
Drawing Bot V3

Release 1.6.10

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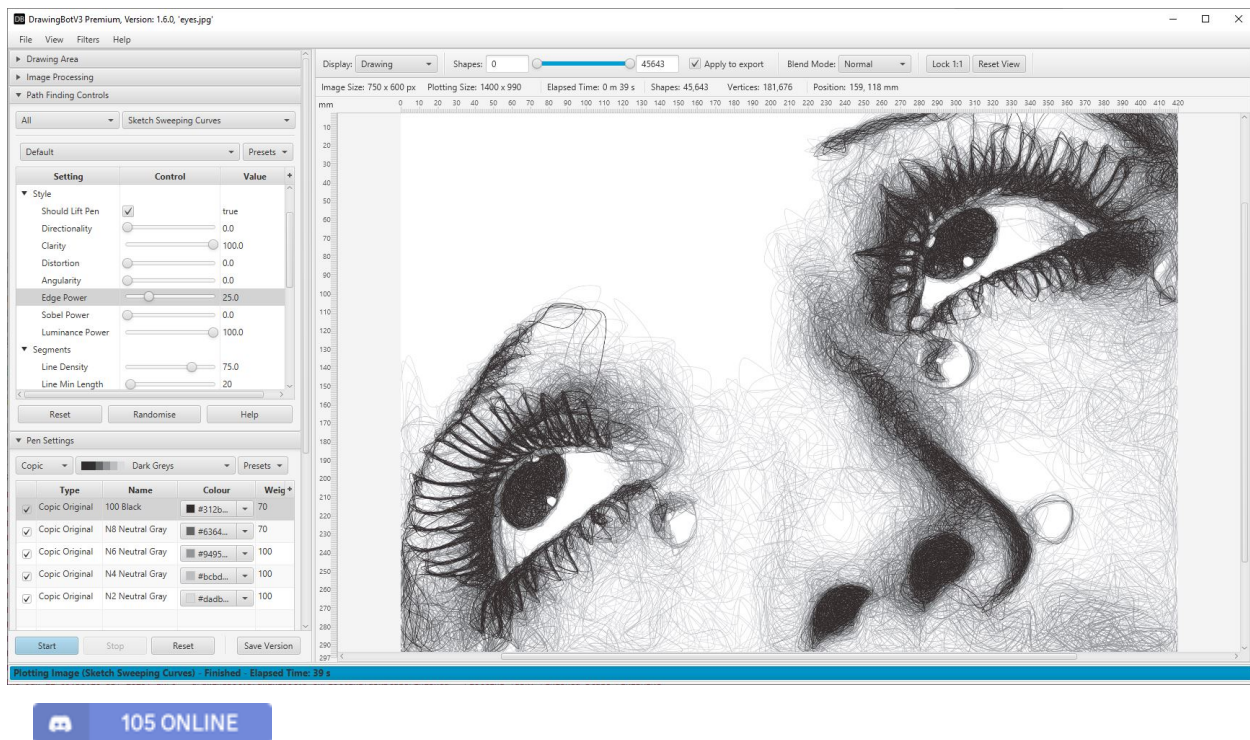
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CHAPTER ONE

DRAWING BOT V3



1.1 About

DrawingBotV3 is a software for converting images to stylised drawings with many applications including Pen Plotter Art, Digital Artwork, Image/Video Stylisation, NFT Creation, Embroidery and Graphic Design. With an intuitive User Interface allowing both Beginners and Advanced users to create beautiful artwork without any programming knowledge. Featuring over 50 in-built styles which are all highly customisable, the possibilities are endless!

You can find the full documentation [here](#).

There are two versions, **Free** and **Premium**.

- The **Free** version is Open-Source and can be downloaded [here](#).
- The **Premium** version is Closed-Source and can be purchased [here](#)

Both versions are available for Windows, Mac and Linux.

Join our [Discord Server](#) to chat all things DrawingBotV3!

1.2 Examples

1.3 Features - *Free Version*

- **3 Path Finding Algorithms:** *all highly configurable to create unique drawing styles.*
- **Automatic Path Optimisation for Faster Plots:** *Line Simplifying, Merging, Filtering, Sorting*
- **Pen Settings:** *configurable colour / stroke width / distribution weight / blend modes - perfect for multi-layered plots.*
- **60+ Image Filters:** *for pre processing the imported image*
- **Advanced User Interface:** *with live drawing preview and intuitive controls*
- **User configurable Drawing Area, with Padding / Scaling Modes**
- **Version Control:** *Save your favourite versions as you go and reload them.*
- **Project Saving & Loading:** *save your work and continue where you left off!*
- **Special pens:** *for Original Colour/Grayscale Sampling*
- **Presets:** *can be saved/imported/exported for sharing different styles with other users*
- **Multiple Export Options:** *can be exported per/pen or per/drawing in multiple file types*
- **GCode Export:** *configurable Drawing Area, XYZ Offsets / Auto Homing.*
- **vpype Integration:** *automatically send plots to vpype for further optimization and processing*

1.4 Features - *Premium Version*

- **All the features included in the Free Version**
- **50 Path Finding Algorithms:** *includes 47 more Path Finding Modules!*
- **CMYK separation:** *effortlessly create images using CMYK Pens*
- **Colour Match:** *create multi-colour plots with your own pens using the Colour Match separation feature!*
- **Batch Processing:** *Process entire folders of images export them in multiple formats automatically*
- **Export Animations:** *You can export animations of your creations as Image Sequences or MP4/MOV files!*
- **Style Controls:** *Adds style controls to Sketch PFMS, to create more stylised outputs!*
- **Plotter / Serial Port Connection:** *Connect to HPGL based plotters and control them over the serial port.*
- **Video Processing:** *Convert every frame from imported video files automatically*
- **HPGL Export:** *Export files for plotters, with configurable Hard-Clip limits, X-Axis Mirror, Y-Axis Mirror, X-Axis Alignment, Y-Axis Alignment, Rotation, Curve Flatness, Pen Velocity and the initial Pen Number.*
- **Hardware Accelerated Renderer:** *Fast OpenGL Based Renderer to preview drawings in higher clarity and speed!*
- **Pen Calibration Tools:** *Use the special Pen Calibration PFM, to calibrate the pens you're using for even better results!*

1.4.1 Supported File Types

Import Formats:

Images: [.tif, .tga, .png, .jpg, .gif, .bmp, .jpeg]

Videos: [.mp4, .mov, .avi]

Export Formats:

Vectors: [.svg, .pdf, .hpgl (Premium)],

Images/Image Sequences: [.png, .jpg, .jpeg, .tif, .tga]

Videos: [.mp4 (Premium), .mov (Premium)]

GCode: [.gcode, .txt],

INSTALLATION

Step 1) Download the latest version: **Premium Version** or **Free Version**

You can choose from the following installers

- **Windows - Installer** (.msi) -
 - Windows 11, 10, 8, 7, Vista
- **Windows - Portable** (.zip)
 - Windows 11, 10, 8, 7, Vista
- **MacOS - Installer** (.pkg)
 - M1, M2 or Intel based
- **Linux Debian - Installer** (.deb)
 - Ubuntu, Linux Mint etc.
- **Linux Red Hat - Installer** (.rpm)
 - Fedora, CentOS, RHEL etc.

Step 2) Download and run the installer.

Step 3) (*Premium Only*) - The first time you run the software you'll need to enter your License Key find out more [here](#).

2.1 Path Finding Modules

2.1.1 Free

- Sketch Lines PFM
- Sketch Squares PFM
- Spiral PFM

2.1.2 Premium

- Sketch Curves PFM
- Sketch Quad Beziers PFM
- Sketch Cubic Beziers PFM
- Sketch Catmull-Roms PFM
- Sketch Shapes PFM
- Sketch Sobel Edges PFM
- Sketch Waves PFM
- Sketch Flow Field
- Sketch Superformula
- Sketch Sweeping Curves
- Streamlines Edge Field
- Streamlines Flow Field
- Streamlines Superformula
- ECS Drawing
- Spiral Sawtooth
- Spiral Circular Scribbles
- Hatch Sawtooth
- Hatch Circular Scribbles
- Adaptive Shapes
- Adaptive Triangulation
- Adaptive Tree
- Adaptive Stippling
- Adaptive Dashes
- Adaptive Letters
- Adaptive Diagram
- Adaptive Circular Scribbles
- Adaptive TSP
- LBG Shapes
- LBG Triangulation
- LBG Tree
- LBG Stippling
- LBG Dashes
- LBG Letters
- LBG Diagram
- LBG Circular Scribbles

- LBG Quad Tiles
- LBG TSP
- Voronoi Shapes
- Voronoi Triangulation
- Voronoi Tree
- Voronoi Stippling
- Voronoi Dashes
- Voronoi Letters
- Voronoi Diagram
- Voronoi TSP
- Mosaic Rectangles
- Mosaic Voronoi
- Mosaic Triangulation
- Mosaic Segments
- Mosaic Custom
- Layers PFM
- SVG Converter
- Pen Calibration

More info [here](#)

DrawingBotV3 started as an expansion of [Drawbot Image to GCode V2](#) originally written by **Scott Cooper**, thanks to Scott for allowing me to publish this version! Since then it has grown into a fully fledged software for creating art.

CHANGE LOG

3.1 v1.6.16-stable

- Added: 'Area Calibration' PFM, used for checking the size of the plotters drawing area and adjusting margins
- Fixed: CMYK / Colour Match / Masking settings not saving / loading properly when saved in a project
- Fixed: Older projects not reloading properly in some situations
- Fixed: Viewport zoom resetting when a task is stopped, or when a task is completed
- Fixed: HPGL plotters not being detected with "Detect Plotter" when the serial port echoes the input
- Improved: Allow multi-threading when running tasks with Batch Processing

3.2 v1.6.15-stable

- Fixed: Preset creation/editing dialogs appearing blank on macOS
- Fixed: Prevent the Drawing Pen selection closing when a check-box is ticked.
- Fixed: Issues editing created presets on macOS
- Fixed: Loaded images, being prevented from being deleted in some situations.
- Fixed: Ruler overlays not matching the drawing when no image is loaded with original sizing enabled.
- Fixed: Files not saving in the correct location when exporting to a directory containing a "." on Linux.

3.3 v1.6.14-stable

- Added: 'Edge Trace' presets to Sketch PFMs, which utilise new 'Seed Type' setting, to create sketches which exaggerate edges and small details.
- Added: 'Seed Type' to Sketch PFMs, ability to seed lines from Luminance / Edges / Sobel data
- Added: Preset Manager - accessible via File/Preset Manager
 - Re-order both user/system presets / change the default order of presets in menus
 - Enable/Disable presets, prevent them from appearing in menus
 - Edit presets with more detailed edit controls
 - Import / Export multiple presets or all presets at once.

- Override in-built system presets with your own settings
- Added: HPGL Custom Codes for more advanced configuring of HPGL Files, configurable Start, End, Pen Up, Pen Down, Start Pen Layer, End Pen Layer
- Added: Additional GCode Wildcard, %PEN_ID% to allow more configurable tool changes
- Added: Individual setting search functionality in the Preferences UI with automatic yellow highlighting
- Improved: Viewport Rewrite: the main viewport has been re-written switching between OpenGL and JavaFX will now be more seamless and the canvas will be more responsive
- Improved: ‘Circular Scribbles’ PFMs have been re-written and now create smoother scribbles
- Improved: ‘Hatch Sawtooth’ PFM has been re-written it now creates more accurate results
- Improved: CPU/GPU Usage when idle, the program will consume less resources in general when running in the background
- Improved: Performance and responsiveness of the Hardware Accelerated Renderer
- Improved: Memory footprint and speed of Sketch PFMs
- Improved: Changes to Drawing Pen presets will be applied to existing Drawing Set presets when the pens match.
- Improved: Presets now must have unique identifiers, to allow for more advanced editing
- Improved: Simplified Batch Processing UX to allow easier editing of Input/Output Folders
- Improved: Presets, added additional notifications while editing presets
- Improved: Preferences now only save changes from default values, allowing defaults to be tweaked more easily in the future
- Improved: Hardware Accelerated Renderer, start time, memory usage and speed
- Improved: Speed of Pen Distribution re-calculations
- Improved: UX the settings panes on the left will grow to fill available space when no other panes are open
- Fixed: Added ‘ocl-icd-opencl-dev’ to linux dependencies, fixing “could not load libOpenCL.so” errors / the app failing to start on linux
- Fixed: Hatch Sawtooth producing incomplete lines when used in Mosaic Segments
- Fixed: CMYK + Streamlines stopping prematurely
- Fixed: Streamlines Edge Fields inconsistency with OpenCL enabled
- Fixed: PFM Layers not using Color Separation
- Fixed: Slow pen distribution when using composite PFMs
- Fixed: Roland DPX 3300 HPGL Preset
- Fixed: ‘Mask Settings’ missing from the ‘View’ menu
- Fixed: Menu Bar positioning with i3 Window Manager on Linux
- Fixed: Black flicker when first starting the OpenGL Hardware Accelerated Renderer
- Fixed: UI flickering / re-layout when opening the application
- Fixed: Potential memory leaks, eventual application slow down

3.4 v1.6.13-stable

- Added: SVG Converter - Support for SVG Gradients when Colour Match is enabled
- Added: Extra options for SVG Converter; ‘Shape Outlines’, ‘Gradient Angle Match’ and ‘Gradient Colour Match’
- Added: ‘Export Logs / Crash Reports’ to the help menu, to simplify providing support / debugging
- Added: ‘Switch to SVG Converter on SVG Import’ option to SVG Preferences
- Improved: Reduced memory usage over application lifetime
- Improved: Speed of clipping when using Masks / SVG Converter
- Fixed: Crash on load when OpenCL Native Library is unavailable
- Fixed: OpenGL Renderer attempting to load on devices without OpenGL 3.3+ support.
- Fixed: SVG Converter - Using incorrect scaling in some situations
- Fixed: Export per/pens failing when the pen names contain special characters
- Fixed: SVG Converter - Shape clipping failing on complex SVGs
- Fixed: Freeze/hang when switching to cm/inches when the drawing width or height is 0.0
- Fixed: PFM not running when the drawing width/height is 0.0, now runs with default sizing: A4 paper
- Fixed: Occasional momentary hang after a PFM has finished processing
- Fixed: Renamed the Stabilo pen presets to match correct pen naming conventions / no special characters

3.5 v1.6.12-beta

- Fixed: OpenCL Integration on MacOS and other configurations where OpenCL 2.0 is unavailable.

3.6 v1.6.11-beta

- Added: “Advanced Settings” to preferences, allowing you to specify which OpenCL device to use for acceleration, use with default settings unless you have issues.
- Improved: Colour Accuracy and Line Quality of Colour Match when using Sketch PFMs
- Improved: Speed of the “Refine ETF” stage of Streamlines Edge Field
- Improved: Speed of the “Comparing Pens” stage when using Colour Match
- Fixed: Crash on load on MacOS High Sierra / Disable Documentation Integration for MacOS pre Big Sur
- Fixed: Crash when using Streamlines Edge Field / Colour Match on more recent GPU/CPU Combinations
- Fixed: Some preferences auto-applying when other settings change
- Fixed: Export Image using the incorrect scaling when using High Quality Mode in some configurations
- Fixed: Sketch PFMs creating digital-like artifacts in dark areas when using Unlimited Tests
- Fixed: Mosaic Custom using the incorrect scaling when the mask and image size didn’t match
- Fixed: Hardware Accelerated Renderer canvas positioning when first loaded
- Note: Switched from Aparapi to JOCL for OpenCL Integration

3.7 v1.6.10-beta

- Added: **3 New Streamlines PFMS** Streamline PFMs generate streamlines to represent an image which are driven by the direction from a vector field. The streamlines are spaced according to the brightness of the image without overlapping. The underlying vector field can be altered dramatically to create many different styles which still remaining faithful to the original images brightness. This makes them very versatile for creating stylised wave like patterns which can be highly customised.
 - **Streamlines Edge Field** - Generates streamlines which follow the natural direction of the image, derived from an Edge Tangent Field
 - **Streamlines Flow Field** - Generates streamlines which follow a Flow Field
 - **Streamlines Superformula** - Generates streamlines which follow a Superformula
- Added: Support for “Export to vtype” when using Batch Processing / Video Processing and in all default export modes “per/pen, per/n pens” etc.
- Improved: Quality and tone retention when using CMYK
- Improved: Line Accuracy of Sketch PFMs
- Improved: SVG Converter - Overall speed especially when Shape Clipping is enabled.
- Improved: SVG Converter - Quality of hatch fills on curved shapes
- Improved: SVG Converter - Handling of compound paths and filling shapes with holes
- Improved: SVG Converter - SVG Dimension interpretation when no dimensions are specified
- Improved: Colour Match pen comparison speed
- Improved: Added more detailed progress bar to Adaptive PFMs
- Changed: CMYK / CMYK (Extended) now use a default Clean Black & Clean White of 0
- Fixed: Sketch PFMs drawing multiple straight lines in dark areas when using Unlimited Tests.
- Fixed: Incorrect canvas alignment when using “Crop to fit” with inches/cm
- Fixed: GCode Export - missing pen up commands at the start/end of layers
- Fixed: Failed start-ups in situations where OpenCV libraries failed to load
- Fixed: Batch/Video Processing failing to draw the current task

3.8 v1.6.9-beta

- Added: “High Quality Mode DPI” setting to preferences, creating greater consistency of style between High/Low Quality input images and different page sizes
- Improved: Tone/Contrast consistency between High Quality / Normal Quality + better shadow detail in High Quality mode.
- Improved: OpenGL Renderer will now initialize silently at runtime
- Improved: Switching between Drawing and Drawing (Hardware Accelerated) will maintain the original viewport position.
- Fixed: Pop-Ups/Dialogs appearing on a different desktop/screen and sometimes crashing the application.
- Fixed: Pop-Ups/Dialogs minimizing/hiding the main window in some situations.
- Fixed: High Quality mode producing lower quality results when using high resolution images.

- Fixed: Export failures when creating drawings with Adaptive Letters and Grid Letters

3.9 v1.6.8-beta

- Improved: Initial start speed of LBG PFMs
- Improved: MacOS - OpenGL Renderer Quality/Speed Improvements
- Improved: HPGL / GCode Export error reporting
- Fixed: PFMs Failing to run in some situations with “could not initialize class” errors
- Fixed: MacOS OpenGL Renderer not initializing on some operating systems.
- Fixed: OpenGL Renderer failing to initialize in Full Screen
- Fixed: Import/Export Dialogs not appearing when the previous location is unavailable.
- Fixed: HPGL / GCode Export failing to start in some situations on MacOS

3.10 v1.6.7-beta

- Added: **Group** option for Masks, right-click a mask in the table with multiple selected to create a new grouped mask.
- Added: **Link Square Paths & Link Circle Paths** to Pen Calibration PFM, reducing pen lifts when running tests.
- Added: **Heart** as a new Shape and Mask Type.
- Added: Support for Proxies when running with a Corporate Firewall.
- Improved: UI Scaling on Pen Settings and Batch Processing panels.
- Fixed: Colour Match failing to finish with “*Out of range*”.
- Fixed: Catmull-Roms PFM failing to finish with “*testData is null*”.
- Fixed: Duplicating masks creating an additional invisible mask.
- Fixed: SVG Converter PFM handling empty paths incorrectly, resulting in export failures.
- Fixed: SVG Converter PFM ignoring the *Pen Limit* when using *Colour Match*

3.11 v1.6.6-beta

- Added: **2 New PFMs**:
 - **Sketch Flow Fields** - Uses a Flow Field to direct the generated paths.
 - **Sketch Superformula** - Uses [Superformula](#) to produce sketch plots which are driven by radial patterns, such as stars, vortexes and ellipses. You can use examples shown on the Superformula wiki by using the examples **m**, **n1**, **n2** and **n3** for **Frequency**, **Curvature**, **Sine Factor** and **Cos Factor** respectively
- Added: **CMYK (Extended Gamut)** - A new color separation option which extends the stand CMYK range to include Orange, Green, Violet, Red and Blue. It can create plots with even more vibrant colors and more colour accurate result than standard CMYK. You can even add your own pens to the color separation, allowing for even more accurate results, it is best to still keep the main CMYK pens as part of the plot.
- Added: **2 New Distribution Types**

- **Random Squiggles** - Unlike the classic *Random* distribution, random squiggles will only change pen when a *Squiggle* (continuous path without pen lifts) is finished.
- **Luminance Weighted** - Distributes pens according to each shape's luminance in the original image, works especially well with non-Sketch PFM's by reintroducing multiple pens to the plot in a more aesthetically pleasing way than alternative distribution types. Try it out with Adaptive Shapes!
- Added: **New CMYK Settings**
 - **Clean Black** - Prevents areas of complete black being drawn over by non-black pens, resulting in a cleaner result with less ink wasted.
 - **Clean White** - Works in a similar way to Clean Black, and protects white areas from being drawn over by off-white pens.
 - **Vibrancy** - Controls the overall intensity for the Extended Gamut colors (Orange, Green, Violet, Red and Blue)
 - **Reduce Overlay** - Controls the amount pens are allowed to overlap in the final result.
- Improved: New CMYK Separation configuration UI, to allow more advanced configurations.
- Improved: CMYK Settings can now be saved along with Drawing Set presets.
- Improved: Serial Connection progress will now show high values in hours/min/sec and not just min/sec
- Fixed: Notifications not appearing
- Fixed: Anchor point positioning when rotating mask shapes with shift held down.
- Fixed: Elapsed time flickering when hours / minutes reached 0

3.12 v1.6.5-stable

- Improved: RAM Usage has been reduced in many situations and the general responsiveness of the application improved.
- Improved: Sketch PFM's have been further optimised, with speed improvements up to 2x.
- Improved: Sketch Sweeping Curves especially now runs considerably faster.
- Improved: Optimised the Hardware Accelerated renderer and improved curve quality.
- Improved: Updated Bic Pens and Drawing Set Definitions & Colours -led
- Improved: Moved baked GCode into default GCode preset, to allow more custom GCode.
- Improved: Drawings which take less than a second will now show elapsed time in milliseconds.
- Fixed: Memory Leak when "Auto Run PFM" is enabled, resulting in slow down of the application.
- Fixed: "Plotting Resolution" breaking on multiple PFM's
- Fixed: "Plotting Size" not showing the correct dimensions when using padding -led
- Fixed: "Preferences" config not saving properly on shutdown in some situations

3.13 v1.6.4-beta

- Added: **3 New PFMs: Grid Shapes, Grid Dashes and Grid Letters**, more details [here](#)
- Added: Documentation Integration
 - Go to **Help / Open Documentation** - to open the documentation in-app
 - In the **Path Finding Controls** window, select **Help**, to display a specific PFM's settings.
 - Select **Any PFM Setting** while the documentation window is open, to bring up the specific setting's definition.
- Added: You can now check for new updates in software by going to **Help / Check For Updates**, if an update is available a link will be provided.
- Added: Option to specify a default Import / Export folder for new projects.
- Added: Invert Colour Option too Colour Match.
- Added: Keyboard Shortcut *Shift + V* - Creates a new version.
- Improved: Saved Projects will save the last used Import / Export Folder.
- Improved: Layout / Appearance of *Export Stats* and moves/pen lifts will now be placed in order making the shapes slider more useful in Exported Drawing mode, shown when exporting vector files
- Improved: Visual appearance of *Notifications*
- Improved: “Reset” & “Stop” responsiveness on Voronoi PFMs
- Improved: Mosaic PFMs will now render their progress in a more useful way, without restarting after each tile is processed.
- Improved: Performance of transformations on SVG masks
- Improved: *Sketch Shapes* PFM now supports all Style parameters.
- Fixed: Mosaic + Layers PFM - Drawing Styles not loading/saving properly.
- Fixed: CMYK Pens not exporting with the correct Opacity value.
- Fixed: Export Stats displaying the wrong units.
- Fixed: Image Cropping not loading properly when re-opening a project / switching to another open project.
- Fixed: Drawings / Images not being refreshed properly when switching between two open projects.
- Fixed: Voronoi PFMs continuing to run the background after being reset.
- Fixed: Log Files being incomplete.
- Fixed: Project files saving with the wrong extension in some situations.
- Fixed: Stipple Size having no effect on Stipple PFMs

3.14 v1.6.3-beta

- Added: New Presets “Messy TSP”, “Hatchy Squiggles” & “Glitchy Stars” - for Adaptive/LBG Circular Scribbles & “Light Crosshatch” for Layers PFM
- Improved: ‘Default’ & ‘Detailed Scribbles’ & ‘Sketch’ - Circular Scribbles Presets
- Improved: More improvements to the quality of Circular Scribbles, transitions between different radii will be smoother.
- Changed: The default “Angular Velocity” for Adaptive Circular Scribbles & LBG Circular Scribbles is 60 instead of 20.
- Fixed: Using CMYK with Mosaic PFMS.
- Fixed: CMYK Processing failing to finish properly with “Coordinate out of bounds”
- Fixed: SVG Converter PFM not scaling properly and sometimes moving elements of the SVG.
- Fixed: Drawings created with the SVG Converter PFM not keeping the SVGs original size when exported.
- Fixed: Loading Projects when the original image can’t be located would not load the chosen replacement image.
- Fixed: “Star” and “Triangle” shapes missing rotation when using Shapes PFMs
- Fixed: Loading Projects ignored the Drawing Area orientation.
- Fixed: Drawings being re-rendered when exporting non-vector files.
- Fixed: Drawings being re-generated when creating new preset files.

