Importing Photos for Field and Laboratory Datasets

Quick Summary

This new tool (Nov 2017) has two functions: One to provide context to spectra by linking them to images of the samples measured, and two to use those images to geolocate spectra in latitude, longitude, altitude map space. Spectra are commonly seen as highly abstract things but adding images of what they represent not only provides context and relevance but also increases confidence in the sample information and spectra in their own right. If you are using a field spectrometer to log core, for example, capturing a general photo or macro-photo of the core just measured spectrally can be extremely valuable. Other uses might include capturing photos along field traverses, or of hand samples when building a spectral reference library.

Introduction

TSG has always been able to show sample photos in a Floater window. The problem has been in the naming of photo files. The files have to be named *just right* for the system to work. In most[1] field-spectrometer datasets, TSG remembers the filename of each spectrum that was imported and expects the photo files to have the same names (except for the file extension). Digital cameras normally don't offer a lot of control over the naming of their picture files, so linking photos to TSG has involved an unpleasant file-renaming excursion for the analyst.
The new tool tries to automate as much of the process as it can. If you are methodical in the way you take your sample photos then you should be able to get them into TSG and associate them with your spectra quite easily.

Preparation

If you haven't started measuring anything yet then I recommend giving some thought to the procedure. The main thing is to *take the photos in the same **sequence** as how the spectra are measured*. You can take the photos in a cross-country traverse along with your spectrometer or you can take the photos later on (e.g., back in the lab) but if you take them in the same sequence then the import will be easy.
Another thing to consider, if you are working with field samples, is that TSG can import GPS coordinates from suitable JPEG photos. It is becoming quite common for digital cameras (especially smart phones) to be able to record their GPS location within the metadata of the JPEG files that they save. TSG can now import these GPS coordinates. If you have such a camera then you should take a photo in the field just before or after taking the spectral measurement. This photo might be a close-up of the spectral sample itself or, say, a more general view of the outcrop. If it is the latter do not stray too far from the site as this will mean the spectra's coordinates will be wrong. (If you take just the camera – not the spectrometer – then by all means take in-situ photos of the samples but consider how you will match them up to spectra later.)
Regarding picture-file format, **the tool can import JPEG or PNG**. JPEG is preferred as it can store useful "Exif[2]" metadata containing the GPS coordinates and photo date / time that can be used by this tool.

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[1] There are no individual spectrum files for an ASCII table import. TSG invents filenames for these.
[2] EXIF – "Exchangeable image file" format in JPEG and TIFF files that record camera information at the point of capture.

Once you're ready, import your spectra into a TSG dataset as usual. Now get your sample photos organised in a directory. The photo directory doesn't need a special name and doesn't have to reside in a special place. TSG will not be interfering with it or the photos in it. Ideally you would have one photo file per acquired spectrum but it doesn't have to be so. There can be more or fewer photo files than spectra. I would recommend that you **do not change any photo filenames** (unless you *know* how to change them for sorting), although you can *append* text to some filenames (before the extension) if you feel persuaded to. Also, **do not edit any pictures** unless you know that your photo editing software is well-behaved[3]. (Read on about picture dates and GPS below.)

Once you bring up the new dialog it will block most TSG controls. However you can navigate "the current TSG sample" from the dialog so you might want to set TSG to a particular screen before launching the dialog. As you go through the process of assigning photos to spectra, you can also view the spectra in Floater 1 and the photos in Floater 4. The tool will launch these two Floaters automatically (and it will take over Floater 4). If you would like more Floater views of the TSG dataset then you should launch Floater 2 and / or 3 before you bring up the new dialog.

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[3] E.g., Two image editing apps that preserve Exif metadata are ACDSee and FastStone. The free Paint.net does not, unfortunately, and neither does the Paint app that comes with Windows 10.

