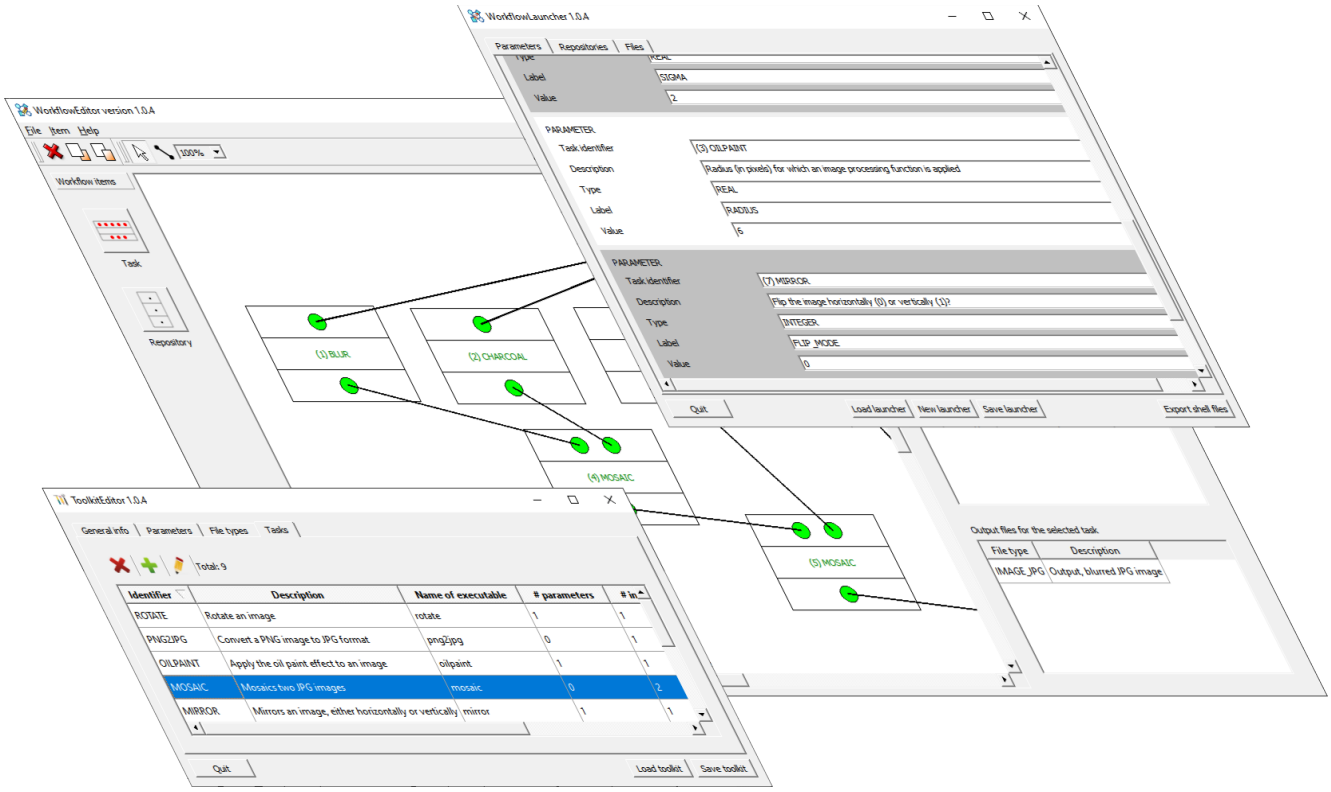
WorkflowMaker image processing samples user guide

For WorkflowMaker version **1.0.5** and later
Windows 10 & 11
64-bit only



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1 Introduction

This document presents a sample set of tools compatible with WorkflowMaker targeted at (very simple) image processing.

The tools included in this sample package do not intend to perform any useful task; these have been designed to be deliberately simple so analyzing its source code will let potentials users learn how to create or modify their own console applications to meet the requirements set by WorkFlowMaker. Furthermore, this example toolkit will also serve so that users can start practicing the visual design (and execution) of workflows, since a complete (WorkflowMaker files and executable tasks) toolkit is available.

Note that this document is not a user guide about WorkflowMaker, but just the definition of a complete (although very simplistic) toolkit. For information about how to use WorkFlowMaker, please, refer to the official user's guide.

2 The image processing example toolkit

The next sections will describe (tasks, list of file types, list of parameters) the text files processing sample toolkit.