3.15 v1.6.2-beta

- Added: New presets “Single Pen Preset V1” for Sketch Sweeping Curves and “Distorted Waves” for Sketch Waves
- Added: “Cache Result” option to all LBG PFMs, which results in a significant increase in speed for subsequent runs on the same image if the “LBG Sampling” settings are still the same. Any changes to image filtering / drawing size will invalidate this cache.
- Added: New “Exporting Drawing” stats, “Page Size” & “Drawing Size” (which shows the size of the area occupied by the drawing only) to make the size of the exported SVG more clear.
- Added: SVG exports now contain the drawing stats, e.g. Shapes / Total Travel etc, enabled by default. Disable it by going to File/Preferences/SVG/Save Drawing Stats to SVG
- Added: SVG exports can now contain the PFM Settings as a JSON preset, disabled by default. Enable it by going to File/Preferences/SVG/Save PFM Settings to SVG
- Improved: Circular Scribbles Performance, now creates much smoother scribbles with fewer artifacts.
- Improved: Simplified Batch Processing Notifications to reduce clutter.
- Improved: Performance of Video Processing, frames are loaded when needed, rather than buffered at the start.
- Improved: Path Optimisation performance, up to 2x reduction in ‘pen up’ / ‘air time’ with some PFMs
- Improved: User Created Presets will now have a coloured label (*User*) indicating they can be edited/renamed/deleted etc.
- Fixed: Curves becoming flattened to lines in some instances when exporting SVGs.
- Fixed: Animation / Image Sequence Exporting not starting when selected.

- Fixed: Video Exporting stopping unexpectedly or causing “Java Heap Issues”
- Fixed: ‘Image & Animation’ settings category not displaying when selected in the preferences menu
- Fixed: ‘Exported Drawing’ stats, in previous versions the reported distances were inaccurate.
- Fixed: Pen Calibration PFM, crashing/hanging when the Test Count was set to 1.
- Fixed: LBG Circular Scribbles not rendering a preview while the sampling is running.
- Fixed: Export File Notifications glitching when using Batch Processing.
- Fixed: Interactions with the “Export to vPype” interface

3.16 v1.6.1-beta

- Added: Pencil Sketch V1 preset from Discord.
- Improved: Renamed + Re-organised some ECS Drawing settings to make them easier to use.
- Fixed: Masking Settings not appearing in the user interface

3.17 v1.6.0-beta

- **IMPORTANT: Premium Versions now have License Keys**, if you already own the Premium Version you’ll find your license key [here](#). If you purchase DBV3 Premium in the future you’ll also receive this License Key with your Order Confirmation. More details [here](#).
- **IMPORTANT:** .jar versions of DBV3 will no longer be distributed, please use the dedicated Windows/Mac/Linux installers. This is to allow more advanced features which require specific Java versions, DBV3 now uses JAVA 19.
- Added: **13 NEW PFMS** -
 - **Sketch Sweeping Curves:** A new Sketch PFM focused on creating long sweeping curves which are more natural / human-like, focused on creating longer curves. It shares most setting with other Sketch PFMS.
 - * ‘Curvature’: Controls the appearance of “knots” in the curve. It translates to spline types: 0 = Uniform Catmull-Rom, 0.5 = Centripetal Catmull-Rom (Default), 1.0 Chordal Catmull-Rom
 - **LBG Shapes, Triangulation, Tree, Stippling, Dashes, Letters, Diagram, TSP, Circular Scribbles** - LBS (Linde Buzo Gray) PFMs combine the speed of Adaptive PFMs with the Quality of Voronoi PFMS and in most cases will outperform both in detail retention. They also respond better to large variations in stipple spacing.
 - * ‘Stipple Radius Min/Max’ - Controls the spacing of the stipple points, smaller stipple radii will result in more detailed results.-
 - * ‘Density’ - Controls the tone of the resulting image, a low density will be low contrast and may lose detail when the min/max stipple radius are far apart, a high density will be high contrast and retain more detail but will result in longer plotting times.
 - * ‘Threshold’ - Controls the luminance at which stipples will stop being placed, similar to “Ignore White” but with finer control.
 - * ‘Max Iteration’ - The number of times the stipple points will be refined, far fewer iterations are required to get good results than with Voronoi PFMS
 - **LBG Quad Tiles:** An LBG PFM which currently has no Voronoi / Adaptive counterpart, this PFM draws a Quad Tree from the LBS Stippling points.

- **ECS Drawing:** This PFM has three separate components **Edge Detection**, **Contour Detection & Shading**. Each component can be controlled independently, you can also run them individually and then combine ECS with other PFMs instead using PFM Layers.
 - * 'Simplify' - Simplifies the Edges & Contours generated.
 - * 'Draw Edges' - Disables/Enables edge detection.
 - * 'Edge Blur' - Affects the pre-filter blur applied before edges are detected, higher edge blur will result in less edges but the edges will be smoother.
 - * 'Edge Threshold' - Controls the amount of edges which are generated: lower threshold -> more edges : higher threshold -> less edges
 - * 'Draw Contours' - Disables/Enables contour detection.
 - * 'Contour Blur' - Similar to Edge Blur but for contours, has a greater impact on the amount of contours and quality of the contours.
 - * 'Contour Detail' - Controls the amount of contours to be generated.
 - * 'Draw Shading' - Disables/Enables shading. The shading component uses a simplified version of the Sketch Lines shading feature, you may choose to disable the shading entirely and overlay another Sketch PFM using PFM Layers.
 - * 'Shading Threshold' - Controls the luminance at which shading will be stopped: lower -> less shading : higher -> more shading
 - * 'Shading Detail' - Controls the accuracy of the shading: lower -> less accurate, more stylised : higher -> more accurate, less stylised
 - * 'Shading Length' - Controls the maximum length of the lines which make up the shading.
- **Pen Calibration:** This PFM is used for generating Pen Calibration tests which can be used to select the most accurate nib size for "Rescale to Pen Width". Choose a suitable Nib Size range for the pen you wish to test and then plot the test. Then set your Pen Width for future plots with that pen to the highest nib size which has no gaps between the lines.
 - * 'Nib Size Min' - The smallest nib size to test
 - * 'Nib Size Max' - The largest nib size to test
 - * 'Test Count' - The number of tests to run between the Min/Max nib size
 - * 'Rotation' - Controls the angle of the lines in the generated line tests
 - * 'Line Tests' - Generates simple hatches line tests
 - * 'Circle Tests' - Generates concentric circle tests
 - * 'Test Size' - The width/height in mm of each nib size test
 - * 'Spacing X/Y' - The grid spacing in mm between each test in the grid
 - * 'SVG Font' - The SVG Font to use to draw the labels for each nib size test
 - * 'Title' - An optional title to draw at the top of page, you can leave this blank to have no title.
 - * 'Font Size' - The height in mm of the label/title text.
- Added: **New Image Filter "Custom Overlay"** - import Black & White image overlays to create new unique styles!
- Added: **New PFM Setting - 'Draw Outlines'** - Draws the outlines of the shapes generated by Mosaic PFMS, great for creating more stylised results!

- Added: **CMYK Offset Settings & CMYK Display Settings** - Controlled in the “Configure” panel, Offset settings allow you to slightly offset each colour channel, display settings allow you to control the opacity of the pens, it will automatically update the colour of the pens and re-draw the drawing (this is a on-screen change only).
- Added: **LP Space** - A new shape type available in Voronoi Shapes / Adaptive Shapes / LBG Shapes - it roughly imitates the LP Space/p-norm function to create shapes which vary from Diamond -> Circle -> Rounded Square. This shape type can better represent the tonality of the original image by adjusting its shape to match. It also produces more variety in the final drawing.
- Added: **New Special Pens: Original Colour (Inverted), Original Grayscale (Inverted)** - Samples the original colour of the source image and inverts it, for use with Digital Only outputs. Great for creating stylised Digital Drawings on a black background.
- Added: “Distortion” setting to all Dashes PFMs
- Added: “Clarity” setting to Sketch PFMs, which increases sharpness and detail in the final output, behind the scenes this effectively adds a Unsharp Mask Filter too the image before processing.
- Improved: Drawing Pen presets now be created easily with “New Preset” - you can select from existing categories and choose a colour
- Improved: Setting pop up windows for Colour Separation / Image Filters / Presets have been improved and standardised
- Improved: Console/Error Logging - log files will now be exported to the Config Folder / Logs, the last 10 logs will be retained
- Improved: Circular Scribbles curve quality
- Fixed: Projects with multiple versions creating massive project files which may fail to load.
- Fixed: Mosaic PFMs not responding in some situations
- Fixed: Batch Processing now supports SVG Files and all Image File types.
- Fixed: UI State Reloading

3.18 v1.5.3-stable

- Added: “Create Curves” option to Voronoi TSP, matching Adaptive TSP.
- Improved: Stars & Triangles in Adaptive Shapes are now symmetrical
- Improved: Selecting values outside of the “safe” range of the slider with the text box now works as expected.
- Improved: Spiral centres can not be placed outside of the drawing area.
- Improved: When exporting files the last used extension will be kept.
- Improved: File name increments now also check for files with different extensions within the same file type e.g. image, svg
- Improved: Support for importing more image file extensions “.tiff”, “.jif”, “.jiff”, “.wbmp”
- Improved: Clicking on the slider trigger Auto Run PFM as expected
- Improved: The CMYK Multipliers will be saved with the application as well as the project so will maintain their last state.
- Fixed: “Create Curves” in Adaptive TSP not working properly
- Fixed: “Ignore White” in Spiral Circular Scribbles not working properly
- Fixed: Spiral PFMs crashing with Colour Match enabled

- Fixed: Checkboxes in the Drawing Pen dropdown not updating properly when pens are removed/added.

3.19 v1.5.2-beta

- Added: **7 NEW PFMS**
 - **Spiral Circular Scribbles:** creates a spiral made of one continuous circular scribble
 - **Hatch Sawtooth:** creates a series of parallel wavy lines to represent an image, the lines are connected at each end, to form one continuous line.
 - **Hatch Circular Scribbles:** creates a series of parallel circular scribbles to represent an image, the lines are connected at each end, to form one continuous line.
 - **Adaptive Letters:** similar to Adaptive Shapes but instead uses letters from included SVG Fonts (it can also use regular fonts)
 - **Voronoi Letters:** similar to Adaptive Letters but distributes the letters with a Weighted Voronoi Diagram instead
 - **Mosaic Segments:** Generates a mosaic out of detailed segments using Simple Linear Iterative Clustering, the shapes it generates represent the shapes present in the original drawing much more accurately than Mosaic Voronoi.
 - **Mosaic Triangulation:** Generates a mosaic out of triangulation generated via Delaunay Triangulation.
- Added: **“Hatch Fill” options to SVG Converter** - which will allow DrawingBotV3 to convert many more SVG types, and generate fills for solid shapes which can easily be drawn by a pen plotter.
 - “Shape Clipping” - When enabled Solid Shapes will “clip” the shapes below, meaning if a shape is covered by another in the SVG only the visible part will be drawn, this only occurs for solid shapes, individual lines won’t clip the shapes below.
 - “Shape Filling” - When enabled Hatch Fills will be generated
 - “Spacing” - The distance between the hatch lines, it is relative to the pen width so a spacing of 1.0 will draw over the entire shape with no gaps, a spacing of 2.0 will leave spaces the same width as the pen.
 - “Min/Max Rotation” - Controls the rotation of the generated hatch lines
 - “Link Ends” - Links the resulting hatch lines to create one continuous line (for some shapes this may not always be possible)
 - “Crosshatch” - Creates an additional set of perpendicular Hatch Lines
- Added: **New Erasing Settings for Sketch PFMS**, these allow the creation of new styles, specifically ones which can be drawn more easily with a single pen. The following settings have been added. These settings replace “Adjust Brightness”, you can think of “Erase Min” and “Erase Max” as the “Adjust Brightness range”, using the same erase min & max is the same as setting “Adjust Brightness” in previous versions. Using a Erase Radius Min & Erase Radius Max of 1.0 will produce the same results as previous versions. The radius allows you to control the spacing of lines in a way which wasn’t possible before.
 - Erase Min: the minimum intensity of the erase process
 - Erase Max: the maximum intensity of the erase process
 - Erase Radius Min: the minimum radius of the erased shape
 - Erase Radius Max: the maximum radius of the erased shape
 - Tone: controls the contrast of the erase process, using a higher Tone will result in a image with a stronger contrast in the spacing of lines. The tone slider has no effect when the Erase Range values are identical.

- Added: **New PFM Presets**
 - Sketch Lines (“Digital”, “Sharp Lines”, “Micro Detail”)
 - Adaptive Dashes (“Vertical Lines”, “Horizontal Lines”, “Needles”)
 - Adaptive Circular Scribbles (“Sketchy”)
 - Adaptive Shapes (“Overlapping Squares”, “Overlapping Circles”)
- Added: **“Exported Drawing” display mode**, this will show the last set of files exported, you can select a recent exported file.
 - It shows the difference in the following stats after path optimization, “Shapes”, “Total Travel”, “Distance Down”, “Distance Up”, “Pen Lifts” and also each pen it’s respective distance travelled.
 - By default when you export a vector file the “Exported Drawing” display mode will be shown, you can disable this in File / Preferences / Export Settings / General
- Added: Splash Screen, which displays while DBV3 is loading.
- Added: New “Contrast” & “Brightness” settings to Adaptive PFMs, Adaptive PFMS rely on good contrast in the original image, so now a initial level of contrast is applied, the default is currently “1.25”, setting this too “1.00” will result in the same results as previous versions
- Added: “Align Rotation” setting to Adaptive Shapes, this will cause the shapes generated to follow the natural contours of the image, when enabled you won’t be able to set “Min” & “Max” rotation
- Added: “Point Density” to Voronoi PFMs - this new options allows you to specify a density of points which is relative to the drawings dimensions, instead of matching a arbitrary point count (you can still use a point count with the “Point Limit” option) i.e. a A4 and A3 drawing with the same density would have a similar about of points in a given area
- Added: “Ignore White” option to Voronoi PFMs, when enabled the PFM will try to avoid creating shapes in white ares of the image.
- Added: ‘Spiral Type’ setting to Spiral Sawtooth (previously named Spiral PFM)
 - “Archimedean” - The default / original Spiral.
 - “Parabolic” - Two connected spirals / Fermat Spiral
- Added: “Invert” button to Mask Settings.
- Added: “Auto Run PFM” - this will automatically re-run the PFM when you change any settings or when you change the current PFM, you can disable this in File/Preferences/General/Auto Run PFM
- Added: “Select”, “Edit”, and “Draw” Modes too Masking Settings to allow the customisation of Masking and drawing custom masks with lines / bezier curves
- Added: “Soft Clip” option to Masking Settings - when this is enabled PFMs will naturally overlap over the edges of the mask rather than clipping the shape exactly at the border.
- Added: “Square Tiles” option to Mosaic Rectangles, when enabled the PFM will only create square tiles, when enabled “row count” and “row padding” will be disabled
- Improvement: **Speed Improvements for Adaptive PFMs**, up to 3x faster on larger images.
- Improvement: **Speed Improvements for Sketch PFMs**
- Improvements: The quality of the output from Adaptive Circular Scribbles has been greatly improved and the default preset will now perform much better and result in a more consistent circular scribble quality.
- Improvement: Increased the rendering speed of the viewport, changes to pen colours and shape ranges will be much more repensive.

- Improvement: Renamed mask buttons from “Bypass Mask” & “Show Masks” too “Enable Masking” and “Display Masks”
- Improvement: Masking - when zooming in the masks edges will now remain 1px wide to allow more precise positioning.
- Improvement: Masking - you can now more masks using the arrow keys.
- Improvement: Using the “Reset” and “Randomise” options on category headings in PFM Settings will now affect all the settings in the category.
- Improvement: The shape / vertice count will now update with the shapes slider
- Fixed: Original Sampling Pens (Original Colour, Original Grayscale etc.)
- Fixed: Installation issues on MacOS, all MacOS installers are now digitally signed and notarized with Apple.
- Fixed: Installation issues on Windows, all Windows installers are now digitally signed and time stamped.
- Fixed: Adaptive PFMs creating unexpected overlapping shapes in certain circumstances.
- Fixed: Spiral PFM producing inconsistent line spacing
- Fixed: CMYK Seperation sometimes producing pixellated areas in Dark areas of the image.
- Fixed: “Reset” button in the Configure Styles menu.
- Fixed: Mosaic PFMs randomly crashing on some runs.
- Fixed: Mosaic PFMs weight not having any effect on number of specific styles
- Fixed: Masking Settings not working in some situations
- Fixed: Old projects not opening properly in new versions.
- Fixed: Issue where sometimes the Pen Distribution would not update properly.
- Fixed: Issue where Sketch Waves would freeze and not complete in some situations.
- Fixed: Adaptive TSP path linking accuracy (results in less overlapping lines)
- Fixed: Reduced the impact of several background processes

3.20 v1.5.1-beta

- Added: ‘Voronoi Style’ option to Adaptive Voronoi, Voronoi Diagram & Mosaic Voronoi.
 - “Classic” - The default and original Voronoi Diagram
 - “Smooth” - A smoother version of the original
 - “Sharp” - A more jagged / stylised version
 - “Offset A, B, C” - Less detailed / stylised version using the different offsets of adjacent triangles
- Added: “Smooth Distribution” option to Colour Match, this option will result in a more even usage of different pen colours which will rely less on Black & the canvas colour.
- Added: Reset UI button to the “View” menu
- Improved: Low Quality mode will now run faster and produce similar results to version of DB before v1.5.0
- Improved: Speed improvements for Sketch PFMs
- Improved: Speed improvements for Colour Match

- Improved: Sketch Shapes paths will now link properly when in Rectangle mode, significantly reducing plotting time.
- Improved: Path optimisation for all PFMS, significant reduction in plotting times.
- Improved: Mosaic PFMs now have better Multi-Threading so will process much faster.
- Fixed: Sketch Sobel crashing in some situations.
- Fixed: Sketch PFMs having an uneven distribution when compared to previous versions of DB before v1.5.0
- Fixed: SVG Converter PFM will now retain the original units / scale of the imported SVG.
- Fixed: Voronoi Diagram not updating on each iteration
- Fixed: Mosaic PFMs using the wrong scale when High Quality mode is being used.
- Fixed: Mosaic Voronoi having excessively long processing times.
- Fixed: Colour Match crashing in some situations due to excessive memory usage.
- Fixed: Minor Issue where the final shape might be not drawn or drawn with the wrong pen.

3.21 v1.5.0-beta

- Added **High Quality Mode** for image rescaling, produces more consistent results across different paper / pen sizes and results in better quality plots.
- Added **Preferences Menu** - Much more finer control over settings in DBV3, with more settings on the way!
 - General Panel: Here you can change some DrawingBotV3 default settings, like default pfms, canvas colour, pen width, pfm presets etc.
 - User Interface: In this panel you can enable / disable rulers, drawing borders and notifications.
 - Export Settings: This is the new home for all your usual Export Settings.
 - NOTE: Search Function is currently limited, but will search settings individually too.
- Added: **‘Directionality’, ‘Distortion’, ‘Angularity’, ‘Edge Power’, ‘Sobel Power’, ‘Luminance Power’ and ‘Squiggle Min Length’** to All Sketch PFMs
 - Directionality - forces the lines to follow the natural contours of the image
 - Distortion - adds some noise to the generated lines, creating more stylised images.
 - Angularity - higher angularity results in lines which don’t change direction as frequently, resulting in more sweeping curves in curve pfms
 - Edge Power - used to exaggerate key edges in the image
 - Sobel Power - used to exaggerate a cartoonish quality for the plot
 - Luminance Power - typically PFMs will follow dark areas in the image when creating lines, this slider can be used to decrease the influence of brightness which in turn will favour other style options like Directionality or Edge Power etc.
 - Squiggle Min Length - prevents incredibly short squiggles from being created, shortening plotting times - thanks to HanzPetrov
- Added: “Connected Lines” - Option to Spiral PFM - creating one continuous polyline for the spiral, massively reducing the amount of pen lifts required.
- Added: “Pen Force” to HPGL Presets for use with the HP 7550

- Added: 'Curve Offset' options to Cubic Beziers and Quad Beziers - These options allow you to control the 'wiggle' of the curve
- Added: Notifications (W.I.P) - Pop-Ups to show you additional information when images are imported / files are exported.
- Added "Rating" and "Notes" columns to Version Control
- Added: "Multipass" - Path Optimisation option to draw over each geometry in a drawing multiple times.
- Added: Ability to have multiple projects open simultaneously in the same window
- Added: **Quick Export** - Added the option to Export Drawings with a single click, or by pressing CTRL + E - you can customize the type of file exported in File/Preferences/General/Quick Export
- Added: Option to disable/enable Transparent PNG export.
- Improved: **Colour Match Support for all PFMs** - All PFMs now support the colour match separation option!
- Improved: **Huge Speed Improvements** for all Adaptive PFMs, up to **x4 quicker**.
- Improved: **Massive Speed Improvements** for the Adaptive Tree PFM, up to **x20 quicker** for large images.
- Improved: **Cubic Beziers Rewrite** - the cubic beziers PFM has been re-written and now can create much higher quality curves
- Improved: Speed Improvements to Sketch PFMs especially up to **x3 quicker** for larger images
- Improved: Sketch PFMs now use a more accurate erasing method, this results in a slower processing time, but better quality lines.
- Improved: Exporting files of the same name, will now have automatically incremented names e.g. name_1, name_2 etc.
- Improved: The pens in the drawing will now be re-distributed when the shapes range slider is adjusted.
- Improved: PFM Controls now have category headings which can be collapsed, this helps to show the relationship between settings and makes it easier to find them again.
- Improved: Settings panels can now be dragged and dropped, you can drag them to be on the right hand side of the viewport, or drag them over the viewport to undock them, you can also drag them over each other to swap them.
- Improved: The user interface layout will now be saved on exit & restored with projects (this can be configured in preferences)
- Improved: The main settings panel can now be resized horizontally.
- Improved: When undocked individual settings tabs can be resized horizontally & vertically.
- Improved: When changing Input Units in the Drawing Area panel, the values will automatically update
- Improved: New icons and options in the File Menu.
- Improved: Added Keyboard Shortcuts for common actions
 - New Project = Ctrl + N
 - Open Project = Ctrl + O
 - Save Project = Ctrl + S
 - Import Image = Ctrl + I
 - Quick Export = Ctrl + E
 - Switch Display Modes; Drawing = Image + 1, Drawing = Shift + 2... etc.

- Fixed: Batch Processing Options not being saved with the project file
- Fixed: HPGL Presets not saving pen velocity
- Fixed: Issue with Adaptive PFMs sometimes creating one-off spots in otherwise consistent areas.
- Fixed: Open GL Renderer having glitched splits on curve pfms.
- Fixed: Issue preventing versions being renamed
- Fixed: Some in-built drawing area presets having the wrong Input Units.
- Fixed: Default Drawing Sets not reloading
- Please consider supporting the development of DrawingBotV3 by donating [here](#). Thank you!

3.22 v1.4.2-stable

- Added: New improved button controls for Image Processing, Pen Settings, Version Control and Mask Settings
- Added: Support for different Plotting Resolution on individual drawing styles in Layers PFM and Mosaic PFMS
- Added: Option to specify the naming convention for Inkscape Layers, go to File / Export Settings / SVG.
- Added: Option to enable/disable background layer export for SVGs, it will now be disabled by default
- Added: Option to disable Grid Snapping when moving masks, found at the top of Mask Settings
- Added: Controls to manually edit the size of the selection when editing masks, found at the bottom of Mask Settings
- Improved: When performing actions on items in tables selections will now be more intuitive e.g. when moving items up and down, they will stay selected
- Improved: Drawing Set render previews will now live update with pen changes
- Improved: Increased the size of the text boxes when editing GCode in File / Export Settings / GCode
- Improved: When opening projects they will always open in the Drawing display mode, rather than Image.
- Improved: Standardised the sizing of tables in the UI
- Fixed: SVG Exports having the wrong scaling when using Inches or Centimeters
- Fixed: Plotting Resolution not working correctly when in CMYK Colour Separation
- Fixed: Completely Black Pens not being shown in SVG Exports
- Fixed: SVG Exports failing in rare cases where closed paths would be merged
- Fixed: Export per/n pens being too large on some screens and made the window resizable.
- Fixed: Removed erroneous pen 222 from Staedtler 36 pen pack - led

3.23 v1.4.1-beta

- Added: **Colour Match - Premium Only** - A new Colour Separation mode for Sketch PFMs only, it will compare the pens in your drawing set to the colours in the image and when drawing will try to use the best matched pen. You also have a few options to configure colour match further, found to the right of the Colour Separation drop-down.
 - “Colour Accuracy” - Decreasing the Colour Accuracy will lower the quality of the colour match and allows pens to draw over areas where they have a higher colour difference. Colour Accuracy relates to a Delta-E colour measurement in the following way
 - * 100: No colour difference
 - * 99: Slight colour difference
 - * 98: Small colour difference
 - * 97: Medium colour difference
 - * 96: Large colour difference
 - * 95: Very large colour difference
 - “Brightness Multiplier” - Decreases the overlap of the pens in the image
 - “Pen Limit” - Limits the number of pens which can be used when matching, if this value is set to 18, only the 18 best matched pens will be used. If this value is set to 0, there is no limit.
 - “Use Canvas Colour” - Adds an invisible pen which matches the colour of the Canvas, helps to avoid drawing unnecessary lines.
 - “Line Density - from Sketch PFMs” - the line density control found in the Sketch PFMs can also be used to control the Colour Match output.
 - **For the best results**
 - * Use all the pens of a specific manufacturer, i.e. Use the presets for the set of 60 Staedtler Fineliners, then use the Pen Limit feature, to limit selection to approx 18+ pens allowing colour match to choose your best matched pens for each plot.
 - * Use a bright, saturated image, murky images or ones with a limited colour palette will perform poorly.
- Added: **SVG Import & SVG Converter PFM - Premium Only**
 - You can now import SVGs generated in other softwares or in DrawingBotV3, this opens up many possibilities, such as SVG cropping, rotation, flipping, masking, pen/layer reassignment, layering multiple SVGs and recovering old DBV3 projects. Note: Any text in the SVGs will be blank, you should use “Object to Path” in Inkscape before importing SVGs with text.
 - SVGs can be also be treated like any other image allowing them to be run through any PFM, they will be rasterised at the highest quality possible before plotting (the image tab will show a low quality preview of the SVG).
 - You can control the conversion process in the new PFM SVG Converter, it has a few settings.
 - * SVG Path: The path to the SVG to be used, if this isn’t set it will use the current imported SVG, if there isn’t one the PFM will produce no output. You can however use this PFM as part of a Layers PFM, to layer SVGs together, when you run the PFM like this you can set the SVG Path to use an SVG which hasn’t been imported.
 - * Derive Drawing Set: When enabled DrawingBotV3 will generate a new Drawing Pen for each colour in the SVG, allowing you to access them each as layers. This opens up possibilities for splitting SVGs by colour using a per/layer export, or even re-assigning colours to your SVG, once the SVG Converter

PFM has been run you'll have access to change the colour of lines with all the tools available with a default drawing.

