

Appendix B- Grainsize distribution routine

SI from “Digital image analysis on cathodoluminescence microscopy images for ancient ceramic classification. Methods, applications, and perspectives.” Odelli et al.

The main objective of the macro developed for the ImageJ image analysis software is to separate the blue grains from the red grains and the predominantly green (or yellow) grains in the optical CL images. Once this separation is done, measurements are made on each grain as well as global measurements such as the specific surface occupied (percentage of the area) by each family of grains.

As the colours of the grains are not purely red, green or blue but a weighted component of each primary colour, it is not possible to separate them by simply using the RGB channels.

The first method is to divide the image into three Red, Green and Blue (RGB) channels and also into three Hue, Saturation, Brightness (HSB) channels and put these six images into a single stack. A PCA (Principal Component Analysis) is then performed on this stack, resulting in a new stack of six images, six PCA factors (ImageJ plugin MSA 514 developed at UMRS-INSERM 514, Reims, France under the supervision of Noël BONNET) (Fig B1). The second method programmed into the macro assumes that each colour is independent and that there can be no mixing of one colour with another. This is called ICA for Independent Component Analysis, (ImageJ plugin μ Fica, Laboratory of Cardiac Energetics, NHLBI, National Institute of Health, USA Lam.dao@nih.gov) (Fig. B2).

Both methods were tested for each sample and the best performing one is used to present results (see Table 2 in the main text). The new images thus obtained (three masks corresponding to red, green and blue particles) are therefore used to obtain the particle size distribution of the different mineral grains responding to the same CL signal, by the following steps: manual or automatic thresholding of each channel; opening to eliminate the smallest particles and separate the others; dilation to a size smaller than the opening to reconstruct the particles if necessary; filling in the holes. As a particle can only belong to one of the three colours red, blue and green (or yellow), the green image is subtracted from the blue image, and the green image and the new blue image from the red image. Finally, each grain per colour is measured by removing the grains that touch the edges of the image or the edges of the object (see Fig. B1 and B2). Global measurements are also made per colour (without removing the grains that touch the edges).

Figure B1: Description of the ICA processing algorithm

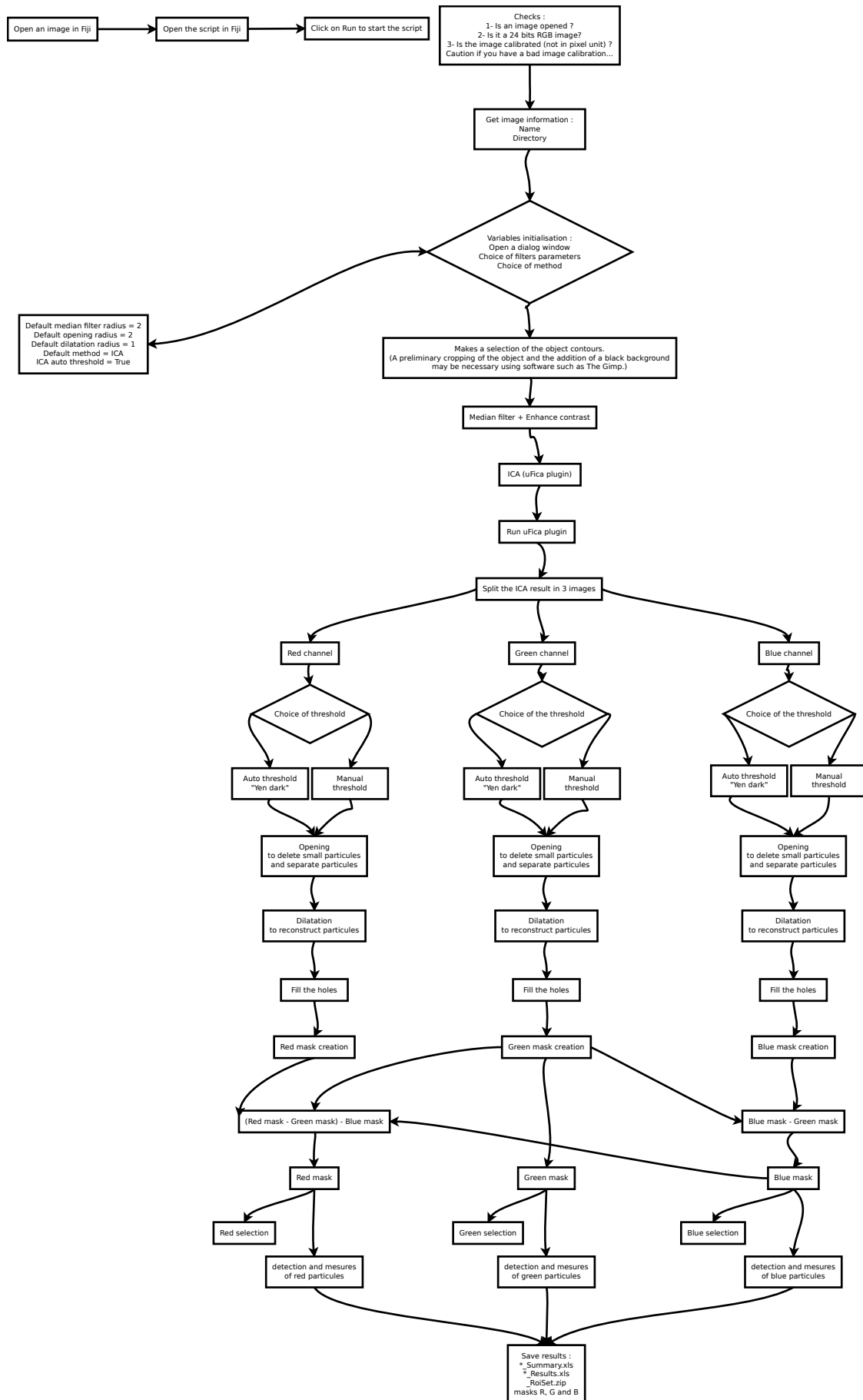


Figure B2: Description of the PCA processing algorithm

