The file `best-experiments-results.zip` contains a table with the MCC value and the F_1-scores computed for each of the 47 test image pairs in the case of the repeat and historic experiments with the highest overall MCC value (see Table 2 in the paper). The table is available in Open Document Spreadsheet (ODS), Microsoft Excel (XLS, XLSX), and PDF file formats.

3 License and Citation

The dataset is released under the *Creative Commons Attribution-Non Commercial 4.0 International License*[3]. If you intend to use this dataset for your own research and publications, please cite the dataset paper as follows:

> F. Jean, A. Branzan Albu, D. Capson, E. Higgs, J. T. Fisher, B. M. Starzomski. "The Mountain Habitats Segmentation and Change Detection Dataset", In *Proceedings of the IEEE Winter Conference on Applications of Computer Vision* (WACV), Waikoloa Beach, HI, USA, January 6-9, 2015.

The dataset has been assigned its own DOI[4]: `10.5281/zenodo.12590`. Note that this DOI is different from the paper's DOI. The dataset can be accessed at the following address: http://dx.doi.org/10.5281/zenodo.12590.

4 Contact

For any question about the dataset, please contact Dr Frédéric Jean: `fjean AT uvic.ca`.

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[3] http://creativecommons.org/licenses/by-nc/4.0/legalcode
[4] http://en.wikipedia.org/wiki/Digital_object_identifier