– You can also import an SVG to run through a standard PFM

- Added: **Masking - Premium Only** - A new useful settings tab, to allow you to mask areas of the image, you can add shapes masks such as Rectangles and Circles, you can move, resize, rotate, skew with the controls in the viewport area. You can also import SVGs as masks, they will keep their original sizing so you can create detailed masks by importing an SVG with the same dimensions as in drawing area controls.
- Added: **Image Cropping** - You can now crop images in the Image Processing tab, this allows you to enter values in pixels for cropping the image. You can also hit the “Edit” button and this will display a resizable box in the viewport area which you can then move to create the desired crop. You can also access this cropping feature via the new Display Mode “Image Cropping”.
- Added: **Rulers Overlays** - There are now rulers on the borders of the viewport area to show you an accurate scale of your drawing / image.
- Added: Lock 1:1 button to the viewport toolbar, to allow viewing drawings at the correct scale relative to the screen, useful for evaluating the density of your plot.
- Added: Reference Image exports - You can now export the edited reference image used in your plots, via Export / Export Reference Image File.
- Added: Winsor & Newton ProMarkers, Pens/Drawing Sets - led
- Added: Bic Cristal and Intensity, Pens/Drawing Sets - led
- Added: Staedtler Fineliner 305 Sky Blue - Pen Definition - led
- Added: Support for Googles WebP Image Files (.webp)
- Added: Fullscreen Mode, you can enable it by going to View/Fullscreen Mode
- Added: Frame Hold Start and Frame Hold End to Animation Settings
- Changed: Increased default render quality in the viewport to x4 the previous quality
- Changed: You can now send any file type via the Serial Connection, allowing for sending GCode files to compatible plotters.
- Changed: Image Rotation / Flipping is now Image Specific, when you load a new image these values will be reset.
- Fixed: Drawings/Images flickering when switching Display Modes.
- Fixed: Serial Connection commands will now be executed properly on non-HPGL devices.
- Fixed: Staedtler Fineliner 63 Delft Blue - Pen Definition - led
- Fixed: Export Directory being used instead of Import Directory when importing files - led
- Fixed: Removed duplicate Copic Black Pens - led
- Fixed: “Original Sizing” preset not activating properly
- Fixed: GCode Settings not saving properly
- Fixed: HP-GL Padding/Offsets creating inaccurate drawings outside of the HP-GL bounds
- Fixed: When exporting with N/Pens the render order will now be used rather than the export order, meaning the order will now match the generated HPGL files correctly.

3.24 v1.4.0-beta

Note: This update has kept growing and growing, and it's time it was released, this is a Public Beta, although it has already been through an alpha testing phase.

- Added: New 9 new PFMS
 - **Adaptive Circular Scribbles (Beta)** – this is an implementation of Chiu Et Al 2015, “Tone- and Feature-Aware Circular Scribble Art” – it generates one continuous circular scribble to represent the image. If you wish to achieve results similar to Chiu Et Al's implementation use a size of paper, pen width which gives you a plotting size of 4000px on the largest edge then use the “Chiu Et Al – 4000px” preset
 - **Adaptive Shapes, Triangulation, Tree (Beta), Stippling, Dashes, Diagram, Adaptive TSP**, are all very similar to their Voronoi counterparts but give a much better representation of the tonality of the input image, they are also typically faster to run.
 - **Voronoi Dashes**, this variation of the new Adaptive Dashes PFM, but using the original Voronoi style.
- **Using Adaptive PFMS**
 - They love high resolution, high contrast images.
 - They are called “Adaptive” because they adapt to match the tone of the input image. This means the reproductions of tones is way more accurate than other PFMS, this means they have an additional processing stage “Tone Mapping”. This process only needs to be performed once per configuration of settings, if you change a setting which could alter the tone map it will run again.
 - You can view the output of the tone mapping stage by selecting “Display:” and then “Tone Map”, this shows you three outputs the Reference Tone Map, the drawing created by the PFM with the current settings and the blurred version of this output. If your blurred output reassembles the reference tone map very closely that's very good and if you find one which matches better than the current Adaptive Circular Scribbles settings let me know. If the tone map doesn't reassemble the image very closely don't worry DrawingBotV3 will account for this variance to create an image which better matches the tone map anyway.
- Added: Ability to have multiple Drawing Sets, you can then use different sets for each layer/tile in Layers PFM / Mosaic PFM.
 - Drawings Sets can be created and edited from the Pen Settings tab.
- Added: Colour Picker option when right clicking a Drawing Pen, then right-click anywhere in the viewport to set the pen's colour.
- Added: Settings panels can now be undocked, and moved around independently, they can be re-docked by closing the window it hitting the link button again.
- Added: “Per/Group” export option, when using PFM Layers or any Mosaic PFM this option will export the individual layers/tiles individually
- Added: “Per N/Pens” export option, to allow drawings with multiple pens to be split into a certain number of pens. Useful when exporting for Vintage Plotters which have automatic pen changes.
- Added: “Layer Distribution” option to PFM Layers, which allows finer control over the distribution of pens between layers
 - NONE: Layers will be distributed separately.
 - ORDERED PER PFM: Layers which use the same PFM and Drawing Set will be distributed together, treating the first layer as the darkest and the last layer as the brightest.
 - ORDERED: Same as the above, but only matches Drawing Sets

- Added: “Clipping Mode”, available in the Drawing Area, allows you to choose if shapes should overflow the edges of the drawing/page or not, this will only have an effect on some PFMS, as some PFMS only work within the image provided anyway. You have three options
 - “Drawing” – Clip the geometries to the drawings edges
 - “Page” – Clip the geometries to the page’s edges
 - “None” – Allow geometries to overflow the page and drawing
- Added: Portrait/Landscape toggle to the Drawing Area to replace the “Rotate” button, this will remember the orientation you have chosen and keep this orientation when you select a new paper size.
- Improved: Voronoi PFMS are now multi-threaded and also have a new slider “Voronoi Accuracy”, an accuracy of 100% is the equivalent to the previous version
- Improved: The OpenGL Renderer will now render while the drawing is being generated, the UI will also be much more responsive when it’s updating.
- Changed: When editing Drawing Sets while using Layers PFM / Mosaic PFM they will now live update without having to run the PFM again.
- Changed: Moved “Blend Mode” from Pen Settings to be above the Viewport
- Changed: Moved “Colour Separation” to be part of Pen Settings
- Changed: Pen settings buttons Add/Remove/etc. now use symbols instead of text and have tool tips when hovered, to try and re-clutter the UI.
- Changed: If you open a project and DrawingBotV3 is unable to locate the original image used you will now be prompted to locate the image.
- Changed: The recommended Distribution Type will now be change based on the current settings.
- Changed: DrawingBotV3 will now remember the PFMS “preconfigured” distribution, so when creating drawings with CMYK separation the distribution will not be forgotten when you switch back.
- Fixed: Some pop-up windows not closing when the main window is closed.
- Fixed: Mosaic PFMS and Layers PFM will now show their current progress properly.
- Fixed: Voronoi PFMS will now show their current progress properly.
- Fixed: HPGL Exports not having the correct offset
- Fixed: GCode Settings not loading correctly when switching presets
- Fixed: Custom version names not being saved with the project

3.25 v1.3.5-stable

- Note: The recommended JAVA version for DBV3 is now Java 17.
- Note: All packaged installers now use a Java 17 Runtime instead of Java 11
- Added: Sketch Waves PFM, another Sketch PFM variation which uses Sin/Cos/Tan waves to direct the sketched lines, it’s in Beta (Premium Only)
- Added: Sketch Layers, allows you to layer the results on multiple PFMS on top of each other and optionally pass the lightened image between them to create new unique styles (Premium Only), thanks to HanzPetrov for all his hardwork on this!

- Added: Projects saved will now store the current drawing state, allowing you to reload projects exactly where you left off. Versions will also store the drawing state, so you can switch between variations instantly. (Premium Only)
- Added: New GCode Options, “Curve Flatness”, “Center Zero Point” and “Comment Type”
- Added: US Paper Sizes to Drawing Area presets. ANSI, ARCH and US Letter/Legal/Executive.
- Fixed: OpenGLRenderer will now work as intended on MacOS!
- Fixed: Images randomly failing to load, fixes issue where images might need to be imported twice.
- Fixed: Viewport scrolling on some hardware configurations.
- Fixed: Serial Connection control panel not opening
- Fixed: MacOS .pkg Installers not running
- Changed: Delayed OpenGL Initialization to speed up load times and prevent crashes at start up.
- Changed: Simplified logging, removing redundant information
- Changed: The first time you run OpenGL after restarting DBV3 it will take a moment to activate.
- Changed: Improved OpenGLRenderer compatibility to favour faster implementations.

3.26 v1.3.4-stable

- Fixed: Windows .zip and .exe Installers not running for some configurations.

3.27 v1.3.3-stable

- Added: New Installer Type: .pkg for MacOS Users, this is considered Beta!
- Added: “Set As Default” option to all preset menus, the selected default preset will load when DBV3 is started.
- Added: Export / Import Preset Dialogs, the export dialog gives you the option of opening the folder you saved the preset too.
- Changed: Versions will now be saved in project files.
- Fixed: For now by default the OpenGLRenderer will be disabled on MacOS to prevent issues at startup, if you think your MAC is compatible you can change “enableOpenGLMacOS” to “true” in the config but this may cause DBV3 to not start properly.
- Fixed: Voronoi Circles will now produce a useful output if it’s stopped early.
- Fixed: Half-pixel offset showing up on the following Display Modes: “Image”, “Reference”, “Lightened”

3.28 v1.3.2-stable

- Hot-Fix: Exports missing some geometries, in particular Voronoi Triangulation.
- Fixed: Imported Presets not saving properly.

3.29 v1.3.1-stable

- Added: New option in config “disableOpenGLRenderer”, some systems are incompatible with the Hardware Accelerated Renderer, if DrawingBotV3 fails to start, try changing this value to true.
- Fixed: Batch Processing on MAC and Linux will now use the correct File Separator.
- Fixed: SVG Exporting
- Fixed: Drawing Pen / Drawing Set preset loading.

3.30 v1.3.0-stable

- DrawingBotV3 now comes in two version **Free** and **Premium**, find out more [here](#)
- Added: New Hardware Accelerated Renderer, to activate go to Display Mode : “Drawing (Hardware Accelerated)”
- Added: “Squiggle Deviation” Slider to Sketch PFMs, this allows you to decide how far a squiggle is allowed to deviate in brightness before it is ended prematurely, this has the result of making shorter squiggles which are more accurate and less likely to cross over brighter areas of the image.
- Added: “Unlimited Tests” Option to a few Sketch PFMs, this will run as many tests as required to find the “best” line possible, resulting in more accurate drawings with longer processing times.
- Added: “Curve Refinement” Option to Catmull-Roms, this will add an additional pass after the curves have been found to see if minor adjustments to the curves points will improve the accuracy.
- Added: Blend Mode compatibility to PDF export - HanzPetrov
- Added: Live updating “Position”, above the viewport you’ll be able to see where you mouse is relative to your drawings size!
- Changed: Batch Processing will now display the current drawing, and give more useful progress messages and updates
- Changed: Sketch Curves/Beziers/Catmull-Roms now render as individual curves rather than grouped shapes, allowing finer control over the curves rendered, and resulting in a more accurate mapping of the colour values to the pens enabled.
- Changed: Shading Options are now also available on Sketch Shapes and Sketch Sobel Edges
- Changed: Improved the accuracy of Sketch PFMs
- Changed: Sketch PFMs now use the Bresenham Midpoint Circle Algorithm to reduce the number of neighbour tests required.
- Changed: Allow Customizable Drawing Pen & Drawing Set Categories rather than just “User”
- Changed: Voronoi Default Settings: Point Count now defaults to 50000 instead of 10000 and Luminance Power / Density Power default to 3 instead of 5
- Fixed: When creating new Pen Presets, the type name will be used instead of defaulting to “User”.

- Fixed: Image Filters losing their settings when using “Edit Settings” and not hitting apply.
- Fixed: Image Filters not updating when an earlier filter in the chain is disabled.
- Fixed: Sobel Edges PFM not working properly on images with Alpha Channels
- Fixed: Dirty Border Filter not working properly on images with Alpha Channels
- Fixed: CMYK Separation not working properly on images with Alpha Channels
- Fixed: View menu will now work as expected and not glitch out the settings panels
- Fixed: Export settings panels disappearing after being displayed while exporting for HPGL, Image Sequences and GCode
- Fixed: “Special” Pens can now be saved in Drawing Set Presets without losing their functionality.

3.31 v1.2.3-stable

- Fixed: Drawings randomly failing to export when Path Optimization is enabled.
- Fixed: GCode Bezier Curves not matching the drawing properly. -Triod-project
- Changed: Geometries will now start from the middle of the pixel and not the top left - HanzPetrov

3.32 v1.2.2-stable

- Fixed: Fixes UI Hanging after re-processing image

3.33 v1.2.1-stable

- Added: Option to specify the PPI to render Images/Animations at higher resolutions, in the Export Settings menu - HanzPetrov
- Added: Replaced the Displayed Shapes slider with a Range Slider
- Added: “Apply to export” checkbox to enable the Ranges selected on the exported files
- Added: A “Task Monitor” to monitor background tasks, accessed via File/Open Task Monitor
- Changed: Removed the “Zoom In” and “Zoom Out”, the viewport can now be zoomed with the scroll wheel.
- Changed: Line Merging/Sorting Algorithms now use an STRTree which results in better optimisation in 1/10th of the time, particularly on Voronoi Triangulation PFMS.
- Changed: The progress of Optimization Algorithms will now be shown in the progress bar.
- Changed: The default “Curve Flatness” for HPGL from 6 to 0.1
- Changed: The default “target pen width” from 0.5 to 0.3
- Changed: The default rotation for HPGL from 90 to 270, when using AUTO which requires rotation
- Changed: Improved the monitoring of progress during Geometry Optimization
- Fixed: Bug where the Serial Connection Menu would fail to load when less than 2 Serial Ports were available.
- Fixed: The viewport will now behave as expected when zooming in and out.

3.34 v1.2.0-stable

- Added: HPGL Export - Export your images to HPGL for sending to plotters.
 - You can configure your HPGL files with configurable Hard-Clip limits, X-Axis Mirror, Y-Axis Mirror, X-Axis Alignment, Y-Axis Alignment, Rotation, Curve Flatness, Pen Velocity and the initial Pen Number.
 - If you're inputted the Hard-Clip limits you can use "Auto" rotation, to position your image correctly for you so you don't need to worry about if it's landscape or portrait!
 - Choose from presets for different plotter models and paper sizes
 - When the export is complete you'll see a dialog indicating where pens should be loaded and the size of the HPGL File.
 - If the drawing exceeds the Plotter's Hard-Clip limits you'll be notified.
- Added: Serial Port Connection for Plotters! Send HPGL Files and commands directly from DrawingBotV3.
 - Allows you to set the Serial Port, Baud Rate, Data Bits, Stop Bits, Parity and Flow Control
 - Also including monitoring of the Progress, Bytes Sent, Elapsed Time, Remaining Time and the Plotters own buffer.
 - Sending can also be paused when needed and resumed.
 - Ability to detect the plotter being used and apply the recommended settings!
 - The serial port connection runs in a separate thread so you can continue using DrawingBot while your Drawing is plotting.
 - It can also be used to send files not generated with DrawingBot and in fact will stream any .txt file over the serial port!
- Added: Video Import - You can now import videos and process every frame automatically
 - When you choose your export option this will apply to every frame in the video
- Added: Configurable Canvas Colour - HanzPetrov
- Added: Right-Click menu for Drawing Styles
- Changed: Stroke end-caps will now default to ROUND - HanzPetrov
- Changed: PDF exports will now match the print resolution not the image resolution - HanzPetrov
- Fixed: Disabled pens will not output a file when exporting "per/pen"
- Fixed: Mosaic Custom being uneditable when loaded from a preset
- Fixed: Pen Width not being loaded with projects, or preventing them loading entirely.

3.35 v1.1.1-stable

- Fixed: Previous iterations of Voronoi Diagrams showing up in SVG exports. (Random dots on the export)

3.36 v1.1.0-stable

- Added: Three New Path Finding Modules Mosaic Custom, Voronoi Tree and Voronoi TSP.
 - “Mosaic Custom” - Allows you to create your own Custom Mosaic, using an image mask. This opens up many creative possibilities combining the effects of multiple PFMs to create more complex pieces. This is very easy to do, you first need to create an image mask in an image editor which has the same resolution as the original image which contains a unique block colour for each drawing style you plan to use. Then you can import this mask as one of the settings, and for each Drawing Style define a “Mask Colour” which matches the one you used in the mask image. You can also feather the mask in the settings.
 - “Voronoi Tree” - Creates a “Minimum Spanning Tree” using Prim’s algorithm, using the points generated from a Weighted Voronoi Diagram, it creates artwork similar to the classic TSP art but in a fraction of the time.
 - “Voronoi TSP” - Creates a solution to the “Travelling Salesman Problem” for the points generated from a Weighted Voronoi Diagram, if you’re serious about using this PFM with a high point count expect to wait many hours or days to get the final result, optimisations are very welcome! There are currently 3 algorithms, a Lazy 2-Opt Approach which is very fast and inaccurate, then an implementation of the classic Lin-Kernighan, and an attempt to implement the Lin-Kernighan-Helsgaun algorithm. 2-Opt is the most stable and the one I recommend.
- Added: CMYK Configuration, next to the colour separation drop-down you now have the option to configure the weighting of the CMYK plot to allow you to fine tune the density to your specific pens, as many users reported their K layer being too strong, the default for K is now x0.75. This option works with every PFM.
- Added: Video Exporting for Animations in both H.264 and ProRes 422.
- Changed: “Randomise” will now produce more stable results and should be able to run in most instances
- Changed: The min/max of a few key variables have been changed.
- Changed: Values can now be set outside of the range of the min/max for more advanced users, in some instances this may cause the plot to crash or not start at all.
- Changed: Some PFMs which had optimisation disabled by default will now have as a minimum geometry sorting enabled to reduce plotting times
- Changed: Mosaics now optimise the outputs of each tile individually to speed up optimisation times.
- Changed: Raster export dimensions will now be multiples of 2
- Fixed: Padding not being saved properly with Drawing Area presets.
- Fixed: De-activated pens being re-activated in presets
- Fixed: Voronoi Circles and Voronoi Diagram PFMs will now stay within the bounds of the image.
- Fixed: A bug where videos would not export if either of the image dimensions are odd.

3.37 v1.0.16-stable

- Added: Text to display the current images size, and the size it’s being plotted at.
- Added: Rotate / Flip Options for images in Image Processing
- Fixed: Issue where the viewer would zoom into the top left corner of the image after pre-longed use.
- Fixed: Drawing Pens / CMYK Settings not loading correctly with project files.
 - Changed: Renamed the “Pre-Processing” tab to “Image Processing”

- Fixed: Image Rendering - Blend Modes will now create a more accurate representation on exports.
- Fixed: PNG export accuracy, they will now match the JPG exports and only be transparent if the blend mode is “Normal”.
- Fixed: Image Rendering / Image Sequence Rendering - Rendering will now be more accurate when using blend modes or CMYK separation
- Fixed: Image Sequence Rendering - Fixes a rare glitch where random lines may appear on an animation.
- Fixed: Rare bug where Colour Sampling in curve modes would result in the final line being completely transparent.

3.38 v1.0.15-stable

- Added: Two New Path Finding Modules for creating Mosaics!
 - “Mosaic Rectangle” - Creates a mosaic of rectangles out of a set of user configurable styles.
 - “Mosaic Voronoi” - Creates a mosaic based on the output of a weighted Voronoi Diagram from a set of user configurable styles.
 - The “User Configurable styles” can have a “weighting” to affect their distribution, there is no limit on the number of different styles per mosaic.
 - Please note: Using Voronoi PFMs for drawing styles can be temperamental.
- Added: Version Control! You can now save your favourite versions of your project as you go and experiment with settings without losing your favourites.
 - There is a “Save Version” button next to the plotting controls, click this when you create something you like, you can then access and reload / save these versions from the “Version Control” panel, which will show a preview of the version the date it was created and the name of the path finding module used.
- Added: Project Loading & Saving!
 - You can now save your projects and reload them as “.drawingbotv3” files from the “File Menu” - you can also save versions in this way.
 - This saves all elements of the project, like Drawing Size, PFM Settings, Pen Settings & also all of the versions you’ve created!
 - It doesn’t however save the image used to keep the files small but it will save the path to the image used and reload it if it’s still available.
- Fixed: Default presets become replicated when saving new presets.
- Fixed: Broken Sketch PFM Presets, they will now behave as intended again.

3.39 v1.0.14-stable

- Added: Image Sequences for creating animations of your creations! The duration can be change in Export Settings / Image Sequences
- Added: GCode “Start Layer” & “End Layer” custom commands
- Fixed: The new curve PFMs will now bypass plot optimization automatically to avoid curve flattening.
- Fixed: GCode exports will now include bezier curves, though this requires more testing.

3.40 v1.0.13-stable

- Added: Four New Path Finding Modules! All of which use much more accurate “Bresenham” calculations this results in longer processing times.
 - “Sketch Quad Beziers” - Builds the image out of the darkest quadratic curves. By first finding the darkest line and finding the darkest control point.
 - “Sketch Cubic Beziers” - Builds the image out of the darkest cubic curves. By first finding the darkest line, and then finding the darkest combination of control both points.
 - “Sketch Catmull-Roms” - Builds the image out of the darkest catmull-rom splines. This works by finding the best possible curve over the next two segments.
 - “Sketch Shapes” - Builds the image out of either Squares or Ellipses.
- Changed: The original “Sketch Curves PFM” has had a major revamp and now works almost as well as Catmull Roms, however it uses more basic Bresenham calculations so has a reduced accuracy, but does result in a much faster processing time.
- Fixed: An issue where when hitting “Reset View”, it sometimes had to be hit again.
- Fixed: An issue where zooming would behave in strange ways.
- Fixed: Issue where either the last or first shape wasn’t drawn, primarily in curve modes.

3.41 v1.0.12-stable

- Added: Text fields for Image Filter options
- Fixed: GCode Export, files will now have the correct offsets and orientation.

3.42 v1.0.11-stable

- Added: “vpye” integration, automatically open your drawing in vpye + run commands from presets with “File / Export to vpye”
- Added: New GCode Settings completely customisable GCode Commands / Orientation to support many more types of plotter.
- Added: You can now drag + drop images into the viewer
- Changed: Plotting task will now give more status updates than before.
- Changed: Export options will be greyed out until an image is imported.

3.43 v1.0.10-beta

- Added: DrawingBotV3 now has [documentation](#)!
- Added: The name of the current image file will be displayed in the title of the window.
- Changed: Line density's maximum value will now result in target brightness of 253.5, not 250
- Fixed: Inaccuracies in plotting image sections smaller than the line length.
- Fixed: Progress updates when exporting files

3.44 v1.0.9-beta

- Added: New Presets for "Sketch Squares" - "Waves" & "Triangles"
- Added: CMYK Separation is now multi-threaded & gives an accurate live preview
- Added: If the "CMYK Drawing Set" is selected & CMYK isn't activated a dialog will appear to apply the settings automatically.
- Changed: CMYK Separation will now use opaque pens on some PFMs.
- Fixed "Sketch Squares" PFM it will now work as expected and have different styles to "Sketch Lines PFM"
- Fixed "Circle Size" not working as expected in "Voronoi Circles" + prevented small circles being invisible.

3.45 v1.0.8-beta

- Added: Five New Path Finding Modules!
 - "Sketch Sobel Edges PFM" - Works like the "Sketch Lines PFM" but uses Edge Detection as well as Brightness Sampling, which can be adjusted to create stylised drawings with emphasised contours.
 - "Voronoi Triangulation" - Draws triangles between the centre points of a Weighted Voronoi Diagram.
 - "Voronoi Stippling" - Draws filled circles at the centre points of a Weighted Voronoi Diagram, each circle is scaled to the average brightness of the containing cell
 - "Voronoi Circles" - Draws inscribed circles into the cells of a Weighted Voronoi Diagram
 - "Voronoi Diagram" - Draws the Voronoi Diagram by itself.
- Added: New "Rescale to Pen Width" option in "Drawing Area" - which helps in optimising the line density of your plots, you must enter the "width" & "height" of the drawing area for this to be applied.
- Added: New Special Pens for use for screen only outputs "Original Red", "Original Green", "Original Blue"
- Added: New Pen Distribution Type Setting, options include "Even", "Even Weighted (Default)", "Random", "Random Weighted", "Preconfigured", "Single Pen" - Path Finding Modules will select their recommended distribution type the first time they are run.
- Added: New "Rotate" button in Drawing Area to quickly swap Width / Height.
- Added: "Centre X", "Centre Y" & "Spiral Size" to "Spiral PFM", which allows you to move the start position of the spiral and change its size.
- Changed: The rendering quality of lines created from low quality images has been improved massively, the images will look the same, exports will still be lower res / match the input resolution.