In this section a very simple toolkit consisting of nine console applications (tasks) will be briefly explained. The field of application of the toolkit is that of image processing. All the tasks included in it apply some type of effect to an input image (such as blurring it) and save the result in an output image. Additionally there are two extra tools used to convert between two image formats.

2.1 The file types

Due to the simplicity of the example toolkit, only two file types have been included. These are described in Table 1.

Identifier	Description	Default extension
IMG_JPG	An image in .jpg format	.jpg
IMG_PNG	An image in .png format	.png

Table 1: The list of file types in the image processing example toolkit.

2.2 The keyboard parameters

The list of unique parameters may be found in Table 2 below. Note that in this context, "unique" means that some parameter is just defined once, but it may be used by as many tasks as necessary,

assigning different values to said parameters in each task.

Identifier	Description	Data type
DEGREES	Amount in degrees to rotate	Floating point
FLIP_MODE	Flip the image horizontally (0) or vertically (1)?	Integer
RADIUS	The radius (in pixels) that some image processing functions require to carry out their work.	Floating point
SIGMA	The standard deviation that some image processing functions require to carry out their work.	Floating point

Table 2: The list of unique parameters in the image processing example toolkit.

2.3 The tasks

Table 3 on page 6 briefly summarizes the tools included in the toolkit. In the case of keyboard parameters, the **boldfaced** text stands for the identifier of such parameters; for both input and output files, the **boldfaced** text corresponds to the labels that will be used in the option files, while the text in red stands for the identifiers of the file type these belong to.

Figure 1 on page 7 graphically illustrates what the different tools included in the example toolkit do. The two converters (JPG2PNG and PNG2JPG) have been excluded from this figure as the type of work they perform is obvious.

Figure 2 on page 8 depicts how ToolkitEditor would define task INTERLEAVE. Note the coincidence of parameters, input and output files between such figure and Table 3.

Identifier	Description	Parameters	Input files	Output files
BLUR	Blurs an image.	**SIGMA** – Standard deviation for the blur algorithm. **RADIUS** – Radius (in pixels) for the blur algorithm.	**INPUT_FILENAME** (IMAGE_JPG) – The input image to process.	**OUTPUT_FILENAME** (IMAGE_JPG) – The blurred image.
CHARCOAL	Apply the charcoal effect to an image.	**SIGMA** – Standard deviation for the charcoal algorithm. **RADIUS** – Radius (in pixels) for the charcoal algorithm.	**INPUT_FILENAME** (IMAGE_JPG) – The input image to process.	**OUTPUT_FILENAME** (IMAGE_JPG) – The output image, charcoal effect applied.
GRAYSCALE	Converts a color image to gray scale.	None.	**INPUT_FILENAME** (IMAGE_JPG) – The input color image.	**OUTPUT_FILENAME** (IMAGE_JPG) – The output gray scale image.
JPG2PNG	Convert an image in JPG format to PNG format.	None.	**INPUT_FILENAME** (IMAGE_JPG) – The input image to convert.	**OUTPUT_FILENAME** (IMAGE_PNG) – The output image, converted to PNG.
MIRROR	Mirrors an image, either horizontally or vertically.	**FLIP_MODE** – To select whether to flip the image horizontally or vertically.	**INPUT_FILENAME** (IMAGE_JPG) – The input image to mirror.	**OUTPUT_FILENAME** (IMAGE_JPG) – The output, mirrored image.
MOSAIC	Mosaics two images	None.	**LEFT_IMAGE_FILENAME** (IMAGE_JPG) – The input image that will be located in the left side of the output mosaic. **RIGHT_IMAGE_FILENAME** (IMAGE_JPG) – The input image that will be located in the right side of the output mosaic.	**MOSAIC_FILENAME** (IMAGE_JPG) – The output image, a mosaic of the two input ones.
OILPAINT	Apply the oil paint effect to an image.	**RADIUS** – Radius (in pixels) for the oil painting algorithm.	**INPUT_FILENAME** (IMAGE_JPG) – The input image to process.	**OUTPUT_FILENAME** (IMAGE_JPG) – The output image with the oil paint effect applied.
PNG2JPG	Convert an image in PNG format to JPG format.	None.	**INPUT_FILENAME** (IMAGE_PNG) – The input PNG image to convert.	**OUTPUT_FILENAME** (IMAGE_JPG) – The output image in JPG format.
ROTATE	Rotate an image	**DEGREES** – Amount in degrees to rotate.	**INPUT_FILENAME** (IMAGE_JPG) – The input image to rotate.	**OUTPUT_FILENAME** (IMAGE_JPG) – The output, rotated image.

