RadonS Software
Software to classify sediment particle roundness

User guide
RadonS Software

RadonS is based on research article

A new method for classifying clast roundness based on the Radon transform

Develope by

Dr. Gamaliel Moreno   *gamalielmch@gmail.com*
Dr. José de Jesús Villa   *jvillah@yahoo.com*
Dr. Damiano Sarocchi   *sarocchi@gmail.com*
Dr. Efrén González   *gonzalez_efren@hotmail.com*

Universidad Autónoma de Zacatecas
UNIDAD ACADÉMICA DE INGENIERÍA ELÉCTRICA

Universidad Autónoma de de San Luis Potosí
INSTITUTO DE GEOLOGÍA

Zacatecas, México,

Abstract

In this paper, a new algorithm for clasts roundness classification based on the Radon Transform is presented. The degree of roundness is determined by processing the sinogram of clasts images. The algorithm consists in applying two low pass filters to the sinogram, obtaining the inverse Radon transform and comparing the filtered image with the original one. For rounded particles, the difference between the original image and the filtered image will be small. On the other hand, considering angular clasts, the difference will be greater than in the case of the rounded ones, due to the presence of high-frequency components. The comparison consists of the subtraction of the original image and the filtered image. Since the images are binary, the difference is an image with topologically unconnected regions that corresponds to the particles edges. The error percentage error between the original and the processed image and the number of regions are used to classify the clasts morphologyrocks. The results have been tested using comparison charts designed for visual roundness estimation (proposed by Powers, (1982). Two cutting frequencies, one to classify well-rounded, rounded and sub-rounded rocks clasts and another one for angular and sub-angular classes has been used. The Ourproposed algorithm performs med very well in distinguish correlat the roundness classes used in the of the Powerss visual charts. Similarly, the results provided by the algorithm have been compared was comparedwith the to a classification performedmade by an expert. The algorithm attributes 92 percent of the clasts to the same classes indicated by the expertThe algorithm classified 92 percent of the clasts in the same class as the expert. In the paper we propose, Gaussian models useful to classify the particles using based in the Powerss classes are also proposed. From this algorithm,A user friendly software that allows clasts morphology classification by means of the Radon algorithm, with a user-friendly graphical interface on the MATLAB platform has been developed on the MATLAB platform. This e software can be freely downloaded from our web pages.
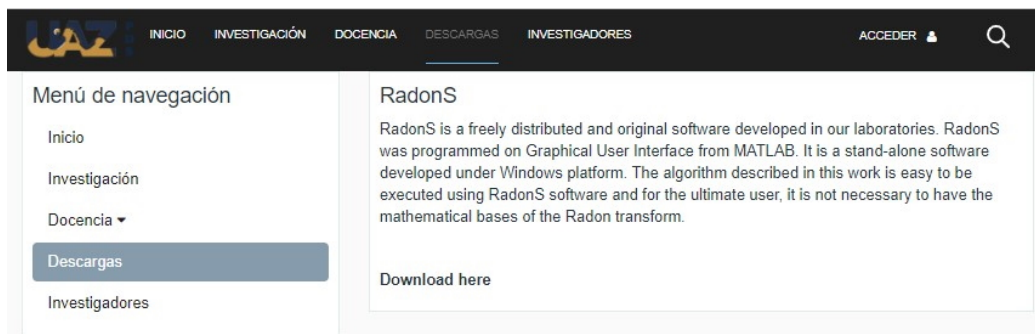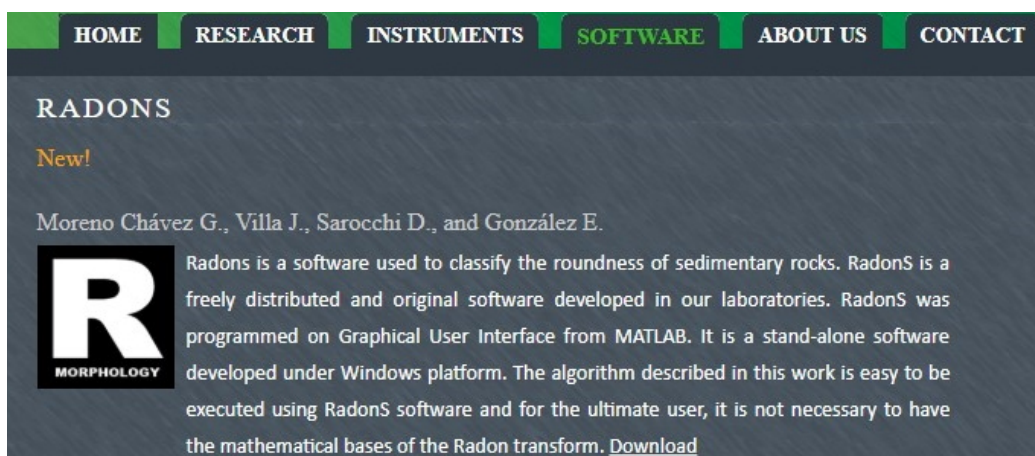
Contents