- Changed: The default preset for “Sketch Lines PFM” now has shading disabled by default, there is a new preset called “Simple Shading” which performs like the original.
- Changed: “Lock” has been renamed to “Randomise Exclude” and hidden by default, as it was misleading for new users and is rarely needed.
- Changed: Renamed setting “Desired brightness” to “Line density”, instead of being an arbitrary number, the images brightness/density is a percentage where any value is valid the default is 75%
- Changed: Renamed setting “Enable Shading” to “Shading”, it behaves the same
- Changed: Renamed setting “Squiggle to shading” to “Shading Threshold”, instead of being an arbitrary number shading now kicks in when the processing has passed the specified percentage default is 50%.
- Changed: Renamed setting “Distance between rings” to “Ring Spacing”, it behaves the same
- Changed: The settings for “Spiral PFM” now have more logical maximums.
- Fixed: Spiral PFM rendering the spiral off-screen.
- Fixed: “Min Line Length” would not always be respected and shorter lines would still be created, this has been fixed and so the defaults of some presets have also changed.
- Fixed: Rounding errors resulting in a less than uniform distribution of random angles, affected most path finding modules.
- Fixed: Line merging in Path Optimisation will now work more like expected.
- Fixed: Issue where completely black would not show up in the SVG output.
- Fixed: Image Rendering not updating when “Width” was changed.
- Note: If you have created any presets in older versions, they may break in this version.

3.46 v1.0.7-beta

- Added: New Path Finding Module! “Sketch Curves PFM”
 - Performs the same as the default, but without shading and with Catmull Rom Splines instead of lines, you can configure the tension of the curves.
- Added: Automatic SVG Optimisation, Line Simplification / Line Merging / Line Sorting
 - Can be configured in File / Export Settings / Path Optimisation
- Added: Export Settings tab, to configure Path Optimisation / SVG Settings / GCode Settings
- Added “Export Inkscape SVG” Option which supports Inkscape layers but might not work in other applications.
- Added: New option “Rename layers (Pen1, Pen2...)” for Inkscape SVGs (compatible with the “Plot” function in Inkscape)
- Added: “Filters” to the Menu Bar to allow for adding filters quickly.
- Changed: GCode Export Settings have moved into the new “Export Settings tab”
- Changed: Re-ordered export settings to better reflect file types used by plotters.
- Fixed: Changing the Plotting Resolution will not affect the visual quality of the render and line size will be consistent
- Fixed: Path Finding Modules will no longer gravitate to the corners of the image and will trace drawings more accurately.

3.47 v1.0.6-beta

- Added: CMYK Colour Separation / Special Drawing Sets - Print results will vary!
- Added: Multi-Layer SVGs, SVGs now have separate groups for each pen
- Added: “Max Line Limit” option to PFM Sketch & PFM Squares
- Added: Import / Export will now store the last used locations.
- Added: “Open Configs Folder” option in the help menu.
- Fixed: Massive Lag Spikes / the program becoming unresponsive
- Fixed: Lag Spikes when changing to Special Drawing Sets / Changing Drawing Mode
- Fixed: Pen stroke sizes will match custom values properly on exported SVGs
- Fixed: Custom pen colours not rendering with the new colour / not saving when pressing “use”
- Fixed: Logs not outputting correctly

3.48 v1.0.5-beta

- Added: New Image Filters, there are now over 60+ Image Filters!
- Added: Presets for Drawing Areas (A4 Paper / A3 Paper etc.) & GCode Settings
- Added: “Image” Display Mode, to view the imported image.
- Changed: Filters / Cropping will now update live in the “Image” display mode.
- Changed: Image exports now have Anti-Aliasing so will match the viewport more closely
- Changed: The viewport now has a max resolution of 4096 x 4096, exceeding this size can prevent some GPUs from working, image exports will still match the resolution of the input.
- Changed: Increased the maximum vram usage from 512MB to 1024 MB
- Fixed: SVG Outputs will now match the specified dimensions and will use a DPI of 96
- Fixed: The application hanging when importing large images
- Fixed: Issue with high resolution images plotting endlessly

3.49 v1.0.4-beta

- Added: Presets for Drawing Sets + Drawing Pens
 - Presets created for Drawing Sets / Pens will be saved to the “User” type.
- Added: Special Drawing Sets/Pens Original Colour / Original Grayscale
 - These will sample the average colour of the image and colour each line using these samples.
 - These samples are taken when the plot is being run and cached, this will slightly impact plotting performance, this caching can be disabled however by setting PFM setting “Cache Colour Samples” to “false”.
- Added: “Padding” option to Drawing Area, with “Gang” check box
- Added: “Scaling Mode” option to Drawing Area: “Crop to fit”, “Scale to fit” and “Stretch to fit”

- Added: “Lock” option for PFM Settings
 - Locking a setting will prevent it from being randomised, this will allow more creativity when using “randomise” allowing you to keep track of values you like.
 - Some settings are locked by default to prevent the plot failing (e.g. Plotting Resolution, Drawing/Shading Delta Angle)
 - Pressing “Reset” will still return the setting to default
- Added: Right-Clicking PFM Settings will now allow you to “Randomise” / “Reset” a single setting.
- Added: Check boxes to Drawing Pen selections to enable quicker configuration
- Added: Extra Buttons in Pen Settings for “Add”, “Remove”, “Duplicate”, “Move Up” and “Move Down”, you can still right click pens instead.
- Added: “Stroke” options for Drawing Pens to change the thickness of the
- Changed: Pressing ENTER will not start plotting anymore, avoiding accidentally overwriting your current plot.
- Changed: Pre-Processing will now be disabled by default
- Changed: Blend Modes won’t lag so much when rendering
- Changed: Preset files have been overhauled to allow for the easy addition of even more preset types.
- Changed: GCode Settings has been split from “Drawing Area” and now appear at the bottom
- Changed: GCode Exporting has been re-written.
- Changed: GCode “Test Drawings” will now respect the enabled pens / allow seperate pen tests
- Changed: Removed “Import URL” option
- Changed: When exporting the default will now be the original files folder and name with the suffix “_plotted”
- Fixed: JPG Export not outputting a file
- Fixed: SVG exporting with individual line segments and consequently creating large output files.
- Fixed: Potential Memory Leaks with JavaFX
- Fixed: Blend Modes will render as expected again & also appear properly in exports.
- Note: Old user presets / presets will be broken, presets will need to be transferred to the new json format (this won’t happen again)

3.50 v1.0.3-beta

- Changed: The “Reset” / “Help” button has been swapped to help avoid accidental usage
- Fixed: JavaFX Native Bindings have been added, so Mac + Linux users should now be able to run the app as expected.

3.51 v1.0.2-beta

- Changed: DrawingBotV3 is now for Java 11+
- Removed: Dependency on Processing
- Fixed: Alpha channels being ignored by Path Finding Modules

3.52 v1.0.1-alpha

- Added: User Configurable Presets which can be imported/exported and shared with other users
- Added: Default Path Finding Module Presets
 - inc. “Sketchy”, “Glitchy Vertical”, “Glitchy Horizontal” & “Messy Lines”
- Added: Default Pre-Processing Presets
 - inc. “Original Dirty Border”
- Added: Pre-Processing Settings, for adding/removing image filters
- Added: Large amounts of work on the API
- Changed: Improved application log output
- Changed: By default images will no longer have a border, use the pre-processing preset “Original Dirty Border” to replicate the original defaults.
- Changed: Combined the two Path Finding Control tabs into one smaller one
- Changed: Moved the Elapsed Time & Plotted Lines values to above the viewport
- Fixed: The application appearing to big on small screens.
- Fixed: The console log not being outputted properly
- Fixed: “Reset Plotting” button, this will now work more consistently and will try to force plotting to stop regardless of where the process is, the plotting will have to be restarted.
- Note: The “Pre-Processing” tab is still W.I.P.

3.53 v1.0.0-alpha

- The first public alpha!

QUICK START

This is a quick guide to creating drawings for Print / Digital Output.

4.1 Using In-App Documentation

While you have DrawingBotV3 open you can navigate the latest documentation within the program (*as of version 1.6.4*).

- Go to **Help / Open Documentation** - to open the documentation in-app
- In the **Path Finding Controls** window, select **Help**, to display a specific PFM's settings.
- Select **Any PFM Setting** while the documentation window is open, to bring up the specific setting's definition.

4.2 Print Outputs

- 1) Import the image you wish to draw with **File / Import**, most Image Formats are supported.
- 2) Open the **Drawing Area** panel and enter the **width / height** you wish to print at in mm
- 3) Enable **Rescale to Pen Width** and enter the **Pen Width** of the pens you plan to use. This is one of the most important settings for getting good plots by ensuring that lines have the correct spacing to be drawn without overlap.
- 4) Press **Start Plotting**, your drawing will now be generated.
- 5) With this first Drawing as a reference you can begin to experiment with the *Pre-Processing*, *Path Finding Controls* and *Pen Settings* panels
- 6) You can export the drawing with **File / Export per/drawing**

4.3 Digital Outputs

- 1) Import the image you wish to draw with **File / Import**, most Image Formats are supported.
- 2) Press **Start Plotting**, your drawing will now be generated.
- 3) With this first Drawing as a reference you can begin to experiment with the *Pre-Processing*, *Path Finding Controls* and *Pen Settings* panels
- 4) You can export the drawing with **File / Export per/drawing**

VIDEO TUTORIALS

You can find video tutorials on the [DrawingBotV3 YouTube Channel](#)

5.1 Beginner Tutorial Series

5.1.1 Part One: Getting Started

<https://youtu.be/9yp7CNEYPw0>

5.1.2 Part Two: Drawing Area

<https://youtu.be/HPKr3qAXK8s>

5.1.3 Part Three: Image Processing

<https://youtu.be/T31QhLVV3m4>

5.1.4 Part Four: Pen Settings

<https://youtu.be/5RBAdK4PnN8>

5.1.5 Part Five: Single Pen Plots

<https://youtu.be/bdJ8aZUJX5U>

5.1.6 Part Six: Export Settings

https://youtu.be/jn3qP-AN_Jw

DRAWING AREA

In this settings panel you can configure the output size of your drawing. If you're output is for print for the best results you should enter paper size / pen width to allow DrawingBotV3 to optimise the drawing for plotting.

All changes you make to the drawing size will be automatically update the preview rendered when the "Display Mode" is set to "Image", to apply these changes to the final drawing you should run the PFM again with the **Start** button.

There are a number of presets already included which cover typical paper sizes, you can also create you own presets.

- **Use Original Sizing:** If the original images size should be used, recommended for digital only output, not recommended for print only outputs.
- **Input Units:** To specify the units for the width/height/padding, either mm, cm, inches or pixels
- **Width:** The width of the drawing area, in the current Input Units.
- **Height:** The height of the drawing area, in the current Input Units.
- **Orientation:** Either Portrait/Landscape, if you change presets your current orientation will be maintained.
- **Padding:** The margins of the drawing area, in the order Left/Right/Top/Bottom, in the current Input Units, you can also gang these controls to have a consistent padding size.
- **Scaling Mode:** How to rescale the image to fit into the new dimensions, this resizing occurs before pre-processing so will still be optimised to the paper size / pen width
 - **Crop to fit:** Crops the source image to fill the entire Drawing Area.
 - **Scale to fit:** Scales the source image so the entire image is visible within the Drawing Area.
 - **Stretch to fit:** Stretches the source image to fill the Drawing Area.
- **Rescale to Pen Width:** When activated the image will be rescaled to the specified "pen width".
- **Rescale Mode:** Controls the method used to rescale the Drawing to the specified Pen Width, affects the quality/accuracy of the final plot but also affects plotting times.
 - **High Quality:** Uses the maximum Plotting Size to create the best quality results. The PFM will use only the original image or an upscaled version as a reference.
 - **Low Quality:** Uses the optimal Plotting Size for lowest processing time. The PFM may use the original image, an upscaled version or a downscaled version depending on the given Pen Width and Width / Height.
 - **Off:** Disables the any image rescaling, the PFM will only use the original image. This is only recommended for Digital Only results. Bypassing rescaling will result in a plot with incorrect density and previews in the viewport won't match the final plot.
- **Pen Width (mm):** The nib size to be used when plotting, this will define the resolution of the image used so where possible use smaller pens or more detailed plots. If you are using multiple sizes often the average of all sizes will give the best result or the most used size.

- **Canvas Colour:** Used for changing the canvas colour of your drawing, this is primarily a visual aid if plotting on non-white materials, however when using *Colour Match* this setting is more important.
- **Background Colour:** Used for changing the background colour of the viewport area.
- **Clipping Modes:** Allows you to choose if shapes should overflow the edges of the drawing/page or not, this will only have an effect on some PFMS, as some PFMS only work within the image provided anyway. You have three options
 - **Drawing:** Clip the geometries to the drawings edges, this will prevent any shapes overlapping the edges of the drawing.
 - **Page:** Clip the geometries to the page's edges, this will allow shapes to overlap into the padding area of the drawing, this can create a more organic style as the drawing will have a less distinct border.
 - **None:** Allow geometries to overflow the page and drawing

PRE-PROCESSING

DrawingBotV3 offers some basic Image Filters to alter the source image before it is plotted by a *Path Finding Module*. The image filters provided are not a replacement for using other more advanced image processing applications. They are instead intended to help with basic corrections, as minor changes can change the final result dramatically and having them in the same software can greatly speed up this workflow. Image filter configurations can also be saved as *presets*

Image Filters can be added at the bottom of the pre-processing panel or from the toolbar.

These are all the image filters currently included.

7.1 Borders

- Dirty Border
- Custom Overlay

7.2 Blur

- Box Blur
- Emboss Edges
- Gaussian Blur
- Glow
- High Pass
- Lens Blur
- Maximum
- Median
- Minimum
- Motion Blur - Fast
- Motion Blur - Slow
- Sharpen
- Simple Blur
- Smart Blur
- Unsharp Mask

7.3 Colors

- Adjust HSB
- Adjust RGB
- Contrast
- Exposure
- Gain
- Gamma
- Gray Out
- Invert
- Levels
- Mix Channels
- Posterize
- Quantize
- Rescale
- Solarize
- Transparency

7.4 Distort

- Diffuse
- Displace
- Kaleidoscope
- Marble
- Ripple
- Shear
- Swim

7.5 Edges

- Detect Edges
- Laplace

7.6 Effects

- Chrome
- Feedback
- Glint
- Mirror

7.7 Keying

- Chroma Key

7.8 Pixellate

- Color Halftone
- Crystallize
- Pointillize

7.9 Render

- Scratches

7.10 Stylize

- Noise
- Contours
- Dissolve
- Drop Shadow
- Emboss
- Flare
- Oil
- Rays
- Shape Burst
- Sparkle
- Stamp
- Threshold

PATH FINDING MODULES

The Path Finding Modules (PFMs) are algorithms for converting images into geometric shapes, they can be configured in the **Path Finding Controls** panel. They have been designed to be as flexible as possible and to run with almost any combination of settings. This means that they can create many more styles than those you see here. Some of these extra styles are included as **presets**!

Every Path Finding Module can also be run with *CMYK Separation* and *Colour Match*

8.1 Sketch PFMs

Sketch PFMs are best used for plots using multiple layers of different pens as the Sketch PFMs rely on the different pens to represent the different tones in the image. However, it is possible to use a single pen with Sketch PFMs though it is recommended to use a pen which is additive where overlapping strokes will result in progressively darker lines.

8.1.1 How do they work?

- 1) Find the darkest area of the image
- 2) Find the darkest pixel in that area
- 3) Finds the next darkest line/curve from that pixel
- 4) Brighten the part of the image that the line covers
- 5) Repeat steps 2 to 4 until the specified *Squiggle Max Length* is reached then return to step 1

The process will stop when either the specified *Line Density* or *Line Max Limit* has been reached.

8.1.2 Sketch Lines

Transforms an image into lines using brightness data.



Settings

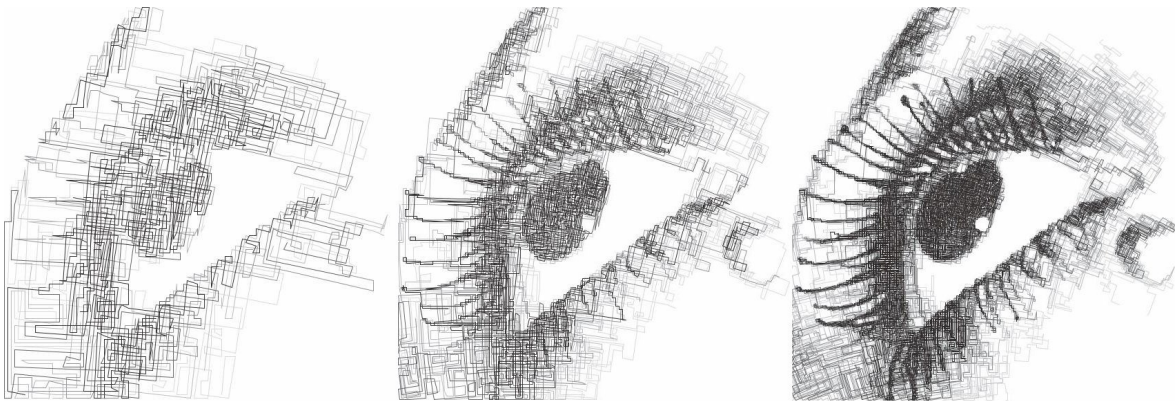
Default

Plotting Resolution

Values: Number (Safe Range: 0.1 -> 1.0)

Controls the resolution of the image used by the PFM but doesn't change the size of the pen to be used, this is available on almost every PFM!

This is a quick way to increase/decrease the visual quality & density of a drawing and also decrease computation time.



e.g. Fig 1. Plotting Resolution = 0.2, Fig 2. Plotting Resolution = 0.4, Fig 3. Plotting Resolution = 0.7

Quick Tip: You can also enter values higher than the Safe Range, for example using (1.0 -> 1.5) may be enough

to get the density you're aiming for

Random Seed

Values: Number

Used to generate all the random numbers used by the PFM. If you use the same Random Seed the PFM will produce the same results when given the same image.

Quick Tip: Created a good style but the lines aren't falling in quite the right way? Adjust the random seed and to alter the positions of the generated lines.

Style

The style portion of the Sketch PFM settings are great for applying a specific creative style to the generated paths. The majority of the style sliders affect the path processing only and not the original bitmap image.

The values don't need to add up 100% the balance between all of them decides the weighting of what to emphasise. e.g *Directionality* of 100% and a *Luminance Power* of 100%, means that the paths will be 50% driven by the luminance of the image and 50% by the *Directionality*.

Should Lift Pen

Values: Boolean (True | False)

When **True**, the pen will be lifted in-between Squiggles.

When **False**, the PFM will never lift the pen from the paper.

Directionality

Values: Number (Safe Range: 0 -> 100)

Forces the lines to follow the natural contours of the image by pushing the Path Finding process towards the direction of lowest variance.

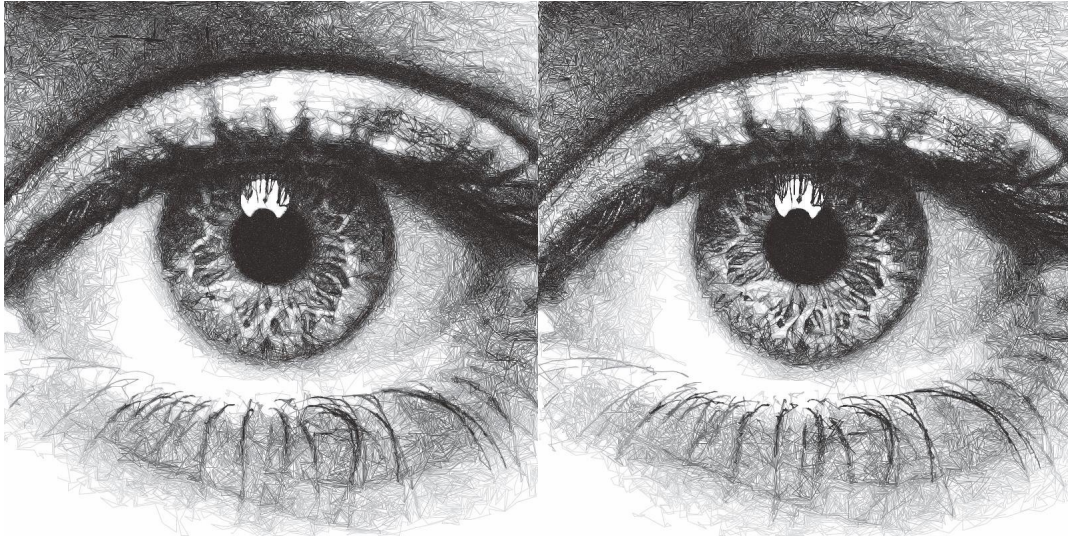


e.g. Fig 1. *Directionality* = 0, Fig 2. *Directionality* = 100 - You can see in this example the paths on the right tend to follow the curves of the original image more carefully and don't fall outside of the shapes as often

Clarity

Values: Number (Safe Range: 0 -> 100)

Controls a sharpness of the input image, and automatically applies an Unsharp Mask before processing the image.

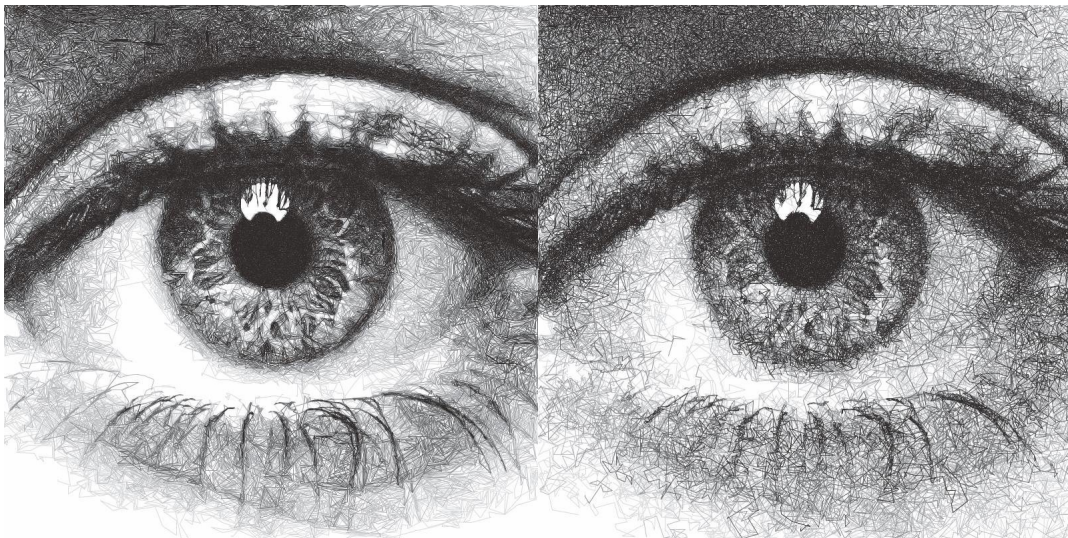


e.g. Fig 1. Clarity = 0, Fig 2. Clarity = 100

Distortion

Values: Number (Safe Range: 0 -> 100)

Adds some random noise to the generated lines, creating more stylised images.

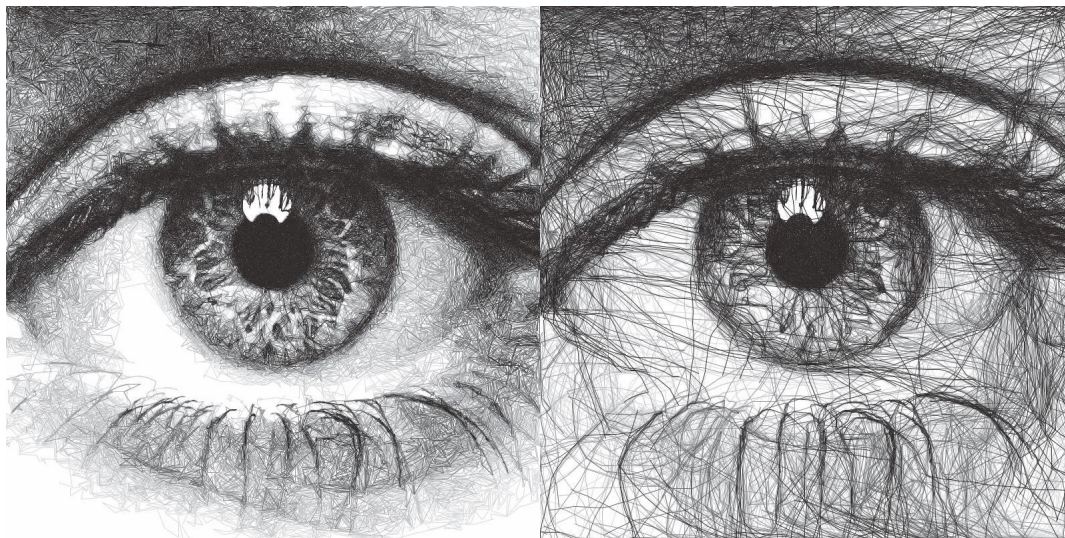


e.g. Fig 1. Distortion = 0, Fig 2. Distortion = 100

Angularity

Values: Number (Safe Range: 0 -> 100)

Controls the frequency at which lines are allowed to change direction, a higher angularity results in lines which don't change direction as frequently and cut across the image in more stylised ways.

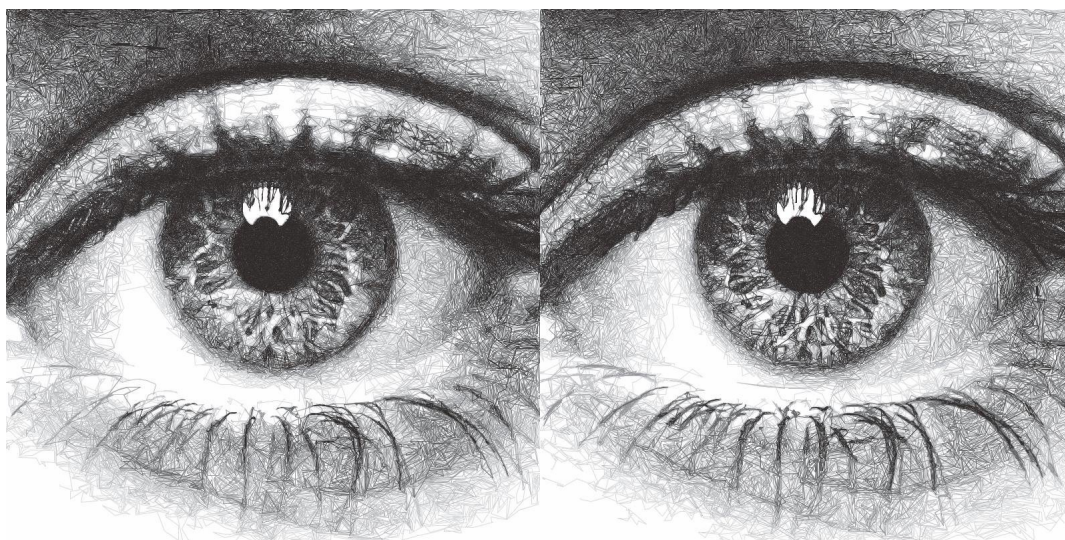


e.g. Fig 1. Angularity = 0, Fig 2. Angularity = 50

Edge Power

Values: Number (Safe Range: 0 -> 100)

Pushes the Path Finding process to edges detected by Canny Edge Detection, which is very accurate and will highlight sharp edges, keeping more detail in the image.