Table 3: Characterization of the tasks in the example image processing toolkit.

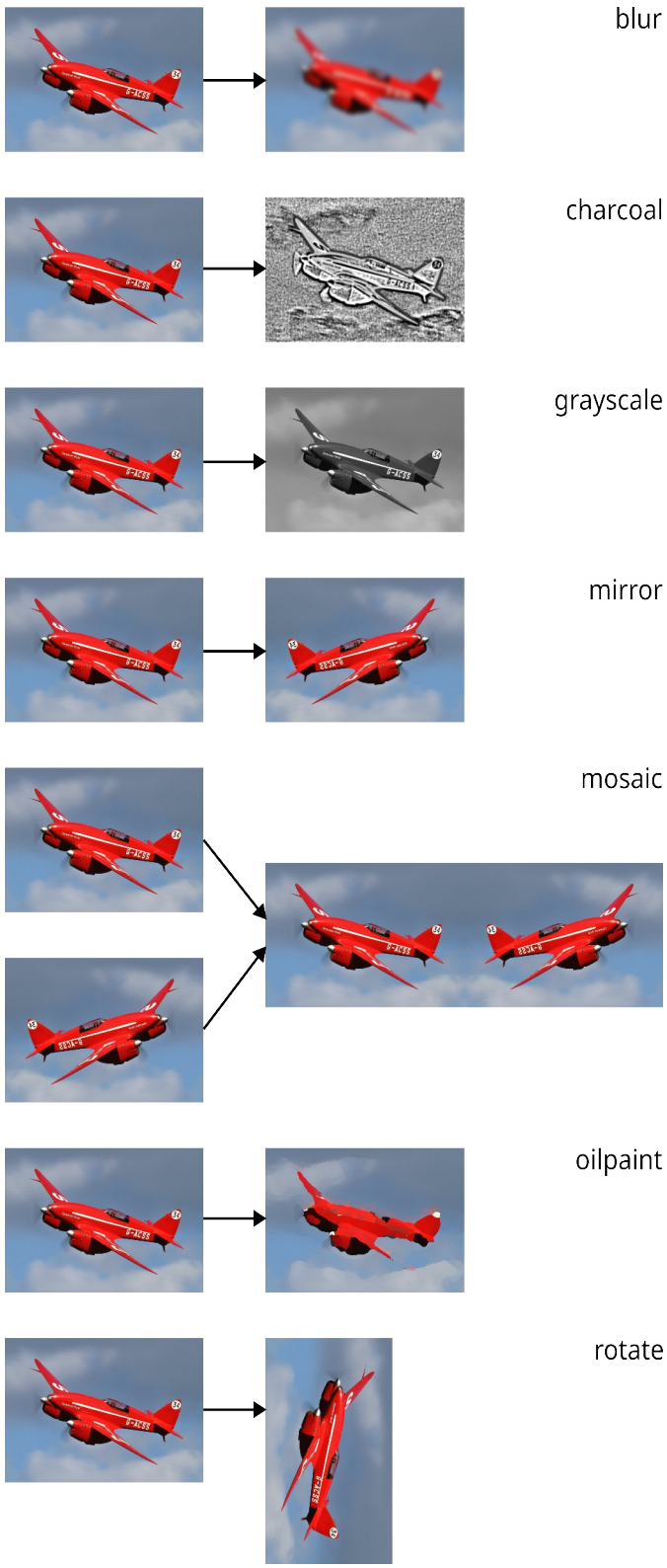

Figure 1: What do the tools included in the example toolkit do?