Download and installation

The software is freeware and is designed to work on windows platforms. Any questions you can write to the authors emails.
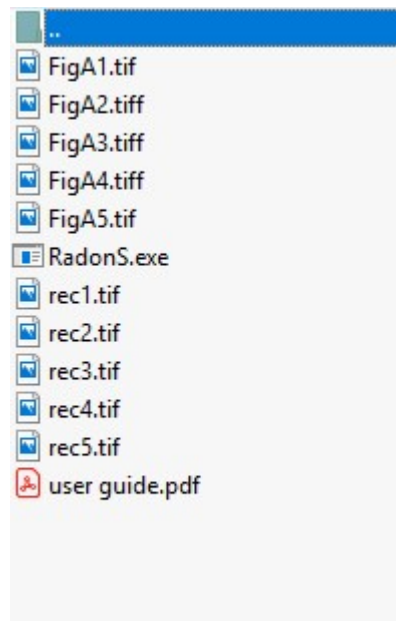
The first step is to download the software from any of the following pages: For the first page `http://pds.uaz.edu.mx/descargas`


For the second page `http://www.laima-uaslp.org/`.

The downloaded file is compressed. It is necessary to decompress. The files it contains are the following:

The figures from rec1 to rec5 are the particles classified by Powers and the figures FigA1 to FigA5 are those classified by an expert.The pdf file is this guide and the .exe file is the software installer.
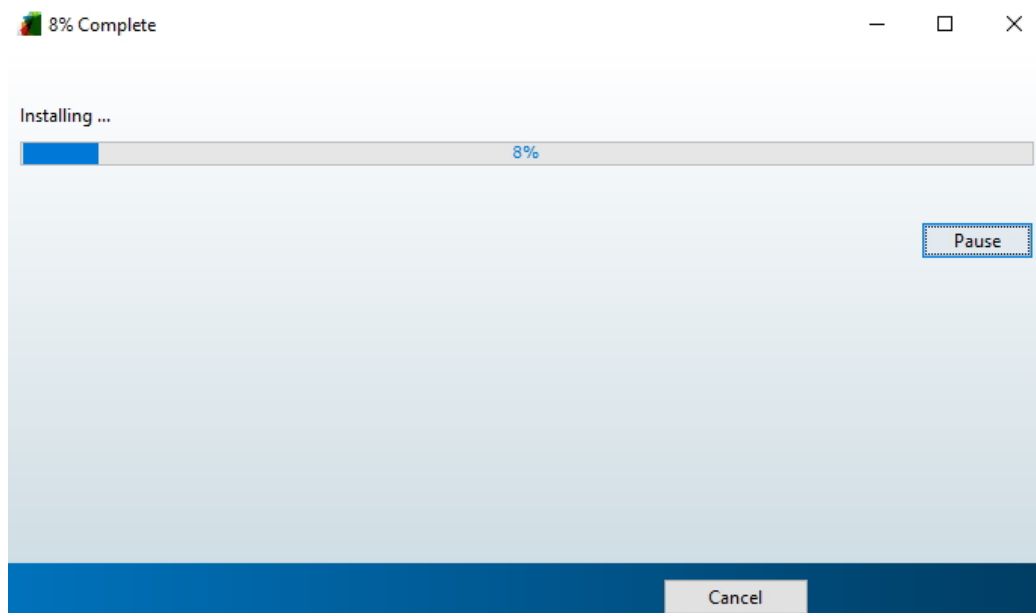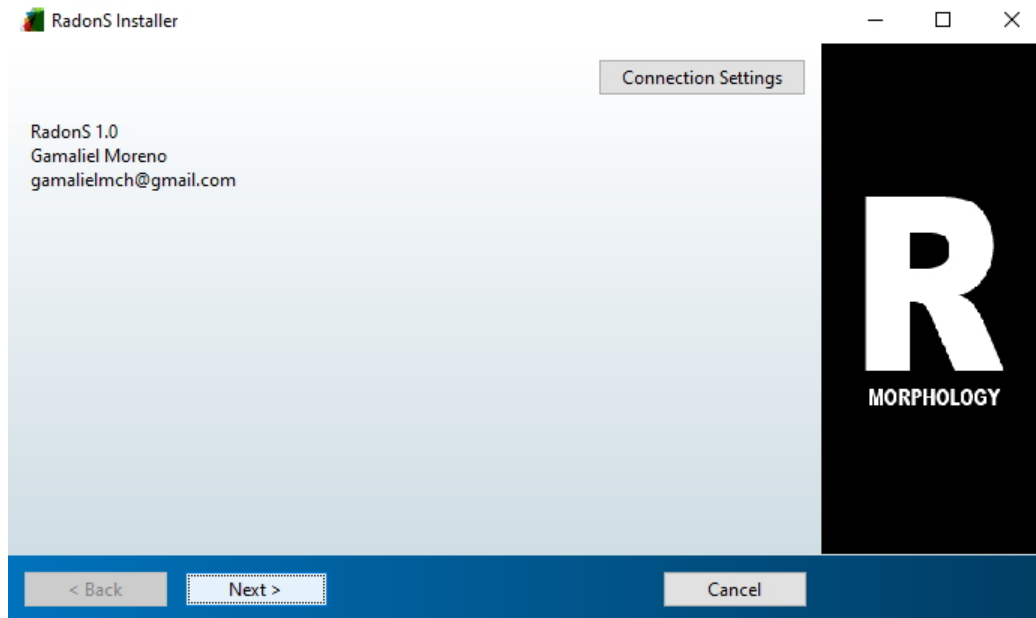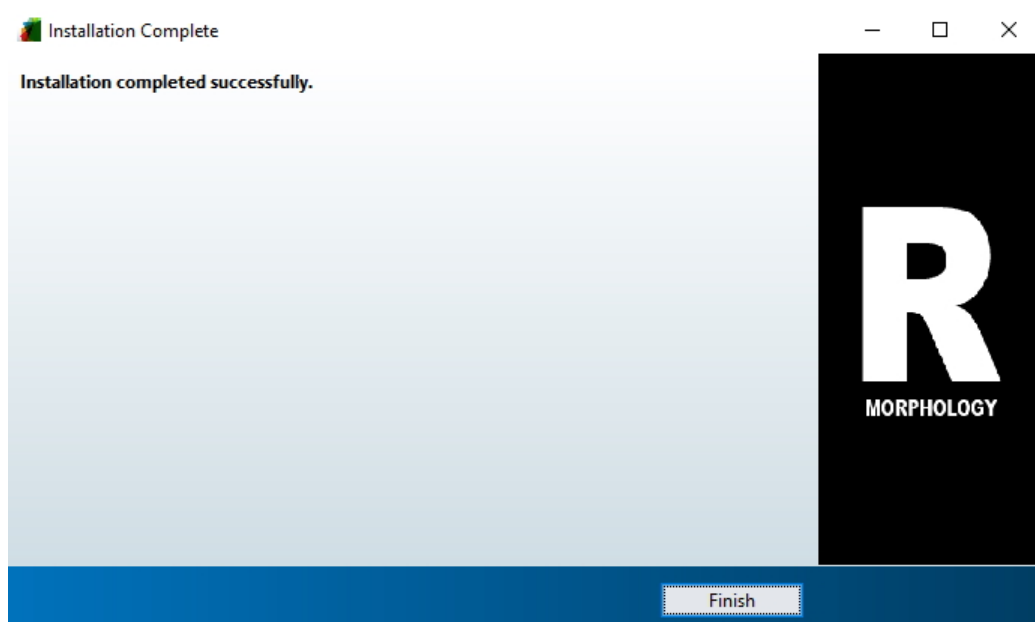
To install, double click on the .exe file.
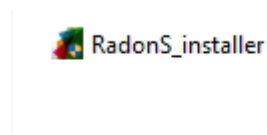
The installation process will start

Accept all conditions. As a suggestion, do not move the installation paths. The installation takes several minutes.