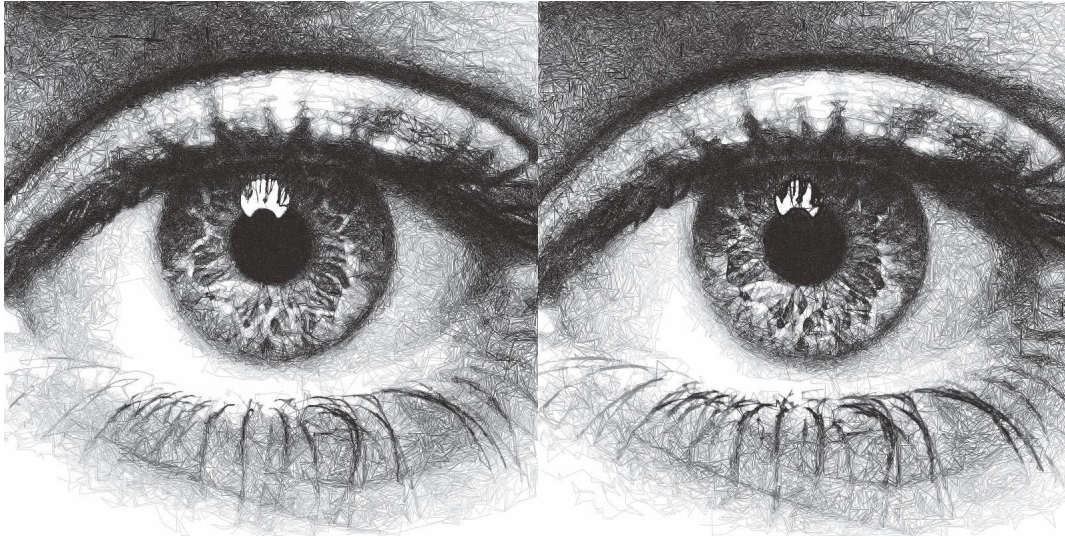


e.g. Fig 1. Edge Power = 0, Fig 2. Edge Power = 100

Sobel Power

Values: Number (Safe Range: 0 -> 100)

Similar to Edge Power but uses a Sobel Edge Filter instead of Canny Edge Detection, which results in less accurate edges and creates an exaggerated cartoonish quality on the plot.



e.g. Fig 1. Sobel Power = 0, Fig 2. Sobel Power = 100

Luminance Power

Values: Number (Safe Range: 0 -> 100)

Luminance Power is what typically drives the Path Finding Process so should usually be left at 100%, and the other style sliders should be introduced bit by bit. Typically PFM's will follow dark areas in the image when creating lines, this slider can be used to decrease the influence of brightness which in turn will favour other style options like Directionality or Edge Power etc.

Drawing Delta Angle

Values: Number (Range: -360 -> 360)

Controls the directions that the PFM can travel during the Path Finding Process.

Segments

Line Density

Values: Percentage (Range: 0 -> 100)

Affects the total number of segments in the final drawing and therefore the computation time. This setting drives the progress bar and when it reaches 100% processing stops.

$$\text{progress} = (\text{avgLuminance} - \text{initialLuminance}) / (\text{desiredLuminance} - \text{initialLuminance}) * \text{lineDensity}$$

Quick Tip: Reducing the Displayed Shapes slider above the viewport has the same effect as decreasing the *Line Density*. So if the density is too high you can reduce it later.

Line Min Length

Values: Number (Safe Range: 2 -> 500)

The minimum length of each segment, see *Line Max Length* for more details.

Line Max Length

Values: Number (Safe Range: 2 -> 500)

The maximum length of each segment, *Line Min Length* defines the minimum.

Decreasing the Min/Max Length will increase the detail retention in the final plot as each segment will be more accurate.

Increasing the Min/Max Length will increase the length of generated lines and decrease the accuracy of the final plot.

Line Max Limit

Values: Number (Safe Range: -1 -> 1000000)

Limits the total number of segments. Will only have an effect if this limit is reached before the chosen *Line Density*.

When the Max Limit is -1, the limit will be ignored.

Angle Tests

Values: Number (Safe Range: 1 -> 360)

Controls the accuracy of the generated lines. When finding the next segment the PFM will generate new segments travelling in different directions and then compare them. The Angle Tests controls the number of new segments to generate at each position.

Quick Tip: This control can also be used creatively, try setting it to 3, 4 or 6. You'll see the PFM generate Triangles, Squares and Hexagonal Lines.

Unlimited Tests

Values: Boolean (True | False)

Will run as many angle tests as required to find the "best" line possible, resulting in more accurate drawings with longer processing times.

Squiggles

A path of segments(lines/curves) is called a squiggle. Each squiggle is continuous and doesn't include any pen lifts.

You can use this area of the PFM to reduce the plotting time of sketches generated but at the trade-off of losing smaller details and potentially having squiggles crossing bright areas of the source image.

Shorter Squiggles = Longer Plotting Time & Higher Quality Output
Longer Squiggles = Shorter Plotting & Lower Quality Output

Squiggle Min Length

Values: Number (Safe Range: 0 -> 5000)

Defines the minimum number of segments for each squiggle, setting a minimum length prevents incredibly short squiggles from being created, shortening plotting times.

e.g. Squiggle Min Length = 100, every squiggle would consist of at least 100+ segments.

Squiggle Max Length

Values: Number (Safe Range: 0 -> 5000)

Defines the cut-off for the maximum number of segments allowed in each squiggle. Once the squiggle has reached the max length the pen will be lifted and move to a new location.

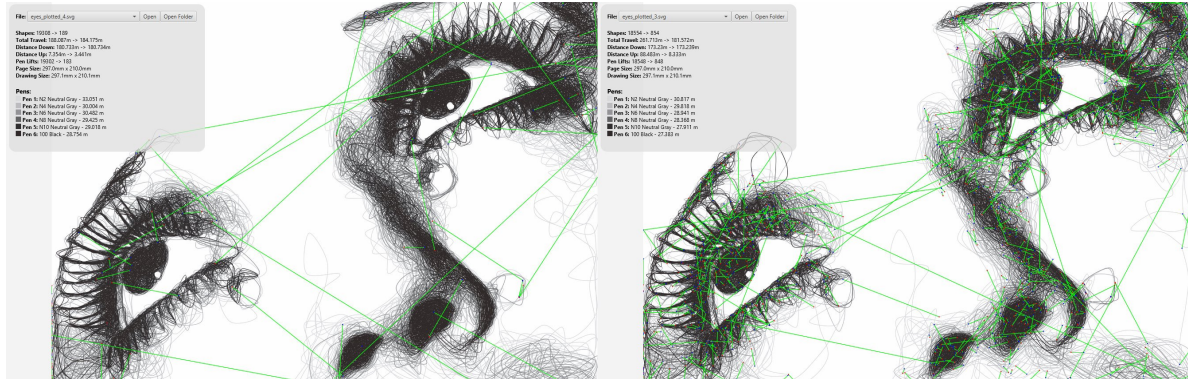
Increasing the Max Length will decrease the plotting time, but may create a poor distribution of tones.

Squiggle Max Deviation

Values: Percentage (Safe Range: 0 -> 100)

Control how far a squiggle is allowed to deviate in brightness before it is ended prematurely. This has the result of making shorter squiggles which are more accurate and less likely to cross over brighter areas of the image. Increasing the allowed deviation will result in a less accurate drawing with fewer pen lifts.

If you notice your drawing has lines crossing bright areas of the image that you wish to remove, you can try lowering the Max Deviation and lowering the Squiggle Min Length.

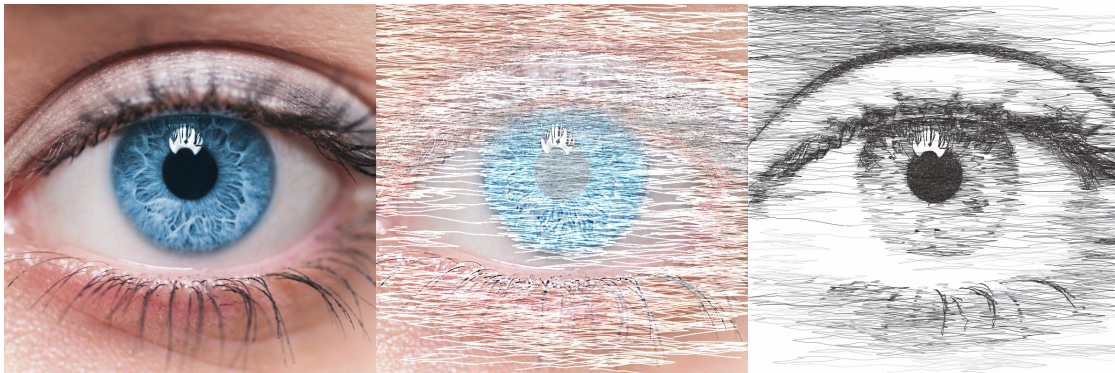


e.g. Fig 1. Squiggle Max Deviation = 5, Fig 2. Squiggle Max Deviation = 1000 - The green lines show the plotter's travel while the pen is up. The overall distance of the plot changed by a few metres, and the number of pen lifts was dramatically reduced. The default Squiggle Max Deviation of 25 provides a good middle-ground, keeping quality while not having too many pen lifts.

Erasing

Sketch PFMs use a Lightened Image to keep track of the areas which have been drawn over. When a line is drawn it is erased from the Working Image, so when the same area is next considered, lines will be less likely to cross over.

You can view the Lightened Image in your viewport by going to "Display / Lightened" after the drawing has finished processing.



e.g. Fig 1. Original Image, Fig 2. Lightened/Erased Image, Fig 3. Sketch Lines Result

Erase Min

Values: Number (Range: 0 -> 255)

Controls the minimum intensity of the 'Erasing' process, see [Erase Max](#) for more details.

Erase Max

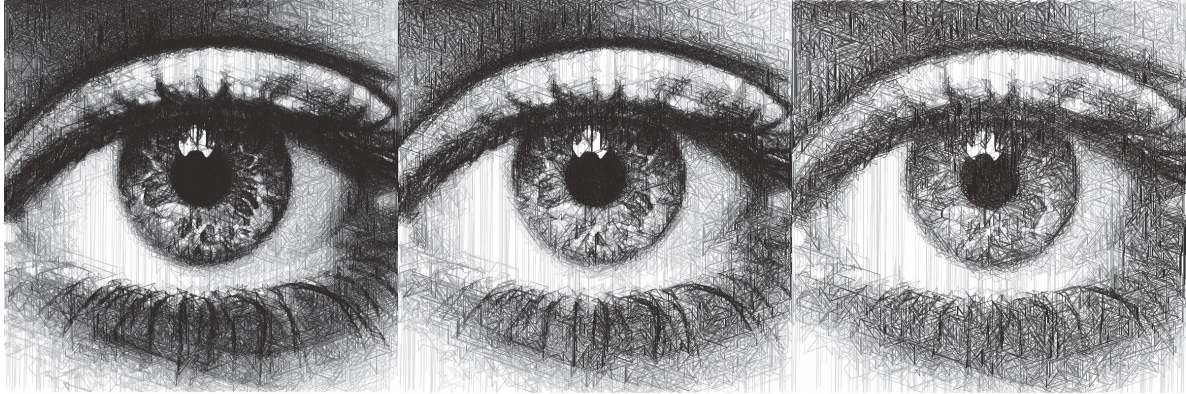
Values: Number (Range: 0 -> 255)

Controls the maximum intensity of the ___`Erasing` process, with *Erase Min* defining the minimum.

Erase Min/Max alters the amount to brighten each RGB channel in the Lightened Image.

It therefore controls the overall plot density & contrast in the image and can be fine-tuned to your specific pens.

The *Tone* setting alters the interpolation between these two values.



e.g. Fig 1. *Erase Min* = 50 & *Erase Max* = 50, Fig 2. *Erase Min* = 50 & *Erase Max* = 125 (Default), Fig 3. *Erase Min* = 50 & *Erase Max* = 255

Quick Tip: Are your Physical Plots coming out too dense and soaking the paper?

Try increasing the Erase Min/Max to reduce the amount of overlap.

Erase Radius Min

Values: Number (Range: 0 -> 50)

Controls the minimum radius of the shapes drawn by the ___`Erasing` process, see *Erase Radius Max* for more details.

Erase Radius Max

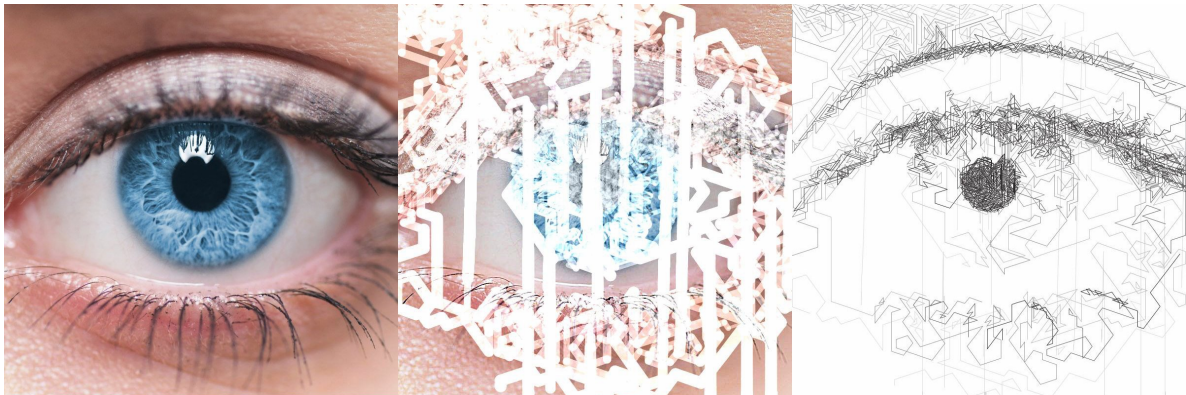
Values: Number (Range: 0 -> 50)

Controls the maximum radius of the ___`Erasing` process, with *Erase Radius Min* defining the minimum.

It therefore controls the spread of shapes in the image and the overall plot density.

The *Tone* setting alters the interpolation between these two values.

Quick Tip: Are you wanting to plot with a single pen? Increasing the Erase Radius Max is a great way to introduce contrast back into the drawing.



e.g. Fig 1. Original Image, Fig 2. Lightened/Erased Image, Fig 3. Sketch Lines Result - The “Digital” Preset was used with *Erase Min* = 1, *Erase Max* = 24

Tone

Values: Percentage (Range: 0 -> 100)

Controls the contrast of the Erasing process, by controlling a tone curve between the *Erase Min / Erase Max* & *Erase Radius Min / Erase Radius Max*.

Using a higher Tone will result in an image with a stronger contrast, with more overlap and less spacing between lines.

Note: The tone slider has no effect when the Erase Values are identical.



e.g. Fig 1. Tone=0, Fig 2. Tone=50, Fig 3. Tone=100 - The “Sketchy” Preset was used with *Erase Min*=50, *Erase Max*=125, *Erase Radius Min*=1.0, *Erase Radius Max*=6.0

Quick Tip: Use a tone of 100 when using a high *Erase Radius Max*, to bring some detail back into the image

Shading

Shading

Values: Boolean (True | False)

When **True**, shading segments will be drawn across the drawing which can only travel in the direction defined by the Start Angle Min & Max

Start Angle Min

Values: Number (Range: -360 -> 360)

Controls the minimum angle when shading, see *Start Angle Max* for more details.

Start Angle Max

Values: Number (Range: -360 -> 360)

Controls the maximum angle when `__Shading__`, effectively changing the direction of the `__Shading__` Process, it will have less effect when `__Shading__` is disabled unless the *Drawing Delta Angle* isn't set to 360, then the angle of the start angle will be more obvious.



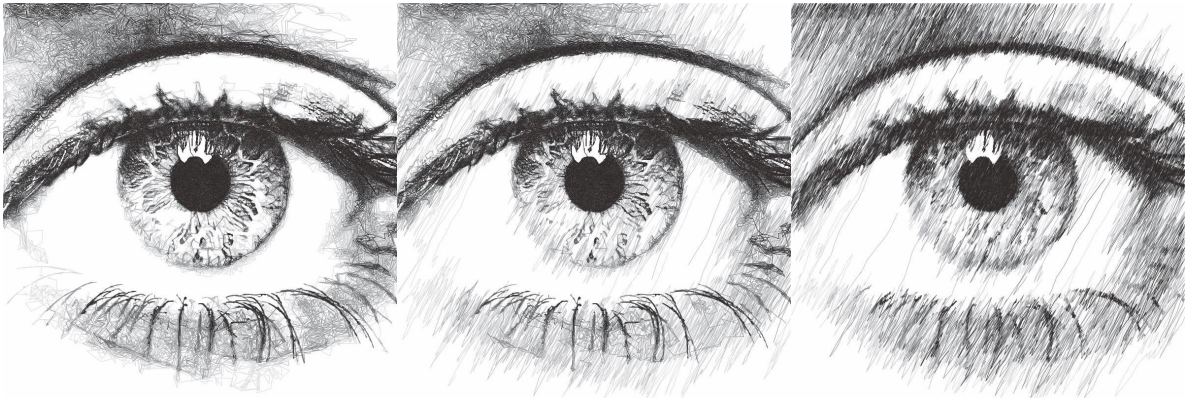
e.g. Fig 1. Start Angle Min = -72, Max = -52, Fig 2. Start Angle Min = -85, Max = 95, Fig 3. Start Angle Min = 0, Max = 0 - created with the “Default” preset with Shading = True, Shading Threshold = 0

Shading Threshold

Values: Percentage (Range: 0 -> 100)

The point in the processing when the shading process will begin, effectively controlling the percentage of the drawing which is created from the shading process.

Note: It ignores *Line Density*, so if the limit is reached before the shading threshold is reached no shading will be seen.



e.g. Fig 1. Shading=False, Fig 2. Shading=True, Shading Threshold=50, Fig 3. Shading=True, Shading Threshold=100

Shading Delta Angle

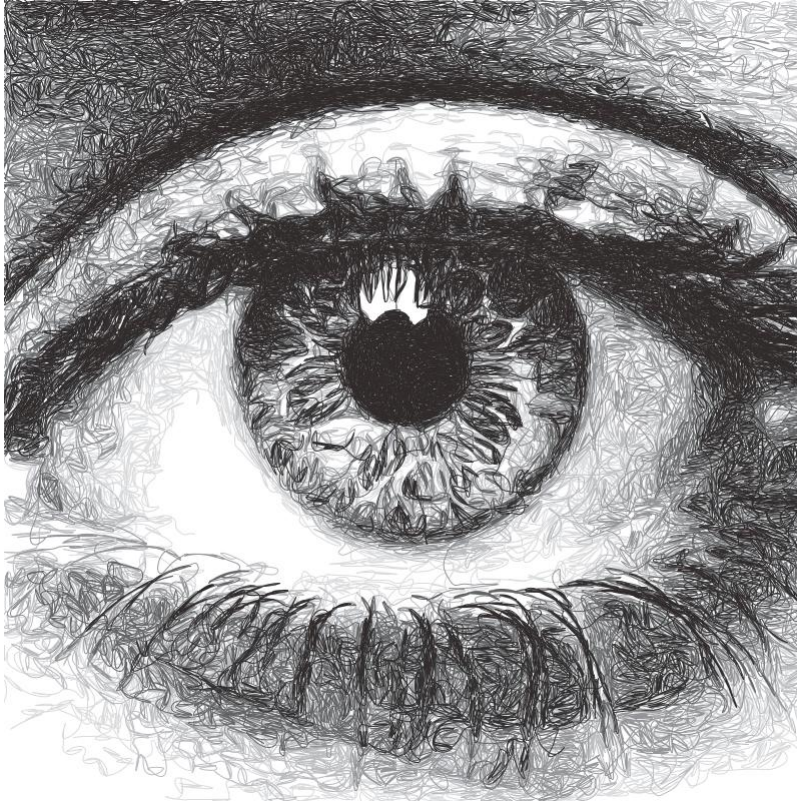
Values: Number (Range: -360 -> 360)

Controls the directions that the PFM can travel during the Shading Process.

Changing this will result in much more “Glitchy” results, and is especially good for digital art!

8.1.3 Sketch Curves

Transforms an image into **catmull-rom splines** using brightness data.



Settings

Curves

Curve Tension

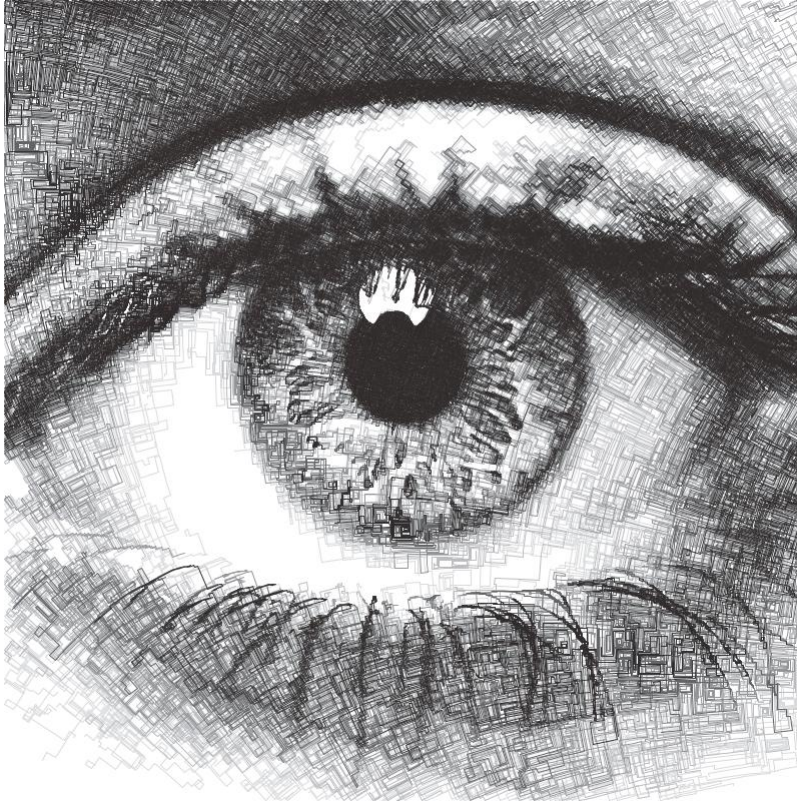
Values: Number (Range: 0.01 -> 1.0)

Affects the tension of the catmull-rom splines

- 0.0 = No Tension, unpredictable curves
- 0.5 = Medium Tension, smooth curves
- 1.0 = Maximum tension, straight lines.

8.1.4 Sketch Squares

Transforms an image into lines in a rectangular pattern using brightness data.



Settings

Squares

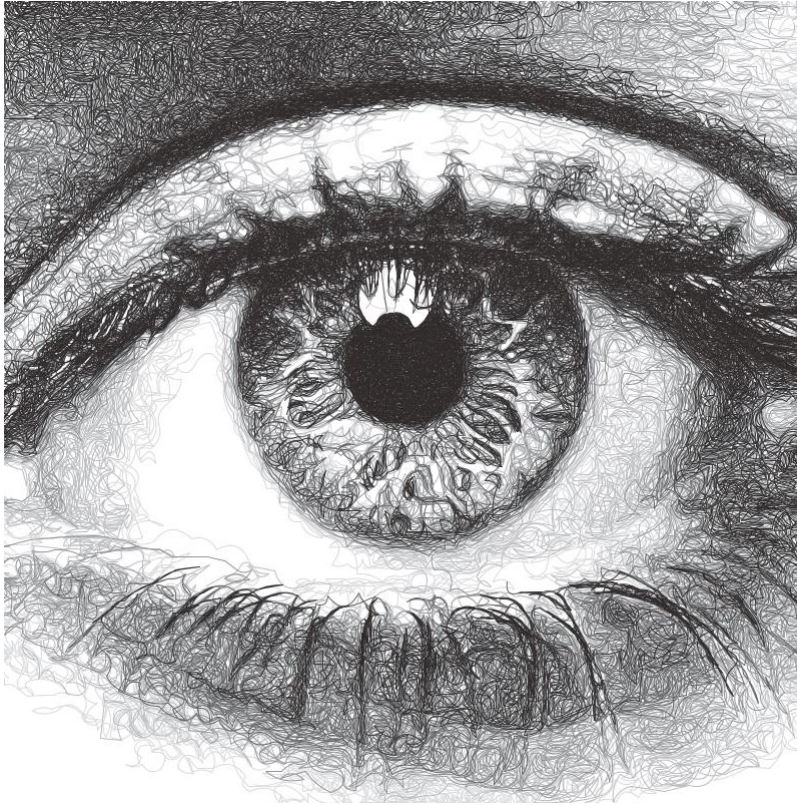
Start Angle

Values: Number (Range: -360 -> 360)

Affects the rotation of the squares, useful to alter the results without dramatically changing the form of the squares.

8.1.5 Sketch Quad Beziers

Transforms an image into [Quadratic Bézier curves](#) using brightness data, by first finding the darkest line and then finding the darkest position for one control point. It uses more accurate “Bresenham” calculations which results in increased precision but longer processing times.