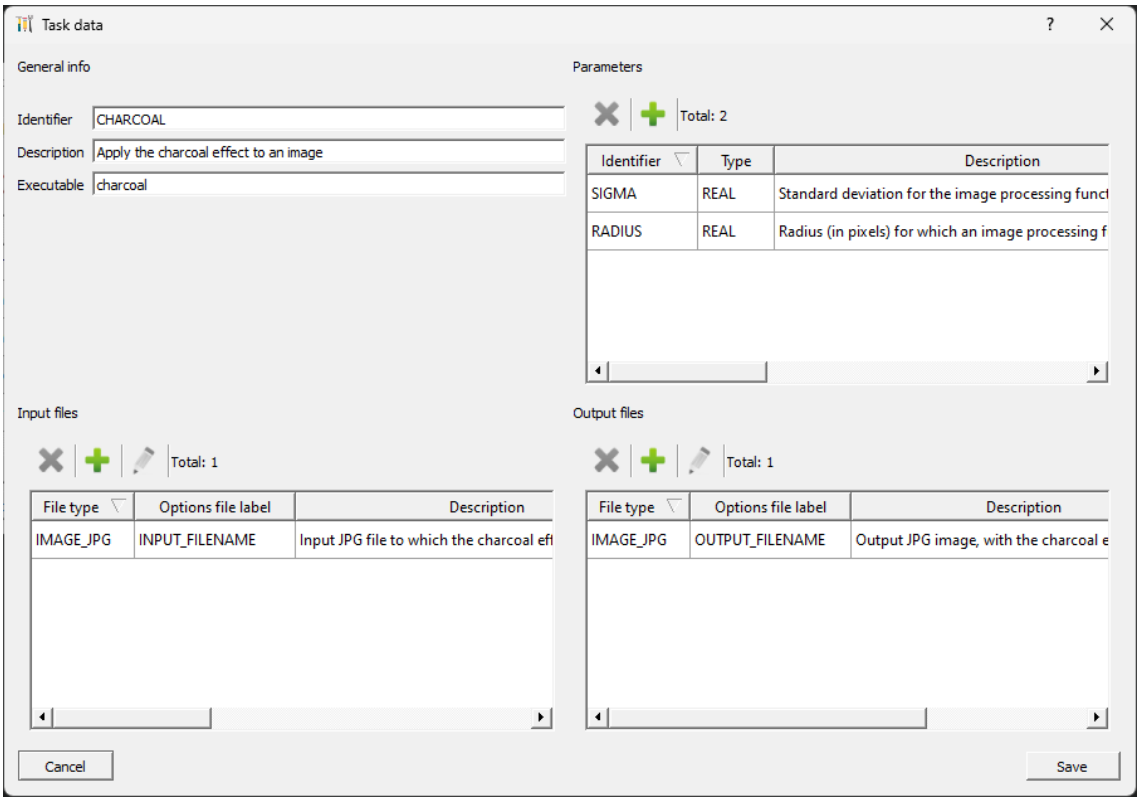

Figure 2: The definition of task CHARCOAL using the ToolkitEditor tool.

2.4 The toolkit sample files

Two sample WorkFlowMaker files have been included:

- image_processing_toolkit.xml – The definition of the toolkit as defined in sections 2.1 to 2.3, tables 1 to 3 and Figure 2. This file may be opened using the tool ToolkitEditor.
- image_processing_workflow.xml – A simple workflow relying on said toolkit. May be displayed / edited using WorkflowEditor.

Note that there are no launcher sample files in this example. The reason is these include the actual paths to some repositories and that these depend on the computer used to create them.

Warning: it is better to copy the sample files to some local directory to edit / modify them safely. These samples reside in folders with no writing privileges, so it would be no possible to save any changes made when editing them.

The example workflow performs the following tasks:

1. It will take a single input color image in PNG format, stored in some folder, and convert it to

JPG format, since all the tools in this toolkit but the converters work with JPG images.

2. It will create three new versions of these images, applying the effects known as blur, charcoal and oil paint.
3. These three images, together with the original one, will be joined in a mosaic.
4. Then, the mosaic will be mirrored around the vertical axis.
5. The mirrored image will be rotated 90 degrees clockwise.
6. The rotated image will be converted to gray scale.
7. Finally the gray scale image will be converted to PNG format and saved to some output folder.

All tasks but the one with number 3 may be carried out directly by some of the tools included in the image processing toolkit. For instance, the tool named MIRROR will take care of step 4; to convert from PNG to JPG or conversely the tools named PNG2JPG and JPG2PNG respectively will be used.

On the contrary, the MOSAIC tool is able to join together only two images at a time. Therefore, step 3 must be performed as follows due to the limitations of this tool:

A. First, mosaic the blurred image with the one to which the charcoal effect has been applied.
B. Then, mosaic the result of step A and the image that has undergone the oil painting effect. The resulting image now includes three parts: blur + charcoal + oil painting.
C. Afterwards, mosaic the result of step B and the original image. The result is the image sought, including three of them showing different image effects plus the original one at the right side.