Once the software is installed, double click on the icon to run it.

Load images

The image that will be processed must be binary or a simple image to segment. The software has a default of otsu's algorithm to segment the loaded image. The images formats that can be loaded are jpg, tiff, tif, jpeg, png and bmp. To load an image click on the file tab and click on the "open binary image" option.
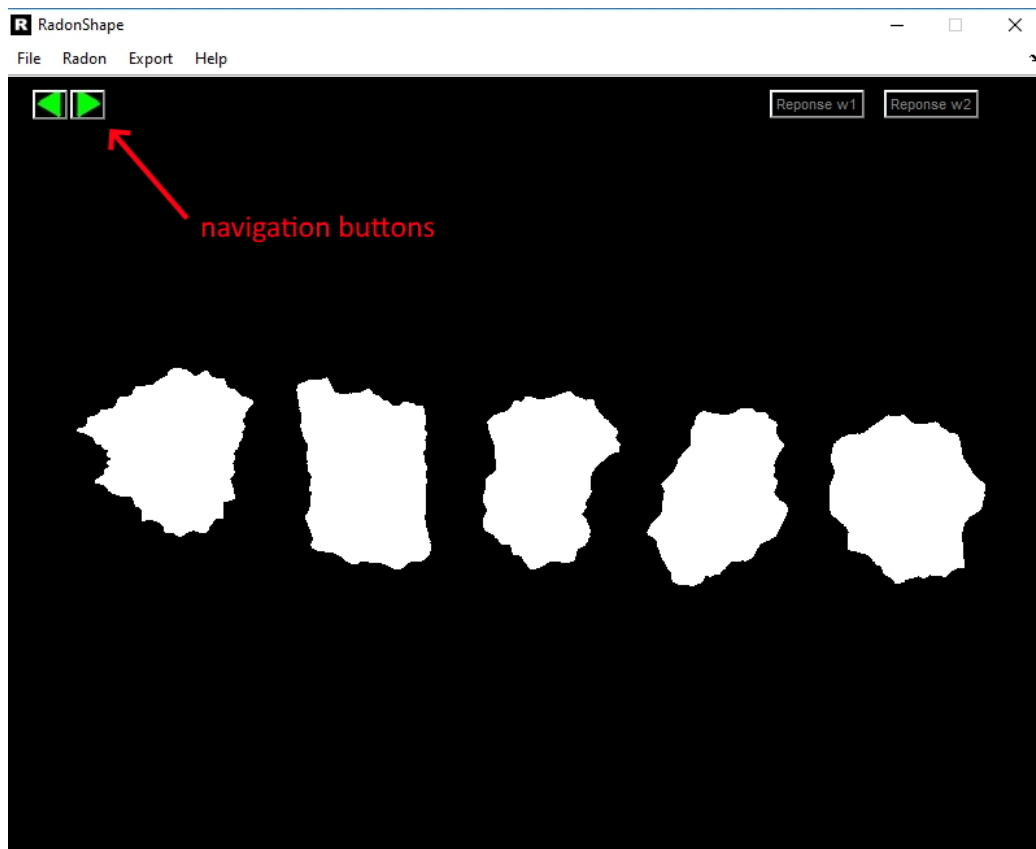