Settings

Curves (Quad Beziers)

Curve Tests

Values: Number (Range: 1 -> 45)

the number of positions to test for each control point to find the darkest curve, increasing this will result in a more accurate plot.

Curve Variation

Values: Number (Range: 1 -> 1000)

the maximum magnitude of the curve. Increasing this will decrease the test accuracy and increase the control point's offsets.

Curve Offset

Values: Number (Range: -100 -> 100)

Allow you to control the 'wiggle' of the curve by defining the maximum offset the control's points can move from the initial segment.

For Sketch Quad Beziers, this is a single control which controls the variation of the central point of each quad segment.

For Sketch Cubic Beziers, this is an A & B Offset which each control the variation of the A & B control points on the cubic segment.

+ Inherits settings from:

- *Sketch Lines*

8.1.6 Sketch Cubic Beziers

Transforms an image into [Cubic Bézier curves](#) using brightness data, by first finding the darkest line and then finding the darkest position for the two control points. It uses more accurate “Bresenham” calculations which results in increased precision but longer processing times.



Settings

+ Inherits settings from:

- *Sketch Lines*
- *Sketch Quad Beziers*

8.1.7 Sketch Catmull-Roms

Transforms an image into **catmull-rom splines** using brightness data, by finding the next darkest curve from each point. It uses more accurate “Bresenham” calculations which results in increased precision but longer processing times.



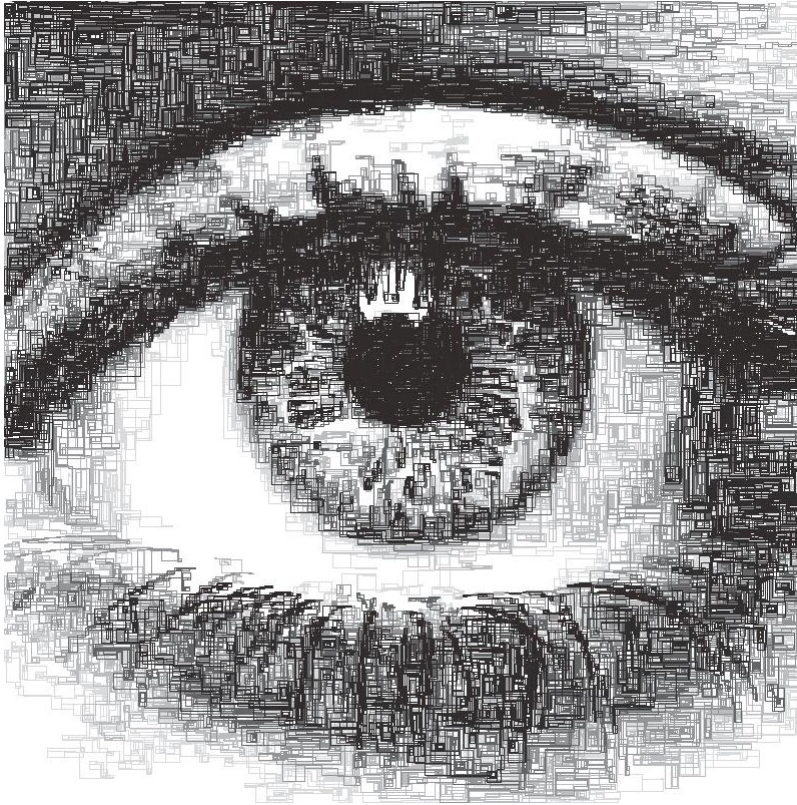
Settings

+ Inherits settings from:

- *Sketch Lines*
- *Sketch Curves*

8.1.8 Sketch Shapes

Transforms an image into shapes using brightness data. It has the following modes: Rectangle and Ellipse.



Settings

Shapes (Sketch Shapes)

Shape Type (Sketch Shapes)

Values: Rectangles | Ellipses

Allows you to choose the type of shapes to create the drawing with.

- Rectangles: All of the rectangles will be linked by sharing a corner segment, which means this setting is still fast to plot.
- Ellipses: All ellipses will end in similar positions but won't be linked so will require more pen lifts. May change in the future.

+ Inherits settings from:

- *Sketch Lines*

8.1.9 Sketch Sobel Edges

Transforms an image into lines using brightness & edge detection data. By using a [Sobel Operator](#) to find edges and then using this data in conjunction with the brightness to find the next line.



Settings

Sobel

Sobel Intensity

Values: Number (Range: 0 -> 10)

The priority of edge detection vs brightness

Sobel Adjust

Values: Number (Range: 0 -> 255)

Similar to `__Erasing`, the amount to decrease a pixel's sobel value by when a line is drawn over it, affects how strongly the PFM is affected by the sobel values.

+ Inherits settings from:

- [Sketch Lines](#)

8.1.10 Sketch Waves

Transforms an image into lines which follow the direction defined by an X and Y curve function.



Settings

Waves

Start Angle (Sketch Waves)

Values: Number (Range: -360 -> 360)

Affects the rotation of the waves, useful to alter the results without dramatically changing the form of the waves.

Wave Offset X/Y

Values: Number (Range: -1000 -> 100)

Shifts the X/Y wave across the image.

Wave Divisor X/Y

Values: Number (Range: -1000 -> 1000)

Affects the intensity of the X/Y wave, increasing the divisor will result in flatter waves, decreasing it will result in more exaggerated waves

Wave Type X/Y

Values: Sin | Cos | Tan

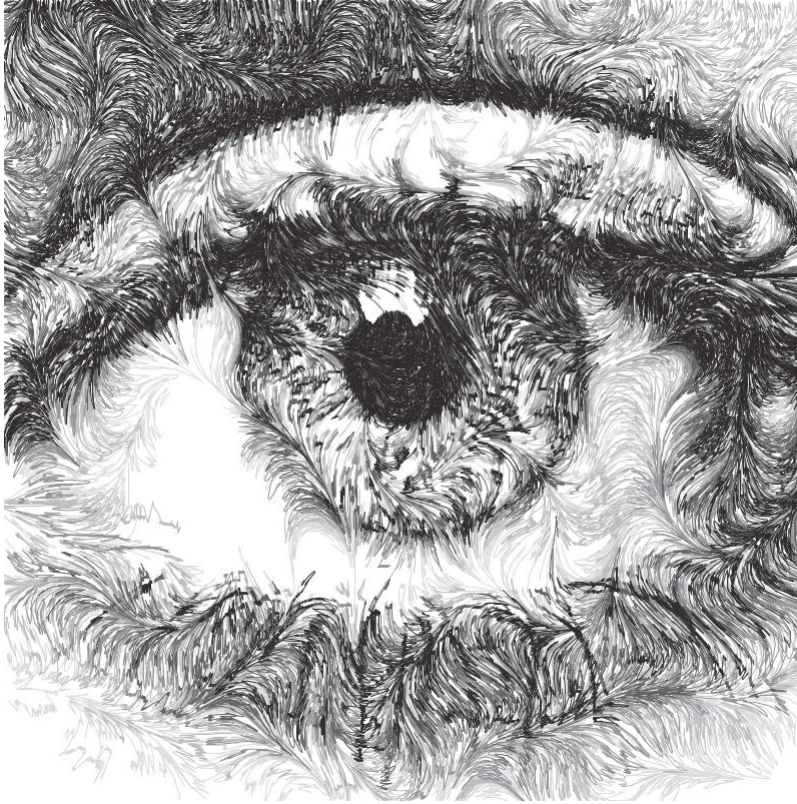
Changes the mathematical function used to create the wave.

+ Inherits settings from:

- *Sketch Lines*
-

8.1.11 Sketch Flow Field

Transforms an image into lines which follow the direction defined by a “Flow Field”



Settings

Default Flow Field Settings

Start Angle (Flow Field)

Values: Number (Range: -360 -> 360)

Controls the initial angle of the Flow Field, rotating the resulting field

X Frequency (Flow Field)

Values: Number (Range: 0.001 -> 4)

Controls the rate of change on the X Axis of the flow field, higher frequency = more detailed flow field

Y Frequency (Flow Field)

Values: Number (Range: 0.001 -> 4)

Controls the rate of change on the Y Axis of the flow field, higher frequency = more detailed flow field

Scale Frequency (Flow Field)

Values: Number (Range: 0.01 -> 20)

Allows you to scale the *X Frequency (Flow Field)* and *Y Frequency (Flow Field)* uniformly, a quick way to alter the detail of the resulting flow field

Amplitude (Flow Field)

Values: Number (Range: 0.0 -> 1.0)

Controls the amplitude / influence of the resulting flow field, a low amplitude will converge the flow fields closer to the *Start Angle (Flow Field)*

+ Inherits settings from:

- *Sketch Lines*

8.1.12 Sketch Superformula

Transforms an image into lines which follow a *Superformula*

**Settings****Default Superformula Settings****Start Angle (Superformula)**

Values: Number (Range: -360 -> 360)

Controls the rotation of the shape/field generated by the Superformula

Centre X/Y (Superformula)

Values: Number (Range: 0.0 -> 100.0)

Controls the origin point of the superformula, expressed as a percentage of the images width/height, allowing you to easily move the generated patterns across the image.

X/Y Scale (Superformula)

Values: Number (Range: 1 -> 20)

Allows you to scale the shape/field generated by the Superformula, essentially zooming into the generated pattern.

Frequency (Superformula)

Values: Number (Range: 0.0 -> 20.0)

Controls the variation of the Superformula pattern around the centre point, equivalent to the **m** parameter in the superformula equation.

Curvature (Superformula)

Values: Number (Range: 0.0 -> 80.0)

Controls the smoothing between the frequencies generated around the centre point, equivalent to the **n1** parameter in the superformula equation.

Sine/Cos Factor (Superformula)

Values: Number (Range: 0.0 -> 80.0)

Controls variation in the X/Y axis, equivalent to the **n2** & **n2** parameters in the superformula equation.

+ Inherits settings from:

- *Sketch Lines*
-

8.1.13 Sketch Sweeping Curves

This PFM is focused on creating long sweeping curves which are more natural / human-like, focused on creating longer curves. Unlike other Curve PFMs which sometimes turn sharply, Sweeping curves will gently change direction. This makes this PFM really excellent for figures, portraits and curved objects.



Settings

Curves (Sweeping Curves)

Curvature

Values: Number (Range: 0 -> 1.0)

Controls the appearance of “knots” in the curve, it will make a greater visual difference at extreme changes in direction which Sketch Sweeping Curves tries to avoid so the difference will be subtle.

- 0 = Uniform Catmull-Rom
- 0.5 = Centripetal Catmull-Rom (Default)
- 1.0 Chordal Catmull-Rom

+ Inherits settings from:

- *Sketch Lines*

8.2 Streamline PFMs

Streamline PFMs generate streamlines to represent an image which are driven by the direction from a vector field. The streamlines are spaced according to the brightness of the image without overlapping. The underlying vector field can be altered dramatically to create many different styles which still remaining faithful to the original images brightness. This makes them very versatile for creating stylised wave like patterns which can be highly customised.

They are also suitable for single or multi-pen plots, and CMYK or Colour Match plots.

By default Streamline PFMs use the “Luminance Weighted” pen distribution creating multi-pen plots which distribute the streamlines based on their luminance.

8.2.1 Default Streamline Settings

Streamlines

Min Spacing

Values: Number (Safe Range: 0.5 -> 20.0)

Controls the minimum spacing between the generated streamlines, see *Tone (Streamlines PFMs)*

Max Spacing

Values: Number (Safe Range: 2.0 -> 50.0)

Controls the maximum spacing between the generated streamlines, see *Tone (Streamlines PFMs)*

Min Length

Values: Number (Safe Range: 0 -> 20.0)

Controls the minimum length of the generated streamlines

Max Length

Values: Number (Safe Range: 0 -> 500.0)

Controls the maximum length of the generated streamlines

Tone (Streamlines PFMs)

Values: Number (Safe Range: 0 -> 100.0)

Controls the contrast of the generated streamlines, by controlling a tone curve between the *Min Spacing / Max Spacing*.

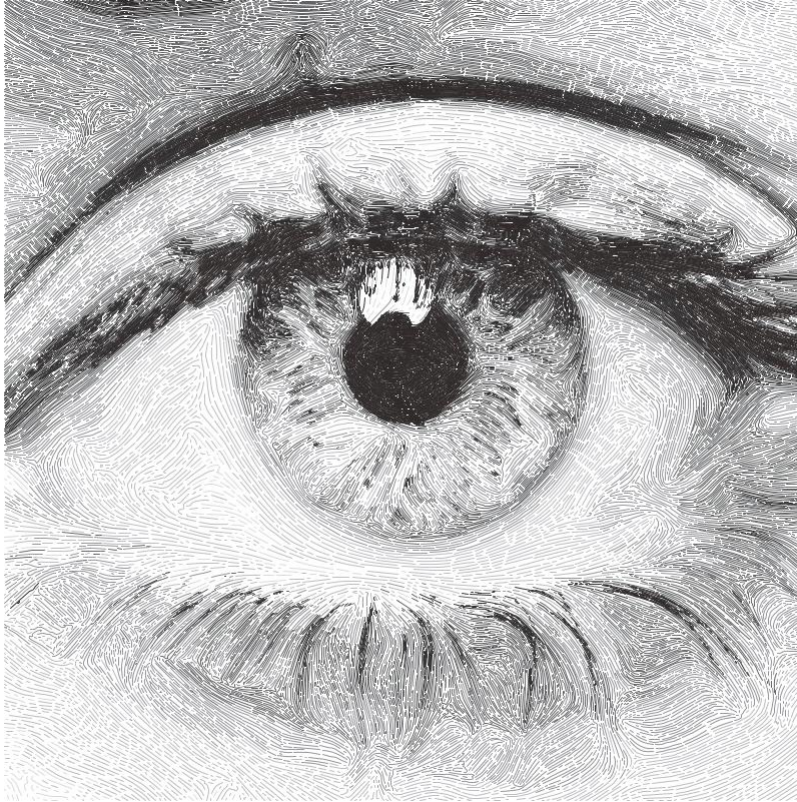
Distortion (Streamlines PFMs)

Values: Number (Safe Range: 0 -> 100.0)

Controls the random distortion of the generated streamlines, allowing more hand-drawn like streamlines to be generated

8.2.2 Streamlines Edge Field

Generates streamlines based on the natural direction of an image as described by an “Edge Tangent Flow” vector field and an optional “Flow Field” vector field.



Settings

+ Inherits settings from:

- *Default Streamline Settings*
- *Default Flow Field Settings*

Edge Tangent Flow

Edge Power (Streamlines Edge Field)

Values: Number (Safe Range: 0.0 -> 100.0)

Controls the influence of the Edge Tangent Flow and instead favour the underlying Flow Field. A value of 100 will ignore the flow field, a value of 50 will be influenced equally by the “Edge Field” and the “Flow Field”

ETF Iterations

Values: Number (Safe Range: 0.0 -> 100.0)

Controls the number of refinement operations to perform on the Edge Tangent Flow. The refinement steps are required in order to allow the ETF to converge towards the best edge directions, many iterations will result in a very smooth Edge Field creating long sweeping streamlines which may lose small details, too few iterations may result in artifacts and shorter streamlines

ETF Radius

Values: Number (Safe Range: 3.0 -> 30.0)

Controls the size of the kernel to be used when refining the ETF and therefore the number of pixels to compare (ETF Radius of 9 -> $9 \times 9 = 81$ pixels), a lower radius will compute faster but may contain more artifacts caused by noise in the original image, a larger radius will take longer to process and may lose small details.

Post Blur Iterations

Values: Number (Safe Range: 0.0 -> 50.0)

Controls the number of post blur operations to perform on the Edge Tangent Flow after refinement. Adding post blur will remove detail from the Edge Field but create aesthetically pleasing results.

Quick Tip: Try out the “Fingerprints” preset which uses Post Blur iterations to create it’s effect.

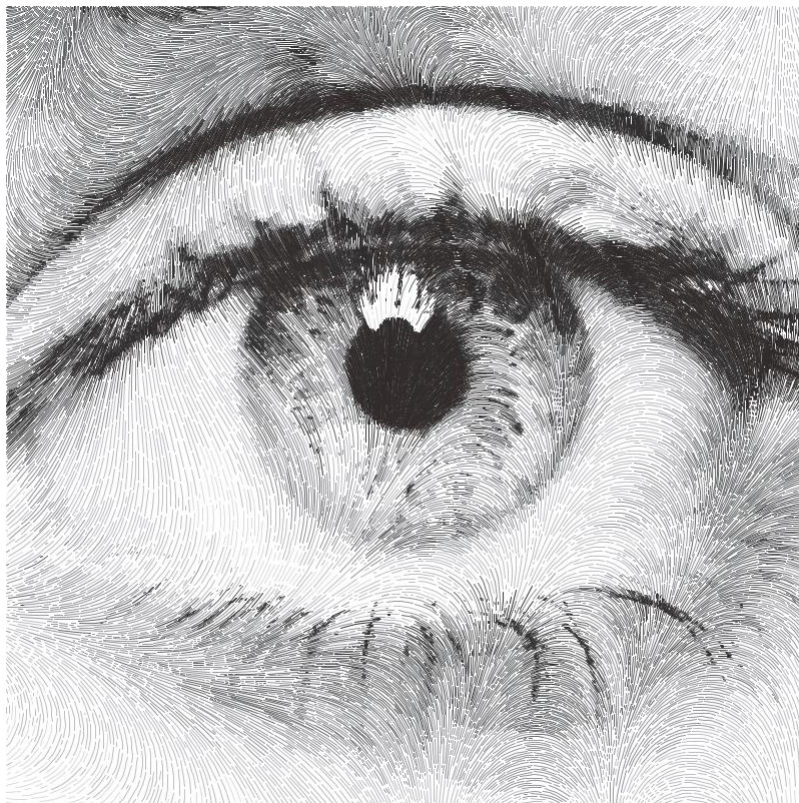
Post Blur Radius

Values: Number (Safe Range: 0.0 -> 50.0)

Controls the size of the kernel used in the post blur operation

8.2.3 Streamlines Flow Field

Generates streamlines based on a “Flow Field” vector field.



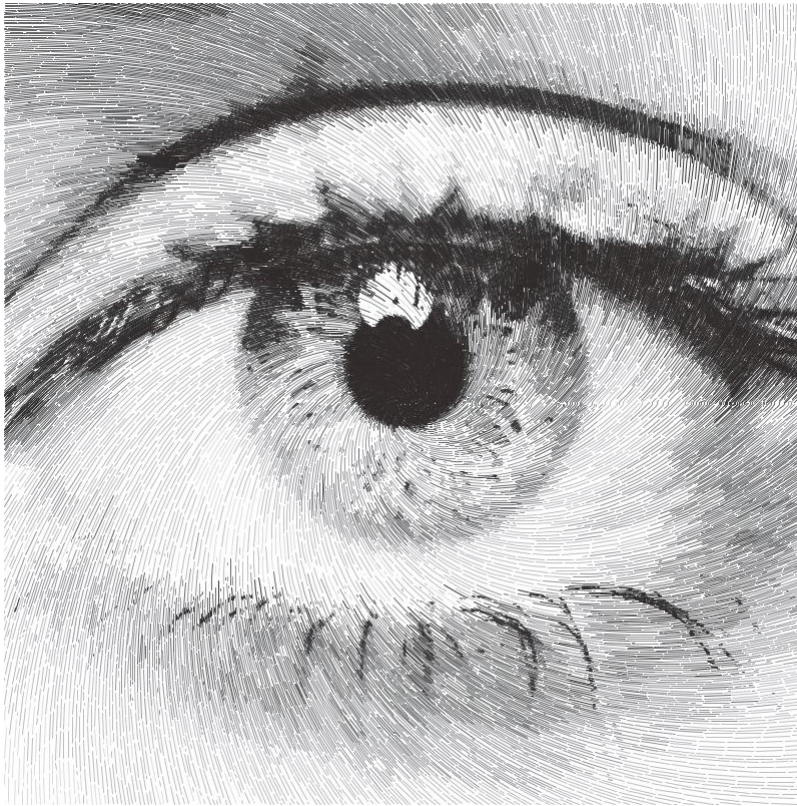
Settings

+ Inherits settings from:

- *Default Streamline Settings*
 - *Default Flow Field Settings*
-

8.2.4 Streamlines Superformula

Generates streamlines based on a [Superformula](#) vector field.



Settings

+ Inherits settings from:

- *Default Streamline Settings*
 - *Default Superformula Settings*
-

8.3 Spiral PFMS

Spiral PFMs are suitable for plots with a single pen, and can generate spirals which are continuous without any pen lifts.

With a small Ring Spacing they can also be very accurate and represent small details in the original image.

8.3.1 How they work

- 1) Moves to the first point on the spiral.
- 2) Samples the brightness at the current point and draws a line which is perpendicular to the spiral where the line's length is proportional to the sampled brightness.
- 3) Move to the next point on the spiral and Repeat step 2.

The process stops when the specified *Spiral Size* has been reached

Default Spiral Settings

Spiral

Spiral Type

Values: Archimedean | Parabolic

Changes the style of the generated Spiral

- **Archimedean:** a single spiral
- **Parabolic:** two connected spirals, this can be used for creating a spiral out of two different pens. Change your Distribution Type to “Preconfigured” after processing has finished.

Spiral Size

Values: Number (Safe Range: 0 -> 100)

Alters where the generated spiral will end. A spiral at 100% will always reach the corner of the image.

Quick Tip: You can adjust the Spiral Size after the drawing has been generated with the Shapes Slider.

Centre X/Y

Values: Number (Safe Range: 0 -> 100)

Controls the centre position the spiral starts from as percentages relative to the images width/height.

e.g. Left = 0, Middle = 50, Right = 100

Ring Spacing

Values: Number (Safe Range: 0 -> 50)

The distance between each generated ring, which also has the effect of increasing the width of the rings as the *Amplitude (Spiral PFMs)* is proportional to the Ring Spacing.

A lower Ring Spacing will resolve more detail from the original image.

Amplitude (Spiral PFMs)

Values: Number (Safe Range: 0.01 -> 2.0)

Controls the scaling of the lines/shapes generated along the spiral. It is proportional to the **Ring Spacing**

$finalWidth = ringSpacing * (amplitude)$

Variable Velocity

Values: Boolean (True | False)

When **True**, the velocity will vary between the Min & Max proportionally to the image's luminance.

When **False**, the Min Velocity will always be used.

Min/Max Velocity (Spiral PFMs)

Values: Number (Safe Range: 1.0 -> 360.0)

Controls the frequency of shapes along the spiral. Lower velocities will result in more shapes, higher will result in less.

The velocity variables should be used to adjust the overall contrast of the spiral (adding a contrast filter in Image Processing is a good place to start too).

- Higher velocity = less shapes generated, lower plotting time. High values will result in more inconsistent results as the spiral generation may skip of key areas of the image.
- Lower velocity = more shapes generated, higher plotting time. More accurate to the original image.

$$velocity = minVelocity + sineFunction(luminance) * (maxVelocity - minVelocity)$$

Ignore White (Spiral PFMs)

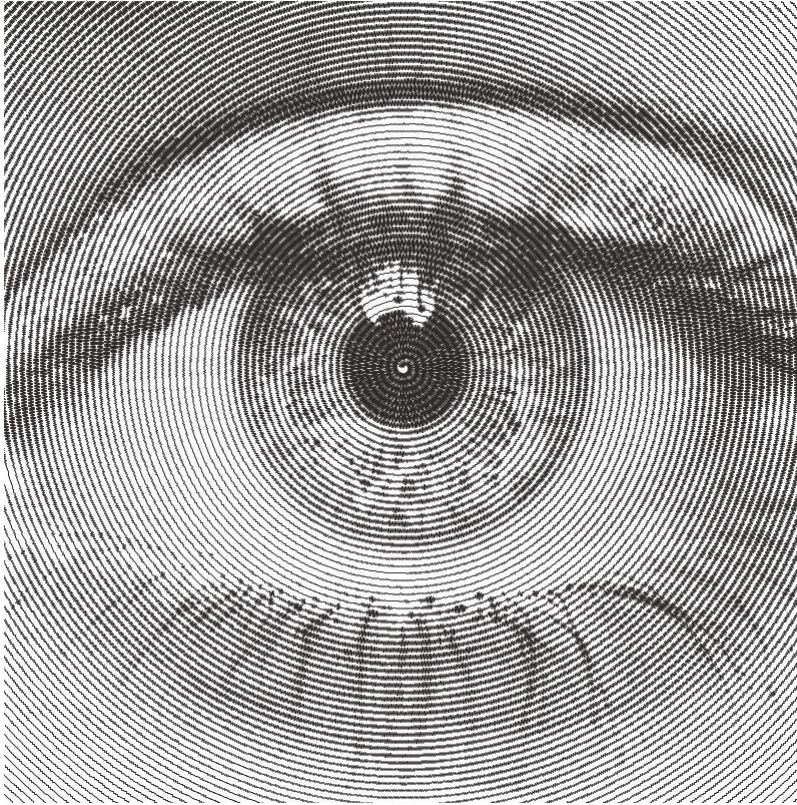
Values: Boolean (True | False)

When **True**, if the spiral reaches a white pixel in the source image the spiral will not be drawn.

When **False**, the spiral will draw over the entire image up to the Spiral Size.

8.3.2 Spiral Sawtooth

Transforms an image into a oscillating spiral.