File -> Import -> Sample pictures…

Let's crack into it. With the field-spectrometer dataset open in TSG, select the **File -> Import -> Sample pictures** menu.   You will be prompted to select the directory where your pictures are.   JPEG or PNG format is supported but JPEG is preferred.   The new dialog will come up once you have selected the picture directory.
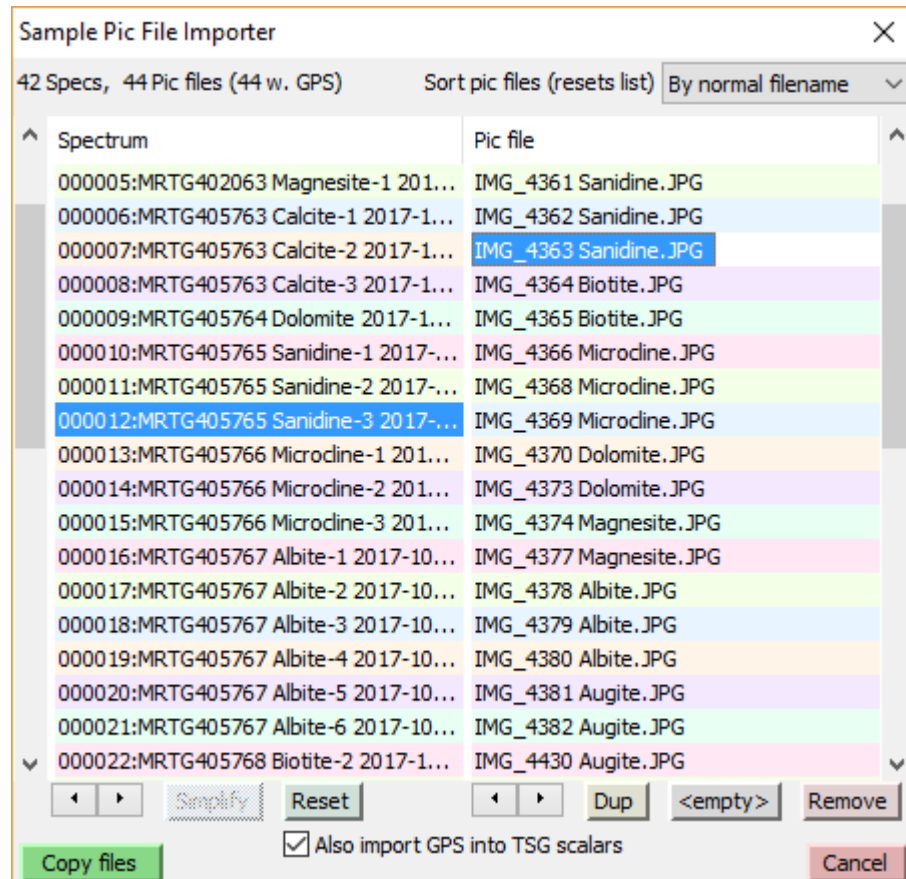
- The left list has one row per spectrum.   It shows spectrum names.
- The right list has one row per picture file.
- TSG keeps the lists synchronised.   They scroll together and are padded as necessary to have the same number of rows. (Padding rows are at the end and are called (list spacer). They play no active role.)
- Ultimately, picture files will be imported for spectra according to how the lists are lined up.
- The label at top left shows what you have.   In this case I have 42 spectra and 44 picture files, and all of the picture files have GPS info embedded in their metadata.
- The drop-list at top right is for sorting the picture-file list.   There are 3 or 4 ways to sort it.   *Be careful because sorting the picture-file list will reset it completely*.
- Each list knows about a current item .   It's the last one you clicked.   It gets shown with white text on a strong blue background.   Note: *You have to click on the text – clicking on the right past the text doesn't work*.
- Something happens when you click a list item.
  - If it's in the left list, Floater 1 is brought up and it can display any view for the clicked spectral sample.
  - If it's in the right list, floater 4 is brought up in evaluation mode, displaying the picture file.

- There are some controls underneath each list. The left list has an up-down control, a Simplify button (maybe greyed out), and a Reset button. The right list has an up-down control, and Dup, <empty> and Remove buttons.
- If some of your pictures have embedded GPS data then you will see a checkbox called Also import GPS into scalars beneath the lists.
- The Copy files button makes it go.

The general idea

Ultimately, picture files will be imported according to how the lists are lined up so your job here is to arrange the list items accordingly. Normally most of the work will be on the right list – the one with the picture filenames – so I'll get the (easier) left list out of the way first.
Important: Work from the top down. Starting in the middle of the lists will lead to frustration.

The left list (spectra)

The main thing you can do here is to reorder items. Select an item (spectrum) in the list by clicking on it, then use the spinner control ◄ ► to move the item up or down. (Sorry but you can only do this with one item at a time.) Although you can also reorder right-list items, this functionality was offered because there may be times when it is less of a job to reorder the left list than the right one.
If some of the spectra already have imported pictures then they will be shown with dark backgrounds in the left list and the **Simplify** button will be enabled. Clicking **Simplify** will remove these items from the left list, leaving just spectra that have no imported pictures yet. This will prevent you from overwriting already-imported picture files.
Click **Reset** to restore the left list to how it was when the dialog started.