An assistant opened. You can select one or multiple images
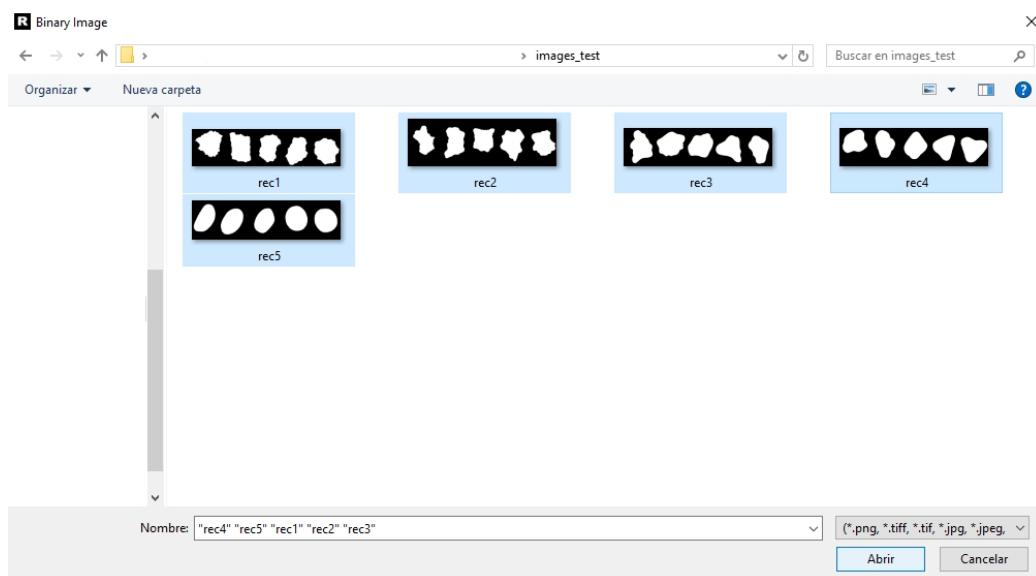
Once the images are loaded, the software will show one of them. If you have selected multiple images, the navigation buttons will be activated. With these buttons you can visualize the different images.