Settings

Spiral

Connected Lines (Spiral Sawtooth)

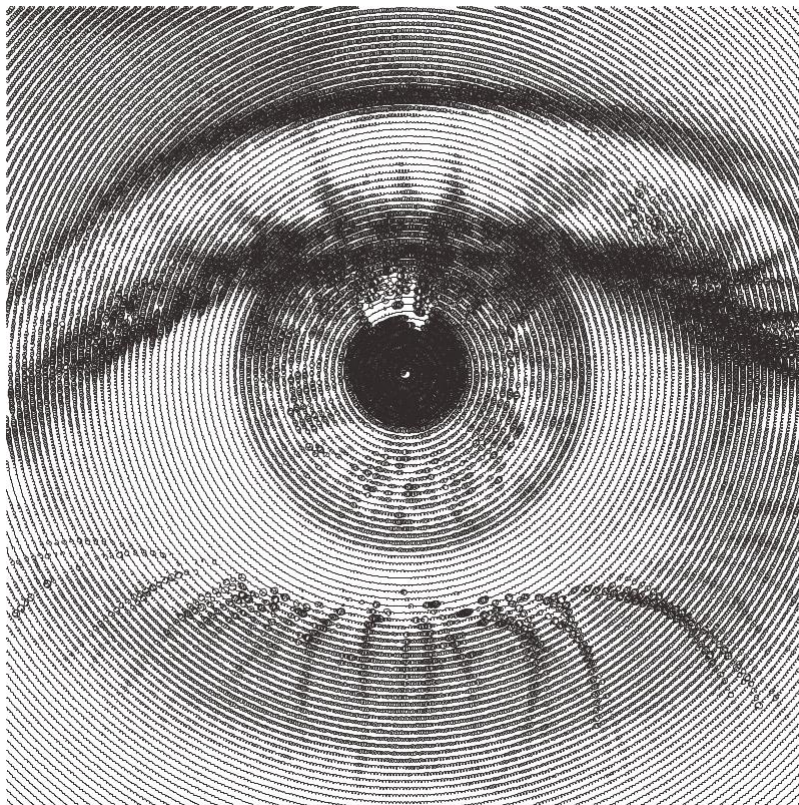
Values: Boolean (True | False)

When **True**, the generated lines will be connected and if the spiral finishes within the boundaries of the paper the final drawing will have no pen lifts.

When **False**, every generated line along the spiral will be disconnected.

8.3.3 Spiral Circular Scribbles

Transforms an image into a oscillating spiral.



Settings

+ Inherits settings from:

- *Default Spiral Settings*
- *Adaptive Circular Scribbles* (some settings are hidden)

8.4 Hatch PFMs

Hatch PFMs generate a set of lines across the image and then use different styles to turn these lines into waves/scribbles whose width matches the luminance at a given point.

They are suitable for plots with a Single Pen and similarly to Spiral PFMs can generate continuous hatched lines across the drawing which don't require any pen lifts.

8.4.1 Default Hatch Settings

Hatching

Line Spacing

Values: Number (Safe Range: 2.0 -> 50.0)

Controls the spacing of the generated lines.

Angle

Values: Number (Safe Range: 2.0 -> 50.0)

Controls the angle of the generated lines.

Crosshatch

Values: Boolean (True | False)

When **True**, an additional set of lines will be generated travelling perpendicular to the current angle, creating a crosshatched effect.

Link Ends

Values: Boolean (True | False)

When **True**, the ends of the generated lines will be linked, creating a plot which doesn't require any pen lifts.

8.4.2 Hatch Sawtooth

Uses an oscillating wave of varying velocity to create a set of lines



Settings

Sawtooth

Amplitude (Hatch Sawtooth)

Values: Number (Safe Range: 0.01 -> 2.0)

Controls the scaling of the shapes generated along the lines. It is proportional to the **Line Spacing**.

$$finalWidth = lineSpacing * (amplitude)$$

Min/Max Velocity (Hatch Sawtooth)

Values: Number (Safe Range: 1.0 -> 360.0)

Controls the frequency of shapes along the generated lines. Lower velocities will result in more shapes, higher will result in less.

Similar to Min/Max Velocity in Spiral PFMs

$$velocity = minVelocity + sineFunction(luminance) * (maxVelocity - minVelocity)$$

Curve Tension (Hatch Sawtooth)

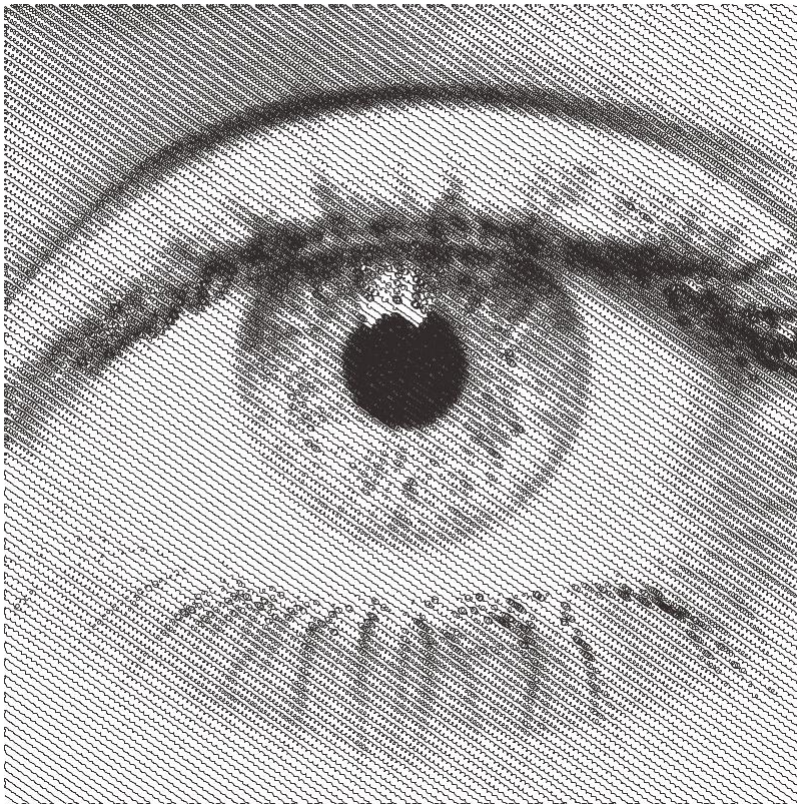
Values: Number (Safe Range: 0.0 -> 1.0)

See *Sketch Curves*

+ Inherits settings from:

- *Default Hatch Settings*

8.4.3 Hatch Circular Scribbles



Settings

+ Inherits settings from:

- *Default Hatch Settings*
- *Adaptive Circular Scribbles*

8.5 Adaptive PFMS

‘Adaptive’ are named after the way they adapt to match the tone of the input image.

The reproduction of tones is considerably more accurate than other PFMs as they have an additional “Tone Mapping” processing stage. This process only needs to be performed once per configuration of settings. If you change a setting which could alter the tone map it will be generated again.

You can view the output of the tone mapping stage by selecting “Display:” and then “Tone Map”. This shows you three outputs; the Reference Tone Map, the drawing created by the PFM with the current settings and the blurred version of this output.

Adaptive PFMs are suitable for Single Pen Plots or Multi Colour Plots

For the best results with Adaptive PFMs use high resolution, high contrast images

8.5.1 How do they work?

- 1) Generate a Tone Map using steps 2 to 3, analyse the result then create a new input image which will result in drawing with a more accurate representation of the original tones.
- 2) Create evenly distributed points across the image based on brightness.
- 3) Generate the specific style based on these points.

8.5.2 Default Adaptive PFM Settings

Adaptive Sampling

Min/Max Sample Radius (Adaptive PFMs)

Values: Number (Safe Range: 0.1 -> 100.0)

Controls the distribution of the generated points, controlling the contrast and detail present in the final image.

In general keeping Min Sample Radius < 2 and changing the Max Sample Radius will provide the best results with more Adaptive PFMs.

Unlike LBG & Voronoi, Adaptive PFMs follow the sample sizes strictly and place points evenly across the entire image and produce a consistent looking drawing.

Brightness (Adaptive PFMs)

Values: Number (Safe Range: 0.0 -> 2.0)

Controls the brightness applied as a pre-processing step to the source image, see *Contrast (Adaptive PFMs)*.

Contrast (Adaptive PFMs)

Values: Number (Safe Range: 0.0 -> 2.0)

Controls the contrast applied as a pre-processing step to the source image.

The quality of Drawings from Adaptive PFMs rely massively on contrast and brightness so these controls are included for simplicity, though they behave the same as adding a contrast filter in the Pre-Processing tab.

Ignore White (Adaptive PFMs)

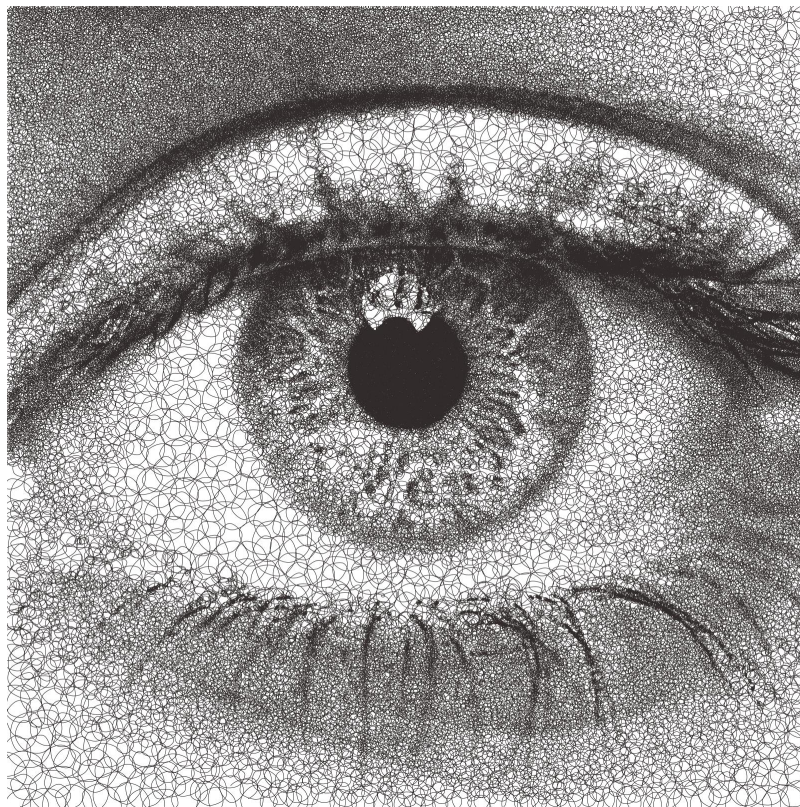
Values: Boolean (True | False)

When **True**, points will not be placed in the white areas of the image.

8.5.3 Adaptive Circular Scribbles

Transforms an image into a single continuous circular scribble.

This is an implementation of Chiu Et Al 2015, “Tone- and Feature-Aware Circular Scribble Art”. If you wish to achieve results similar to Chiu Et Al’s implementation use a size of paper, pen width which gives you a plotting size of 4000px on the largest edge then use the “Chiu Et Al – 4000px” preset





Settings

Circular Scribbles

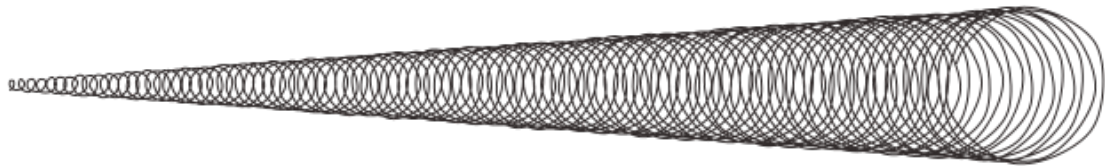
These settings are shared by Spiral Circular Scribbles, Adaptive Circular Scribbles and LBG Circular Scribbles

Min/Max Radius (Circular Scribbles)

Values: Number (Safe Range: 0.1 -> 128)

Controls the radius of the generated Circular Loops which make up the scribble. The radius will vary across the drawing based on the image's *luminance*.

$$radius = minRadius + (luminance * (maxRadius - minRadius))$$



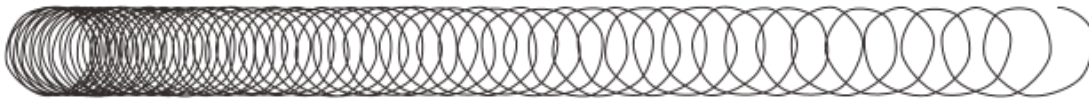
e.g - Circular Scribble varying from Min Radius to Max Radius

Min/Max Velocity (Circular Scribbles)

Values: Number (Safe Range: 0.1 -> 128)

Controls the min/max velocity of the generated Circular Scribbles, in other words this controls the frequency of circular loops in the final scribble. The radius will vary across the drawing based on the image's *luminance*.

$$velocity = minVelocity + (luminance * (maxVelocity - minVelocity))$$



e.g - Circular Scribble varying from Min Velocity to Max Velocity

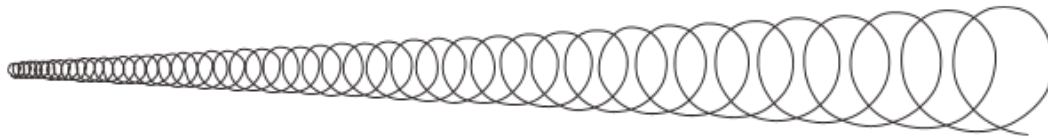
Angular Velocity

Values: Number (Safe Range: 0.1 -> 180)

Controls the speed of rotation of the scribbles. Low angular velocity will result in fewer loops, higher velocity will result in more loops. Generally the angular velocity should be at least double the maximum velocity if you wish the scribbles to always create loops. The default is generally good, but it can be useful to adjust it slightly for some images.



e.g. Angular Velocity = 10



e.g. Angular Velocity = 40

Azimuth Angle Min/Max

Values: Number (Range: -180 -> 180)

Controls the pitch of the circular scribbles, resulting in a slanting effect. Note: If you wish to introduce a regular slant keep the min/max the same.

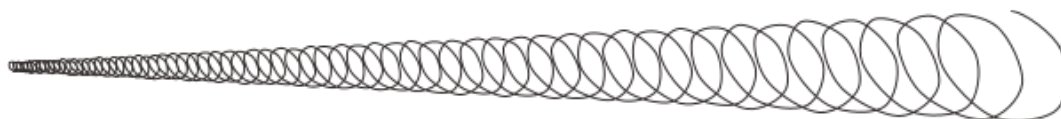


e.g. Azimuth Angle Min = 45 & Azimuth Angle Max = 45

Polar Angle Min/Max

Values: Number (Range: -180 -> 180)

Controls the yaw of the circular scribbles, resulting in closing/widening the circular loops Note: Similarly to Polar Angle, keeping the values the same will result in a consistent style.

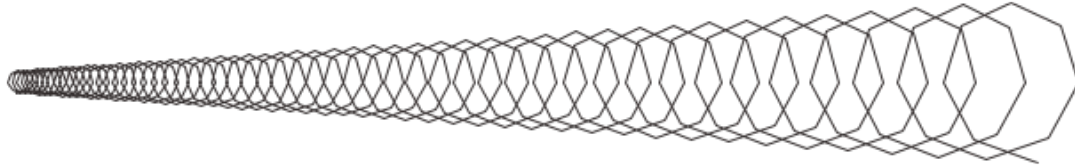


e.g. Polar Angle Min = 45 & Polar Angle Max = 45

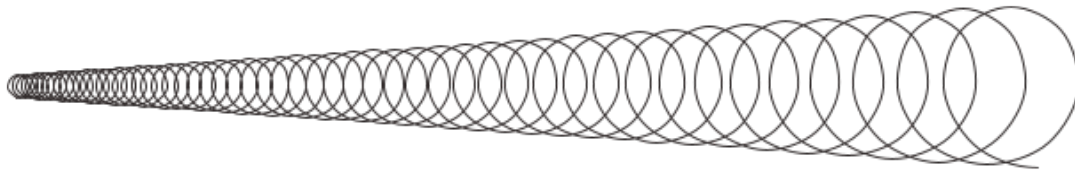
Curvature (Circular Scribbles)

Values: Number (Range: 0 -> 1)

Controls the interpolation between scribble points, 0 = Straight Lines -> 1 = Smooth Curves



e.g. Curvature = 0



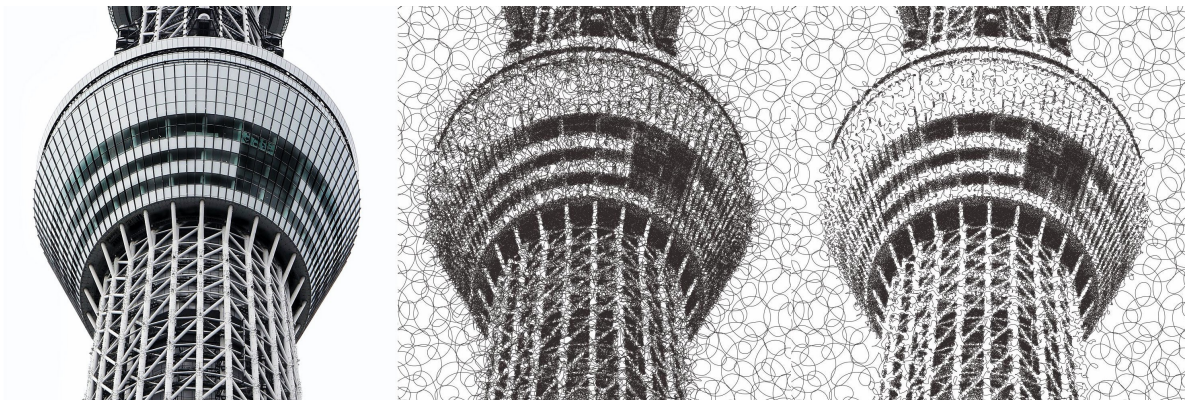
e.g. Curvature = 1

Edge Retention

Values: Boolean (True | False)

When **True**, the radius of Circular Scribbles will be adapted to prevent them from overlapping the detected edges in the image, resulting in more detail being retained in the final drawing.

Set the Edge Threshold A & B, to alter the number of edges detected.



Comparison: Fig 1. Original Image, Fig 2. Default Settings, Fig 3. Default Settings w/ Edge Retention=True

Edge Threshold A & B

Values: Number (Range: 1F -> 255F)

These thresholds are used by the internal Canny Edge Detector to filter out the target edges. Raising the threshold will reduce the effect of the edge retention.

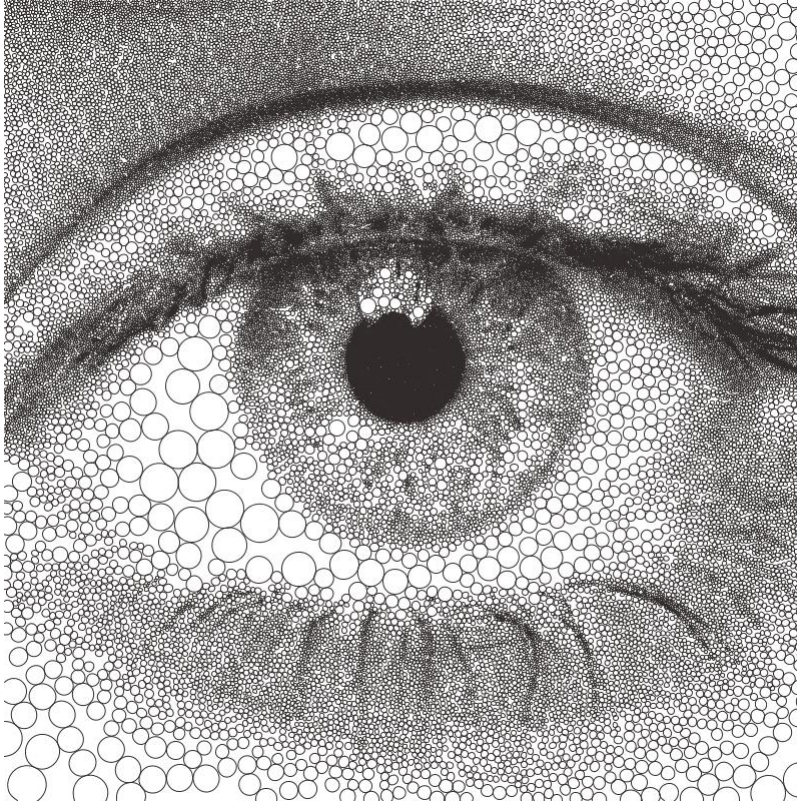
From the [OpenCV documentation](#)

- If a pixel gradient is higher than the upper threshold, the pixel is accepted as an edge
- If a pixel gradient value is below the lower threshold, then it is rejected.
- If the pixel gradient is between the two thresholds, then it will be accepted only if it is connected to a pixel that is above the upper threshold.

Canny recommended an upper:lower ratio between 2:1 and 3:1.

8.5.4 Adaptive Shapes

Transforms an image into a series of packed shapes



Settings

Shapes

Shape Type (Adaptive Shapes)

Values: Circle | Square | Star | Triangle | Cross | Multiply | LP Space | Random

Controls the shape type generated at each sample point, most are self-explanatory with the exception of LP Space which uses

- **Circle:** generates circles
- **Square:** generates squares
- **Star:** generates 5 pointed stars
- **Triangle:** generates triangles
- **Cross:** generates a thick cross
- **Multiply:** generates the outline of a multiply symbol

- **LP Space:** roughly imitates the LP Space/p-norm function to create shapes which vary from *Diamond* -> *Circle* -> *Rounded Square*. This shape type can better represent the tonality of the original image by adjusting its shape to match. It also produces more variety in the final drawing.
- **Random:** chooses randomly from the other shape types each time a shape is generated, the resulting shapes can be altered by changing the *Random Seed*

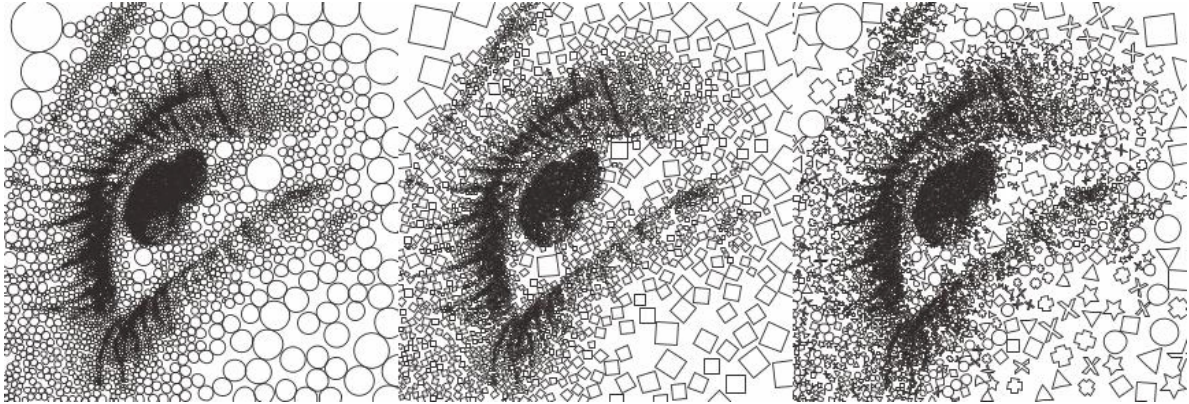


Fig 1. Circle (Default), Fig 2. Square, Fig 3. Random

Align Rotation (Adaptive Shapes)

Values: Boolean (True | False)

When **True**, the rotation of the shapes will follow the natural direction of the image, the Min/Max Rotation will be ignored.

When **False**, the rotation of the shapes will be a random angle between the Min/Max Rotation.

Min/Max Rotation (Adaptive Shapes)

Values: Number (Safe Range: 0 -> 360)

Controls the min/max rotation of the generated shapes.

Used when *Align Rotation* is set to **False**.