Obviously, the procedure to mosaic four images is conditioned by the limitations of the example tool MOSAIC. Real toolkits will have their own set of tools with their own limitations.

Figure 3 on page 10 depicts the procedure described above. Note the text in red color labeling the steps in the said procedure (step 3 includes the three separate mosaic operations, A, B and C, for the sake of clarity). The red, dotted rectangles are not part of the WorkflowEditor interface, but have been added to make clear what are the said steps when these involve more than a single box (either for repositories or tasks).

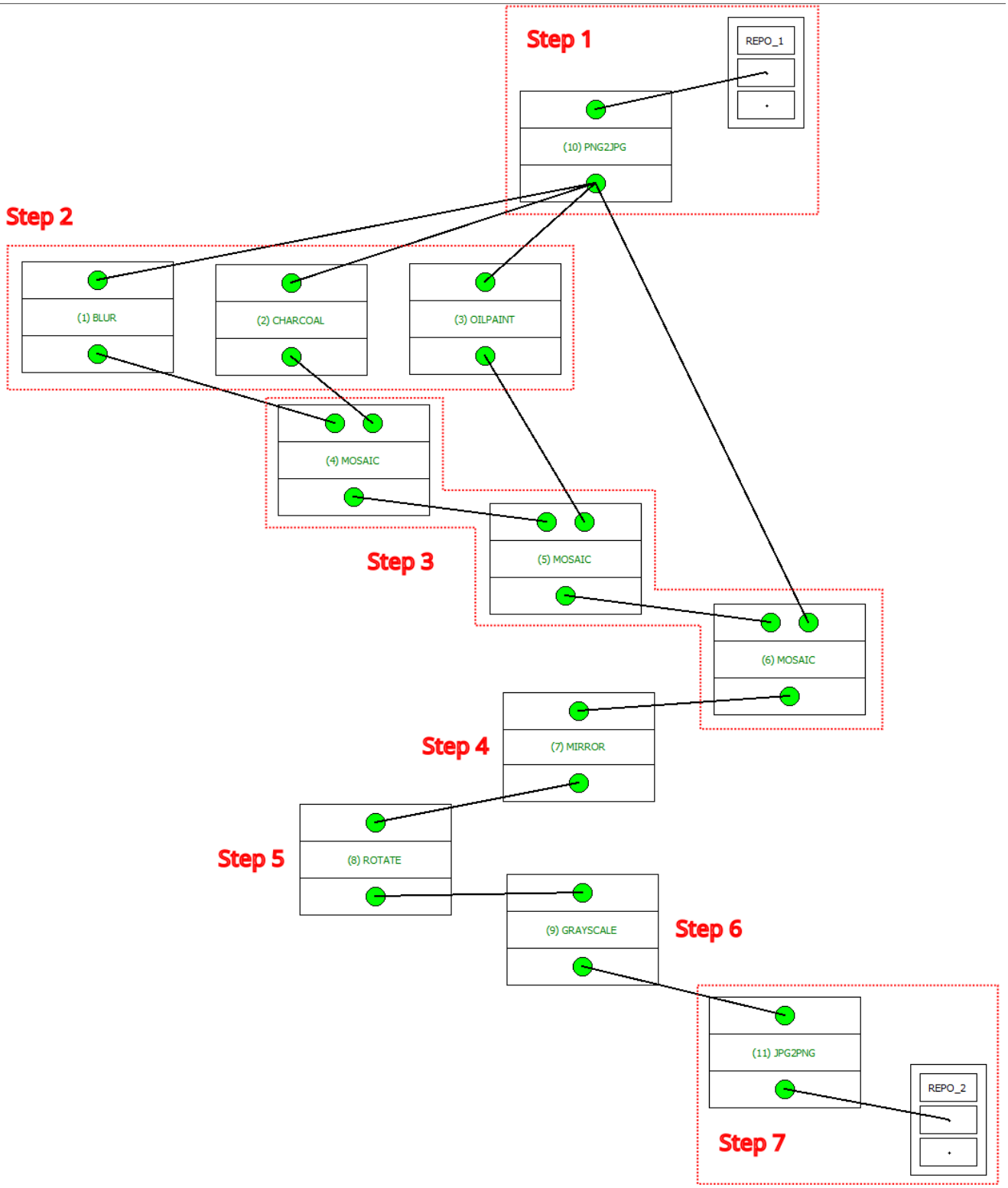

Figure 3: WorkflowEditor depiction of the workflow defined in image_processing_workflow.xml..