Applying Radon transform and classifying

Once you have loaded one or multiple images, the options of the "Radon" tab will be activated. In order to classify the particles, the Radon transform must first be estimated by clicking on the "Radon" option.
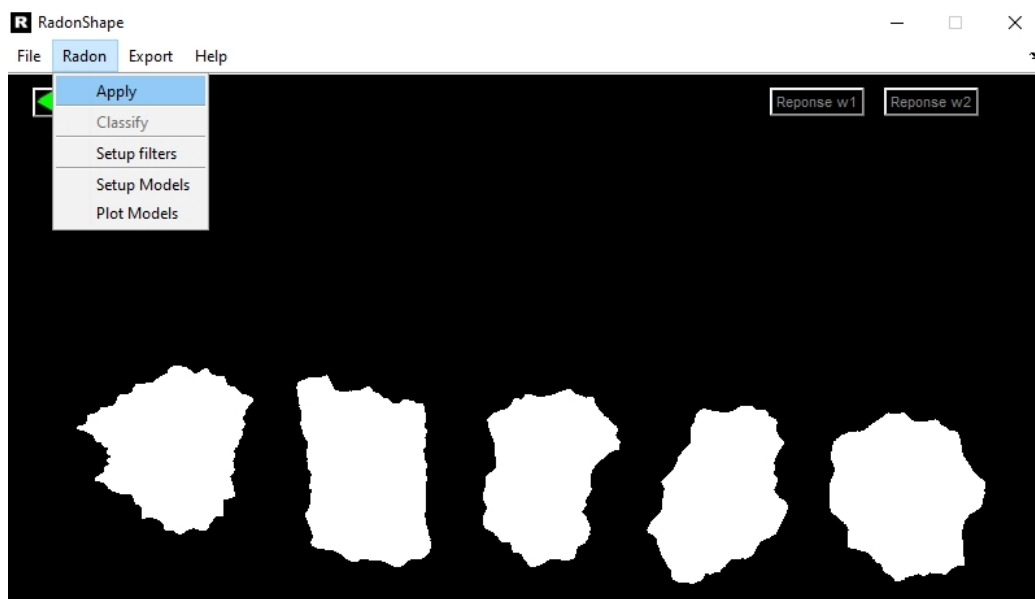
To operate a procedure it is necessary that there is no other in running process. In all the processes,a legend appears when there is a process running.
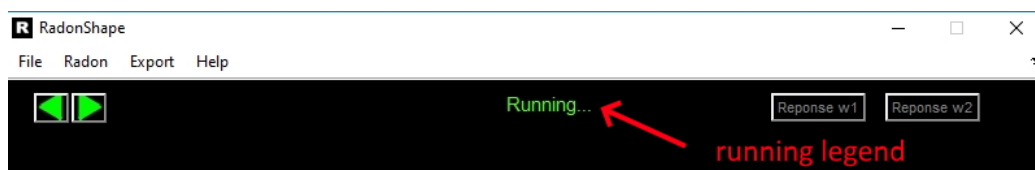
Once the "Radon" process is finished, the "response buttons" will be activated as well as the option to "classify" will be activated. The "response buttons" allow us to visualize the results of the two filters. Here an example
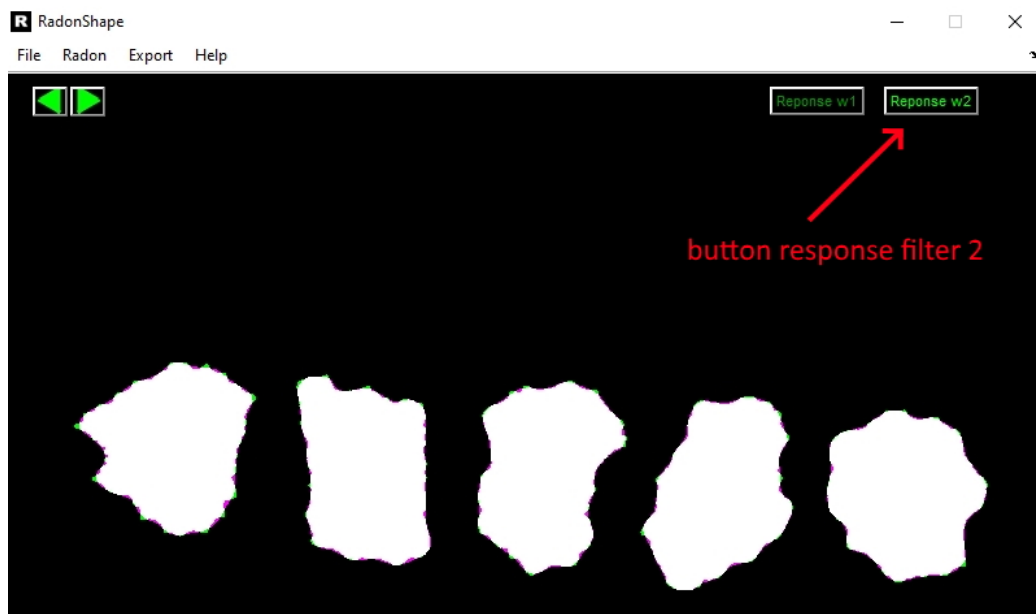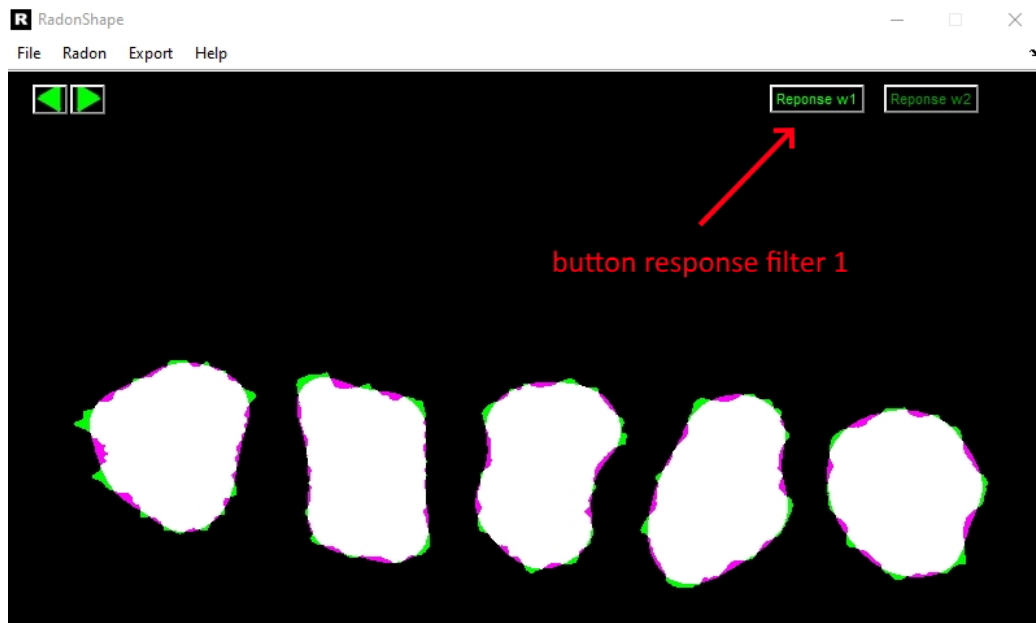
To obtain the classification, click on the "classify" option.