The right list (picture filenames)

Ideally you'll have one picture per spectrum and, if the pictures were taken in the same order as the spectra, you'll get the right list ready just by sorting it and then be ready to hit the Copy Files button. If there are too few / too many pictures then you have a little extra work on your hands, and if the pictures were not taken in order then you probably have a lot.

Sorting

The first thing you should do with this list is to consider **sorting** it. The drop-list at top-right offers 3 or 4 ways to sort:
1. By normal filename – a standard alphanumeric sort on the whole filename;
2. By embedded number – a numeric sort on a number pulled out of the filename;
3. By modified date – a sort on the file's "last modified" date as seen by Windows;
4. By picture date – a sort on the date when the picture was taken.
Option 1 will normally do, given how cameras generally name their files.
Option 2 looks for an underscore ("_") in the filename, then extracts a number starting from the first numerical digit it finds after the underscore. The idea here is to get at the camera's sequence numbers.
Option 3 is, well, an option that is mentioned here in this document that you are reading now.
Option 4 only works with JPEG files (not PNG), and only those that contain "Exif" metadata sections. (These days, cameras commonly include Exif sections in their JPEG files.)
Important: *Some photo editors do not preserve Exif metadata.*

Note: Sorting the picture-file list resets it completely. All item reordering, removal, and blank insertion is abandoned.

List actions

a.k.a. "The controls below the list and what they do". All list actions relate to "the current item" – the item selected in the right list.

- The spinner control ◄ ► moves the current item up or down in the list.
- The Dup button inserts a special (dup) (duplicate this picture) item beneath the current item. This allows one picture to be shared between 2 or more spectra.
- The <empty> button inserts a special (no pic for this sample) entry beneath the current item. Ultimately, no picture will be imported for the spectrum across from this item and if the spectrum already has an imported pic (from before) then it will be left alone. This function is important if, for example, you forgot to take a photo of a field sample/site and your list of photos is shorter than your list of spectra.
- The Remove button removes the current item (real pic file or special entry) from the list. It does not delete a pic file from disk, nor does it remove anything from the spectrum list.

Importing GPS

If at least some of the picture files are JPEG format with embedded Exif metadata then they might include GPS information. It is more and more common for digital cameras (especially smart phones) to deliver pictures like this. If TSG finds some files like this then the **Also import GPS to TSG scalars** button will be active. (If *all* of the picture files have GPS then this button will be turned on by default.)

With this option enabled, TSG will import GPS data to system scalars **Latitude**, **Longitude** and **Altitude**. These scalars will first be created in the dataset if necessary and will appear in the "Locations" scalar folder. If a picture file is lacking GPS data then its corresponding scalars will receive NULL. If a spectrum is lined up with a special (no pic for this sample) right-list entry then its scalar values will be left alone.

Again: Some photo editors do not preserve Exif metadata.

Making it go

Once you're ready, click **Copy files** to start the process. TSG will create a subdirectory named **Pics** alongside the dataset's files and copy picture files into it, renaming the files so that they work in the Floater's Picture mode. It will try to copy a picture for each spectrum that shows on the left list – except those that are opposite a (no pic for this sample) right-list entry. The original picture files (in the directory you selected at the start) will be left unchanged. If the GPS option is on then GPS data will be extracted from the files, where possible, and imported into the Lat/Long/Alt scalars within the dataset. If all copies worked then the dialog will close. If not, TSG will issue an error dialog after copying what it can and the dialog will be left up.

Taking a second run at it

It may happen that after working with the lists for some time, you find that you have left out a few pictures. My advice is to finish the job with what you have, using the **<empty>** option as necessary to take care of those spectra whose picture files are missing. After finishing this import, locate the missing picture files and collect them in a subdirectory of their own. Then start the tool again, giving it this picture subdirectory. You should find that many entries in the left list have dark backgrounds, indicating that they already have picture files. Also, the

Simplify button will be active. Click this button to remove all dark-background items from the left list. Then you are left with the job of importing pictures just for those spectra that don't have any yet.

Results

If your preparation and importing has worked correctly and your images had embedded GPS coordinates then you will now be able to do some useful new things.

1. Open one or two floaters to view your spectra and another floater alongside to view its associated photo (e.g. below)
2. Open a scatter plot and set the 'x' and 'y' axes to the Longitude and Latitude scalars (found in the Locations folder) and plot your spectra sample locations coloured by, say, some other spectral index or scalar (e.g. feature wavelength, feature depth, mineral ID, etc.) as per the cross-country traverse example below. It is valuable to set the Scatter plot sub-screen to an Isometric scale (right-click and choose Scat Extras then Isometric Scale) to equalise the 'x' and 'y' scales.