Error: Reference source not found shows (partially) the Windows script generated by ToolkitEditor for this workflow. The paths shown in the figure have been set by the user using said tool.

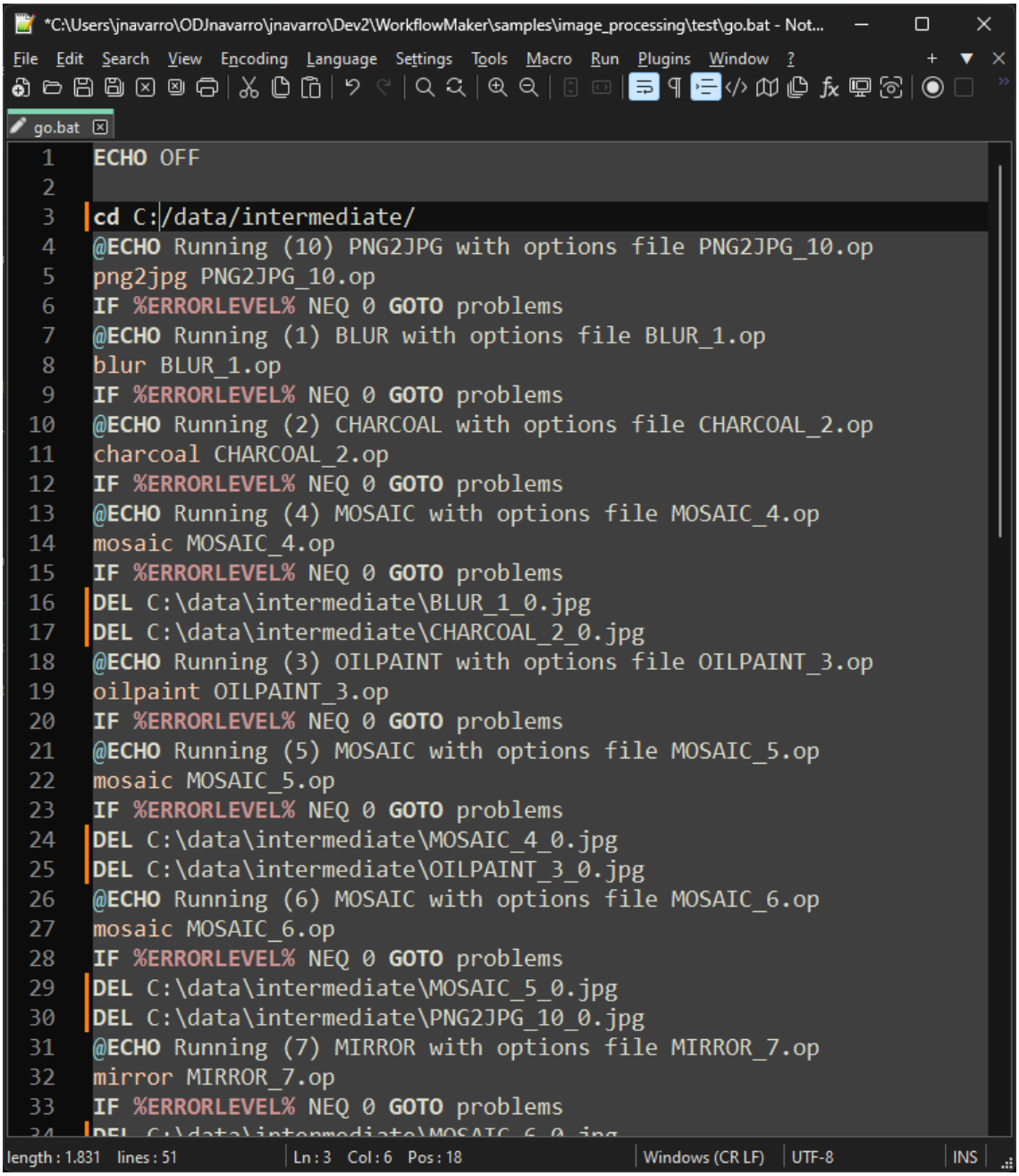

Figure 4: The Windows script created by ToolkitLauncher for the example workflow.