After classifying, the software will label all the particles with a number from 1 to 5, which correspond to the five classes proposed by Powers; 1 = Angular, 2 = sub-angular, 3 = sub-rounded, 4 = rounded, and 5 = well-rounded.
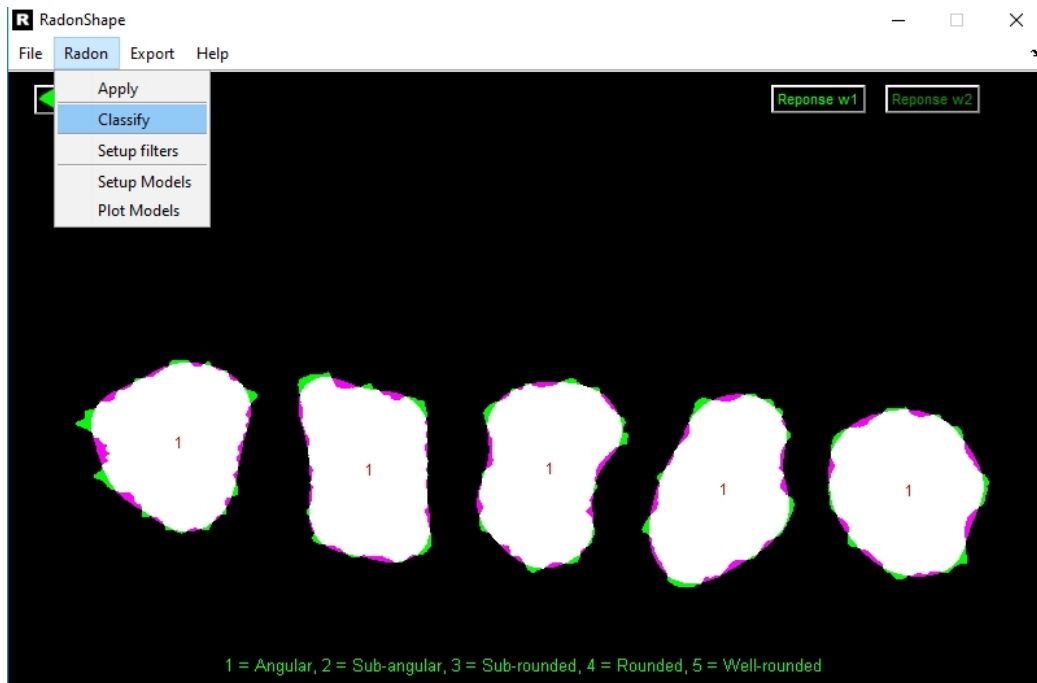
Setup and plot models

The software has the option to modify the filter cutoff frequencies, change the value of the Gaussian models and graph models. To modify the cutoff frequencies, click on the "setup filters" option. Two editors will appear, to set the desired values. To finally click on the "ok" button.
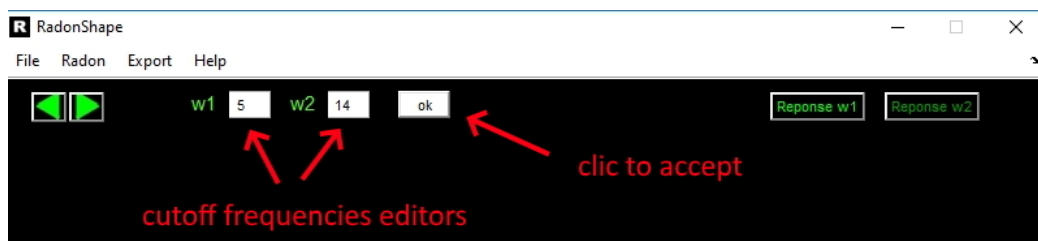
To graph the models, click on the "plot models" option. A new window will open where the Guassian models are plotted. Below is an example
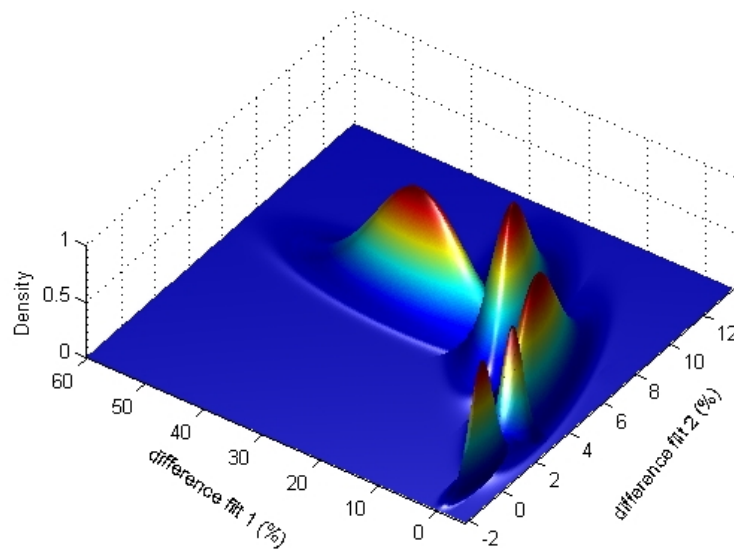
To modify the models click on "setup models" option. A new window will open where you can modify the values of the mean and covariance. Remember that the covariance matrix must be positively defined symmetric

