

Synthetic Image Software's Instructions

This document presents the main instructions to use Synthetic_image software.

- Exit: The present window is closed and the software ends.
- New Project: A new window is opened to indicate the directory and project name. The directory should be select using the right button (represented by ...), and the name of the project should be directly written in the textbox. After entering the appropriate data and clicking “OK”, the initial screen window appears.
- Base Image: a new window is opened and the user is asked to specify the base image parameters: scale (s), unit parcel size (u), repetition (r) and number of classes (t). None of these parameters can be left void. The minimum value and maximum are 1 and 10 for all parameters. The base image is created and saved in the project folder by clicking in the “Create base image” button.
- Multi_spectral: For this option it is necessary to specify the characteristics of the multi-spectral (satellite) image to be used as reference. Firstly, a window is opened and the user is asked to enter the number of bands, lines and columns of the raw multi-spectral satellite image. For the bands the maximum acceptable value is 3 and for the lines and columns fields the maximum is 2050. The minimum value for all parameters is 1. Next, a new window is opened so that the user can indicate the paths to each satellite band file. The next window opened allows the user to input the location of the rectangular training areas of each classthe rectangular areas are specified by the image coordinates of the Top Left Corner (Xminimum, Yminimum) of the class and the Bottom Right Corner (Xmaximum, Ymaximum). None of these parameters can be empty, the minimum value is 1 and the Xminimum/Xmaximum (Yminimum/Ymaximum) can not have the same value. The rectangular areas specified have to fall inside the image. Finally, it is necessary to select the base image created earlier using the option “Open”. The option “Create a multi-spectral image” is the final step of this process.
- Fusion Test: This option is used to create additional panchromatic and multispectral reduced synthetic images. For this it is necessary to indicate the weights of the multi-spectral bands used to produce the panchromatic image. The weights must have values between 0 and 1. Next it is necessary to identify the spatial scale of the sensor used in the acquisition of the satellite image. This spatial scale refers to the $\frac{l}{h}$ quotient, where h is the high spatial resolution (panchromatic image) pixel size and l is the low spatial resolution (multi-spectral image) pixel size. Finally, the option “Create the PAN and reduced bands” creates the two additional images required for the fusion test.
- Segmentation Test: This option is used to create an image with the labels for the base image. The result is a 16-bits image which each parcel represented in the base image has a different label (integer value) assigned. The first parcel in the image (Top Left Corner) has value 1 and the last (Bottom Right Corner) has a label value $(s \times r)^2$.

- *Point Spread Function (PSF)*: This option is used to create a more realistic synthetic image using the Point Spread Function (PSF) and grid offsets. Five approaches were considered: using the PSF only, and using PSF with grid offsets $(1/4, 0)$, $(1/4, 1/4)$, $(1/2, 0)$ and $(1/2, 1/2)$. To execute this option it is necessary to identify the synthetic image and the number of lines in that image.