Click on the ok button to save the new model values.

Export data

The software has two options to export the results. The "data" option exports numerical results in tabular form and the "images" option exports the images shown in the navigation software.
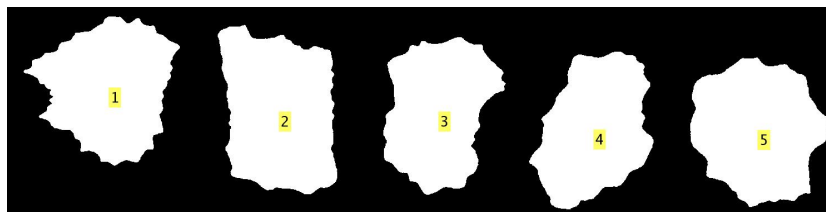

To export the results in numerical form click on the "data" option. Clicking opens a wizard to choose the path and name file. The software saves an .xls file and images with tags, this in order to relate the results of the file and the images of the particles.

The software organizes the information by image and particulates within each image. Below is an example

| Results				
Image	1			
Particle	Filter 1	Filter 2		Class
1	7.49009723	42		Angular
2	6.42798535	26		Angular
3	6.49083165	32		Angular
4	7.33019906	24		Angular
5	7.54019774	24		Angular
Image	2			
Particle	Filter 1	Filter 2		Class
1	9.29209732	22		Sub-angular
2	7.21884498	14		Sub-angular
3	7.61588742	15		Sub-angular
4	9.8291795	17		Sub-angular
5	6.42994242	16		Sub-angular
Image	3			
Particle	Filter 1	Filter 2		Class
1	8.01997004	6		Sub-rounded
2	5.3753976	8		Sub-rounded
3	3.7735094	2		Sub-rounded
4	5.63123887	5		Sub-rounded

Here an example the image with the particles labeled

To export the results in images, click on the "images" option. Clicking opens a wizard to choose the path and name file. The software saves the

images shown in the software navigator. Two images are saved for each analyzed image, which correspond to filter 1 and 2. Here an example.
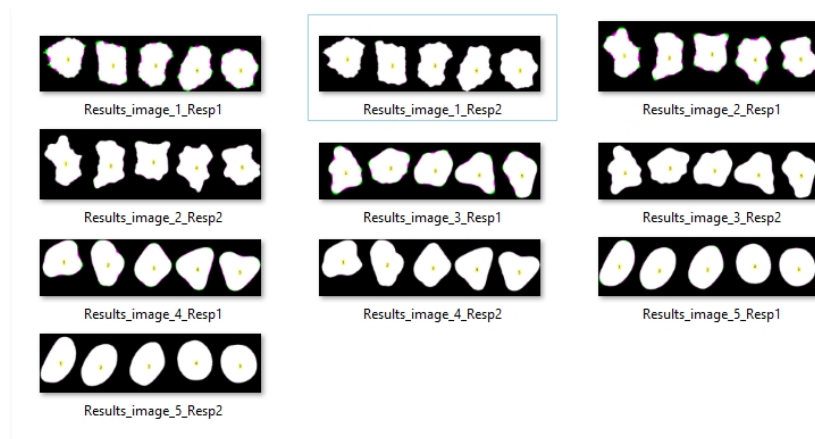
Help

You can access this guide by clicking on the "manual" option on the help tab. You can also do it through our pages `http://pds.uaz.edu.mx/` or `http://www.laima-uaslp.org/`. Any necessary support write to the emails that we give on the cover of this guide