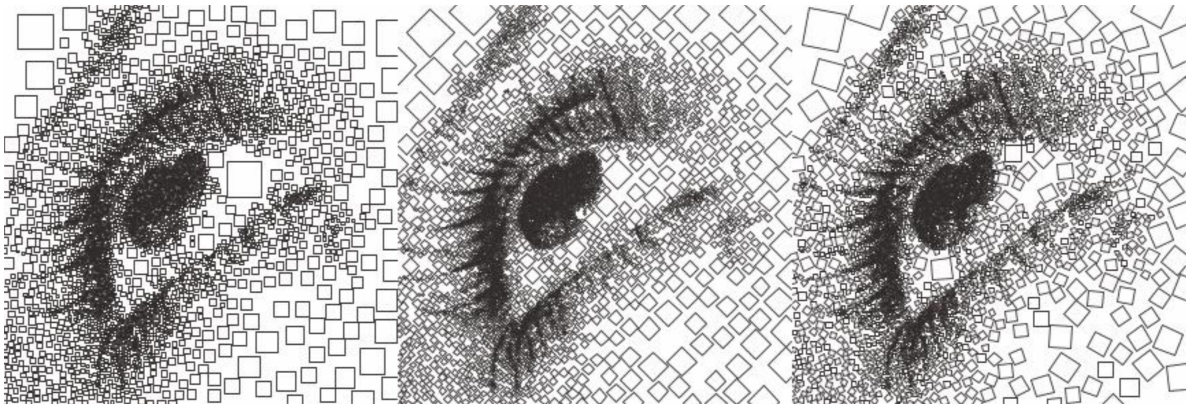


Fig 1. Min & Max Rotation = 0, Fig 2. Min & Max Rotation = 45, Fig 3. Align Rotation = True (Default)

Fill Size (Adaptive Shapes)

Controls the scaling of the shape within the shape available (as defined by the Sampling used e.g. Adaptive, LBG or Voronoi).

$$finalRadius = sampleRadius * (fillSize/100)$$

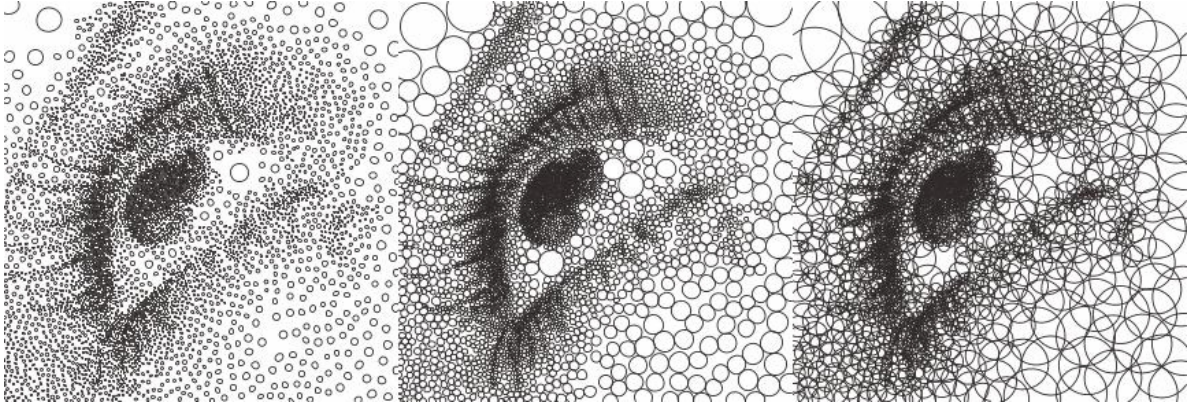


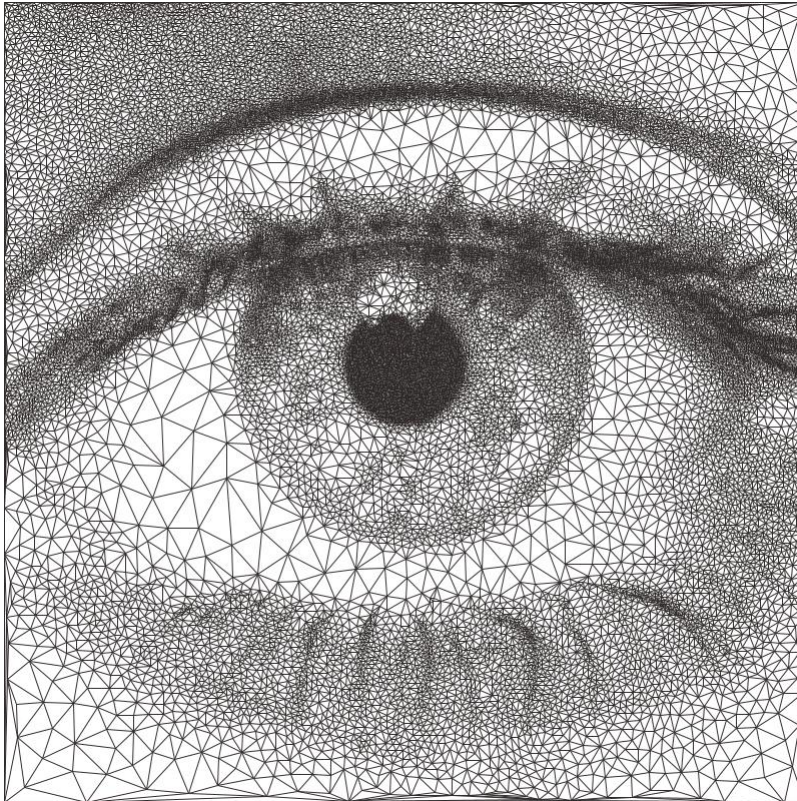
Fig 1. Fill Size = 50, Fig 2. Fill Size = 100 (Default), Fig 3. Fill Size = 200

+ Inherits settings from:

- *Default Adaptive PFM Settings*

8.5.5 Adaptive Triangulation

Transforms an image into a series of connected triangles joining all the points generated using [Delaunay Triangulation](#)



Settings

These settings are also shared with *Adaptive Triangulation*, *LBG Triangulation* and *Mosaic Triangulation*

Transforms an image into a series of connected triangles joining all the sample points generated using *Delaunay Triangulation*.

Triangulation

Triangulate Corners

Values: Boolean (True | False)

When **True**, additional sample points will be added at the corners of the drawing, creating a frame out of triangles around the border of the drawing.

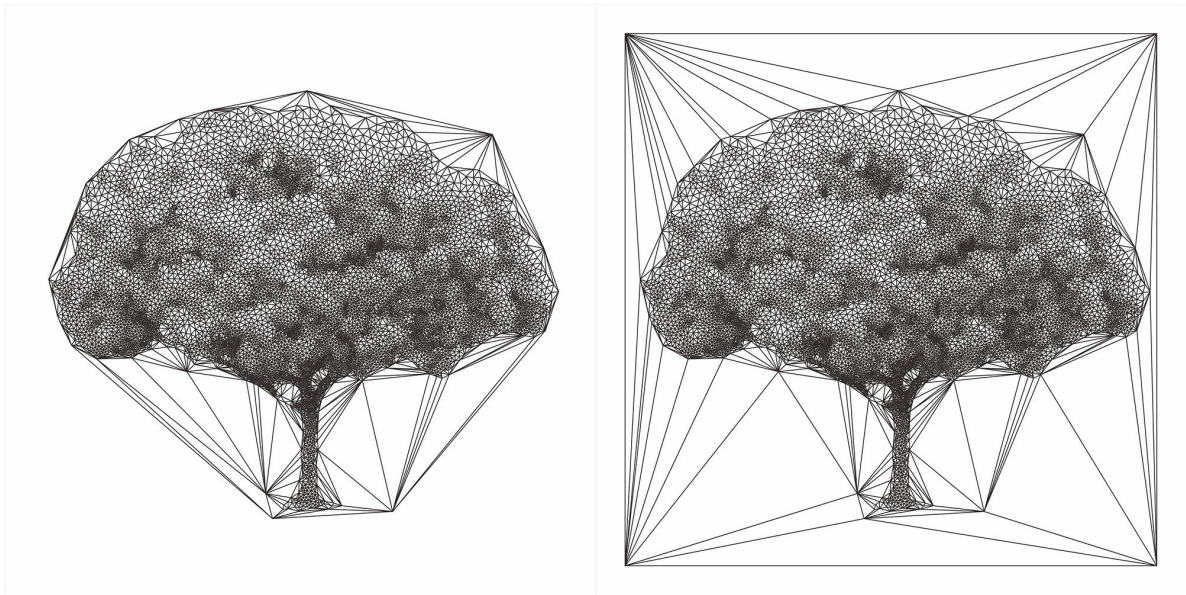


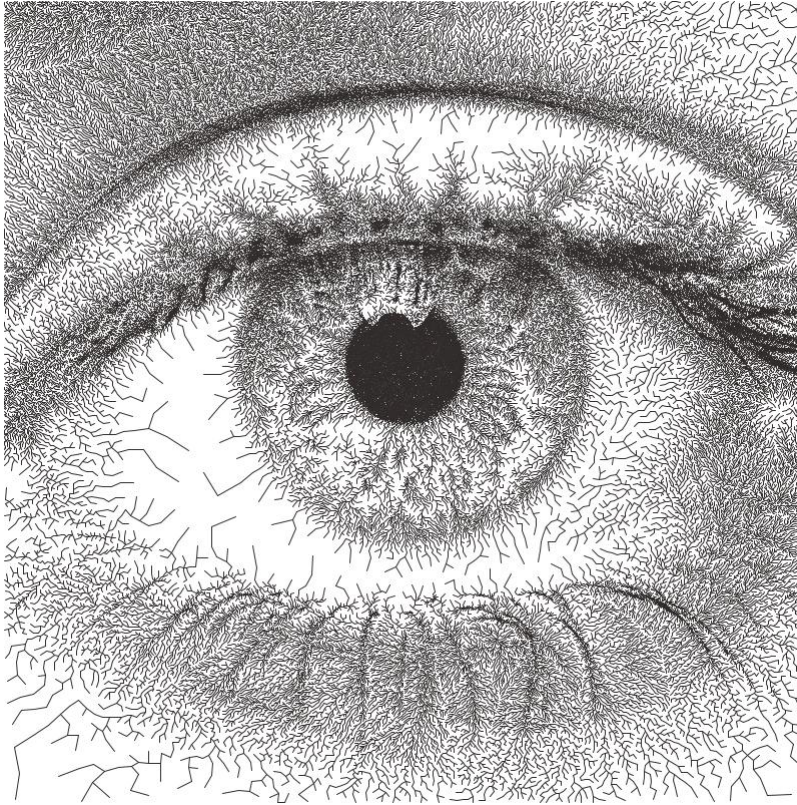
Fig 1. *Triangulate Corners = False (Default)*, Fig 2. *Triangulate Corners = True*

+ Inherits settings from:

- *Default Adaptive PFM Settings*

8.5.6 Adaptive Tree

Transforms an image into a Minimum Spanning Tree, which connects all the points by creating links between each point and its nearest neighbour.



Settings

Tree

Create Curves

Values: Boolean (True | False)

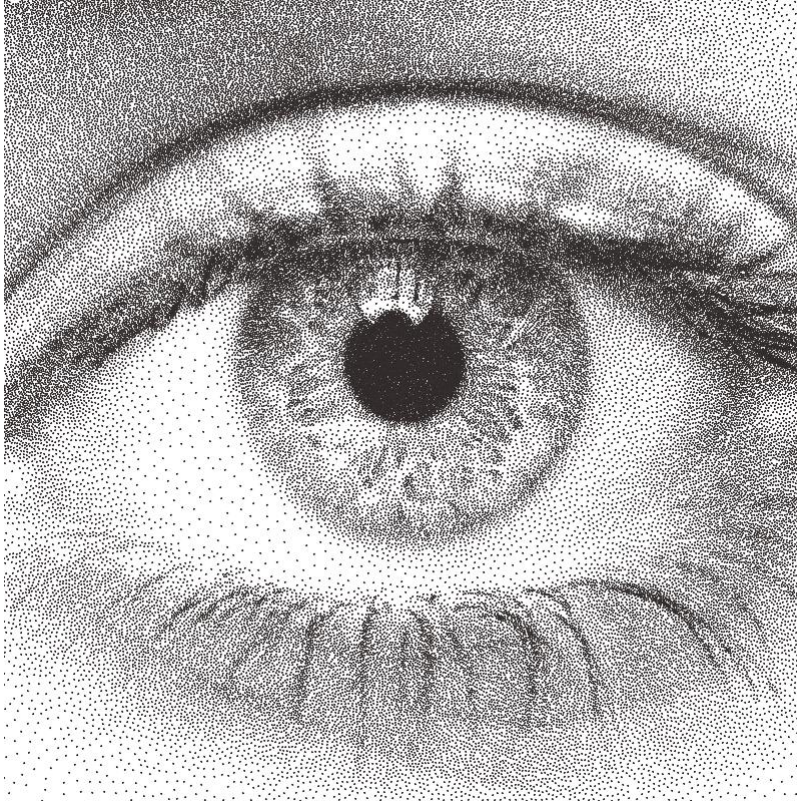
When **True**, the lines generated by the PFM will be converted to curves in a final finishing step.

+ Inherits settings from:

- *Default Adaptive PFM Settings*

8.5.7 Adaptive Stippling

Transforms an image into a series of dots placed at each point generated.



Settings

Stippling

Stipple Size

Values: Number (Safe Range: 1.0 -> 100.0)

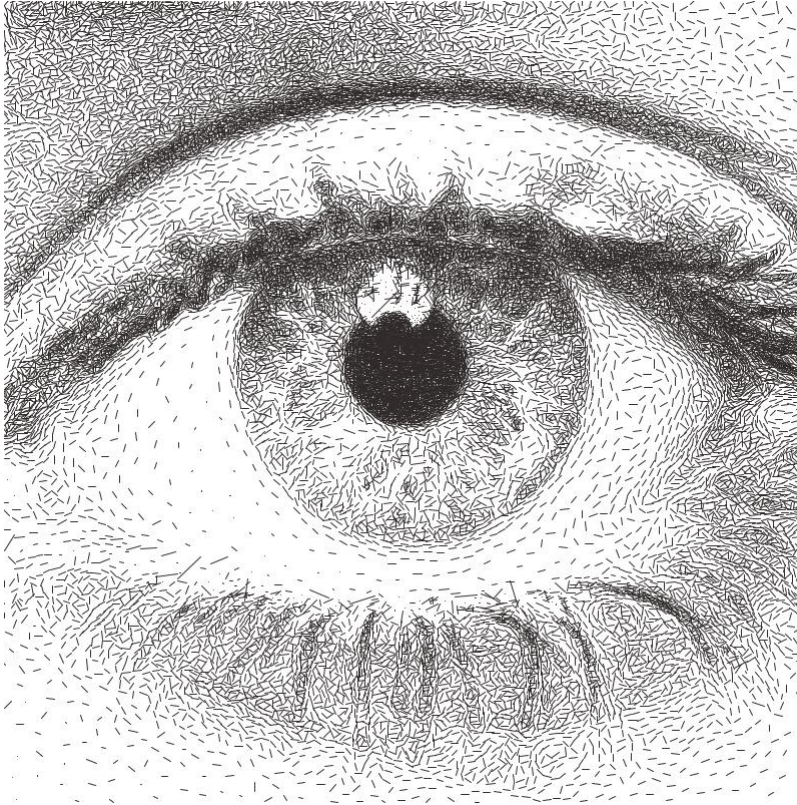
Controls the size of generated stipples.

+ Inherits settings from:

- *Default Adaptive PFM Settings*

8.5.8 Adaptive Dashes

Transforms an image into a series of dashes placed at each point generated.



Settings

Dashes

Distortion (Adaptive Dashes)

Values: Number (Safe Range: 0.0 -> 100.0)

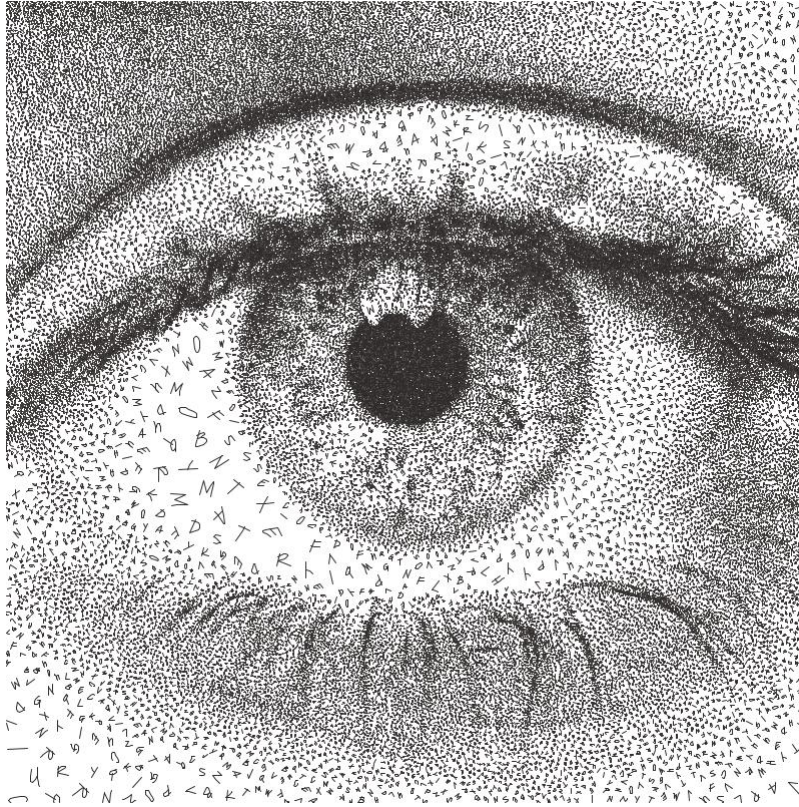
Controls the random distortion applied to the generated dashes, giving them a more human-like quality.

+ Inherits settings from:

- *Default Adaptive PFM Settings*
- *Adaptive Shapes*

8.5.9 Adaptive Letters

Transforms an image into a series of letters placed at each point generated.



Settings

Letters

Order (Letters)

Values: Tone Mapped | Random | Sequenced

Controls how characters are selected for each sample point.

Letters will only be considered if they pass the *Character Filter* and *RegEx Filter*

- **Tone Mapped**

Before processing, the font's characters will be ordered from Darkest -> Brightest. Then when selecting letters, the closest match to the image's luminance at the sample point will be selected.

- **Random**

A random character will be selected at each position from the chosen *SVG Font*

- **Ordered**

Will follow the order of the allowed characters. If a Character Filter has been added then that order will be followed, allowing you to write sentences.

Character Filter

Values: Text

Combines with the *RegEx Filter* to define which characters are allowed in the final drawing. Characters must pass both filters.

If you leave this empty, any character available in the chosen font is allowed which passes the *RegEx Filter*.

If you type any text in the filter, only those included characters will be used in the final drawing.

RegEx Filter

Values: Regular Expression

Combines with the *Character Filter* to define which characters are allowed in the final drawing, characters must pass both filters.

Examples:

- [A-Z] - Matches every character from A to Z.
- [^A-Z] - Match every character not in the range A to Z.
- \d - Matches any digit
- \D - Matches any non-digit
- \w - Matches any word character
- \W - Matches any non-word character

Learn more about [Regular Expressions](#).

Font**Use SVG Fonts**

Values: Boolean (True | False)

When **True**, only SVG fonts will be available to use,

When **False**, you can choose from fonts available on your computer.

SVG Font

Values: SVG Font

The included SVG fonts are Single Line Fonts which are well optimised for pen plotting.

(Thanks to Oskay from [Evil Mad Scientist](#) for allowing me to include them)

Adding your own SVG Fonts

- Go to **Help / Open Configs Folder**.
- Copy your fonts into the `fonts` folder.
- Restart DrawingBotV3, and your fonts should appear in the list.

Font

Values: Regular Font

If *Use SVG Fonts* is **False** you can choose from the fonts on your computer. Many won't be well-suited for pen plotting!

Style

Values: Plain | Bold | Italic

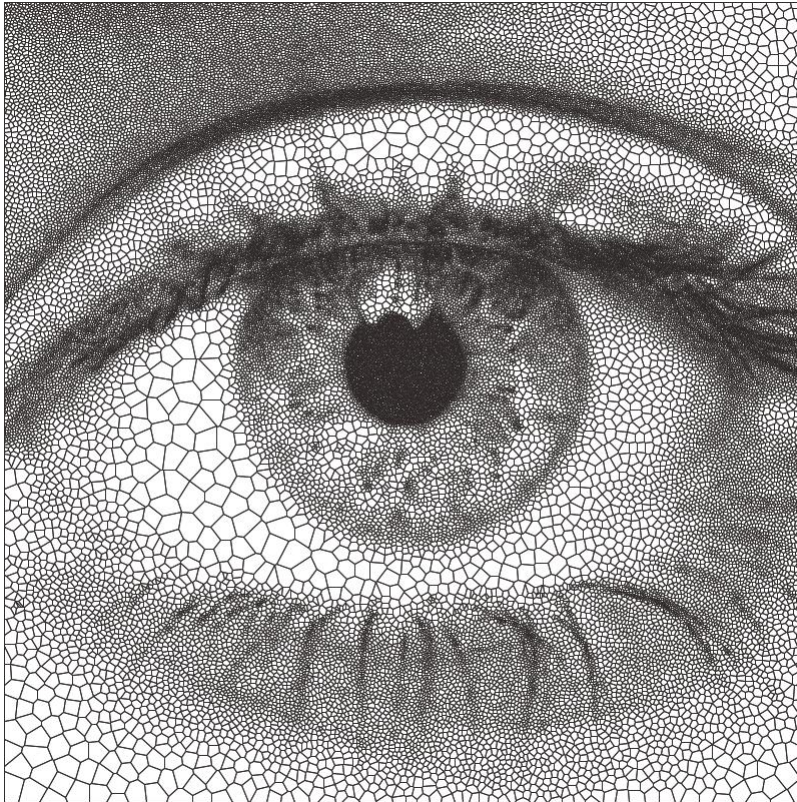
Allows you to choose the style of the letters when using your computer's own fonts.

+ Inherits settings from:

- *Default Adaptive PFM Settings*
- *Adaptive Shapes*

8.5.10 Adaptive Diagram

Transforms an image into a Voronoi Diagram which is generated from all of the evenly distributed points.



Settings

Voronoi Style

Voronoi Style

Values: Classic | Smooth | Sharp | Offset A | Offset B | Offset C

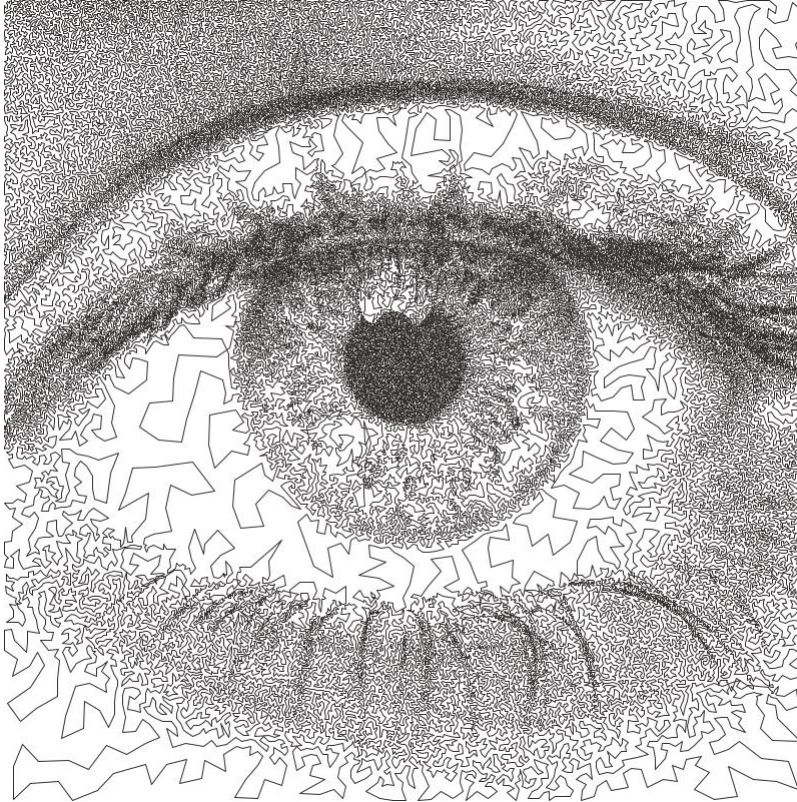
- **Classic** - The default and original Voronoi Diagram
- **Smooth** - A smoother version of the original, creating rounded cells which can be more visually pleasing.
- **Sharp** - A more jagged / stylised version
- **Offset A, B, C** - Less detailed / stylised version using the different offsets of adjacent triangles

+ Inherits settings from:

- *Default Adaptive PFM Settings*

8.5.11 Adaptive TSP

Transforms an image into a single continuous line, or alternatively multiple individual continuous line segments.



Settings

TSP

Merge TSP Paths

Values: Boolean (True | False)

When **True**, the PFM will create one continuous line without any pen lifts.

When **False**, the individual TSP segments will not be joined and will each be drawn as separate shapes.

+ Inherits settings from:

- *Default Adaptive PFM Settings*

8.6 LBG PFMs

LBS (Linde Buzo Gray) PFMs combine the speed of Adaptive PFMs with the Quality of Voronoi PFMs and in most cases will outperform both in detail retention. They also respond better to large variations in stipple spacing.

8.6.1 Default LBG Settings

LBG Sampling

Stipple Radius Min/Max

Values: Number (Safe Range: 1.0 -> 100.0)

The spacing between each sample point generated.

Density

Values: Number (Safe Range: 0.0 -> 100.0)

The mapping between Min/Max radius, giving control over the contrast of the image.

Threshold

Values: Number (Safe Range: 0.0 -> 100.0)

The image luminance threshold for when points should stop being generated.

Max Iterations

Values: Number (Safe Range: 1 -> 100)

Number of improvements to make to the LBG positions before stopping.

Higher iterations will result in more accurate results. If no more improvements can be made the process will stop early

Cache Result

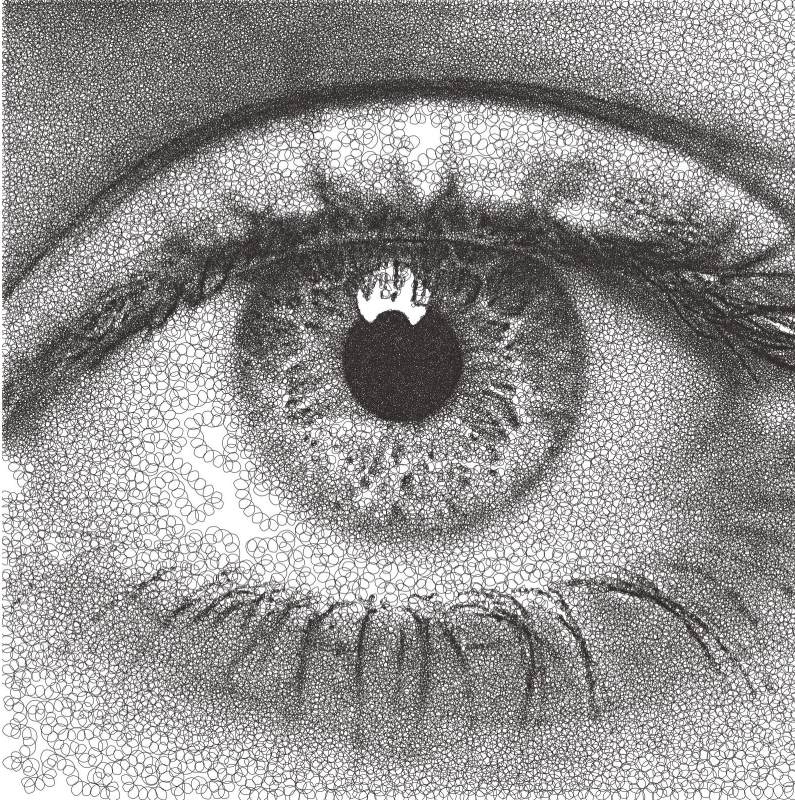
Values: Boolean (True | False)

When enabled, if all of the settings above have remained the same the result of the LBG Sampling will not be regenerated on the next run, which saves processing time and is very useful for PFMs like LBG Circular Scribbles.

8.6.2 LBG Circular Scribbles

Transforms an image into a single continuous circular scribble.

This is an implementation of Chiu Et Al 2015, “Tone- and Feature-Aware Circular Scribble Art”. If you wish to achieve results similar to Chiu Et Al’s implementation use a size of paper, pen width which gives you a plotting size of 4000px on the largest edge then use the “Chiu Et Al – 4000px” preset



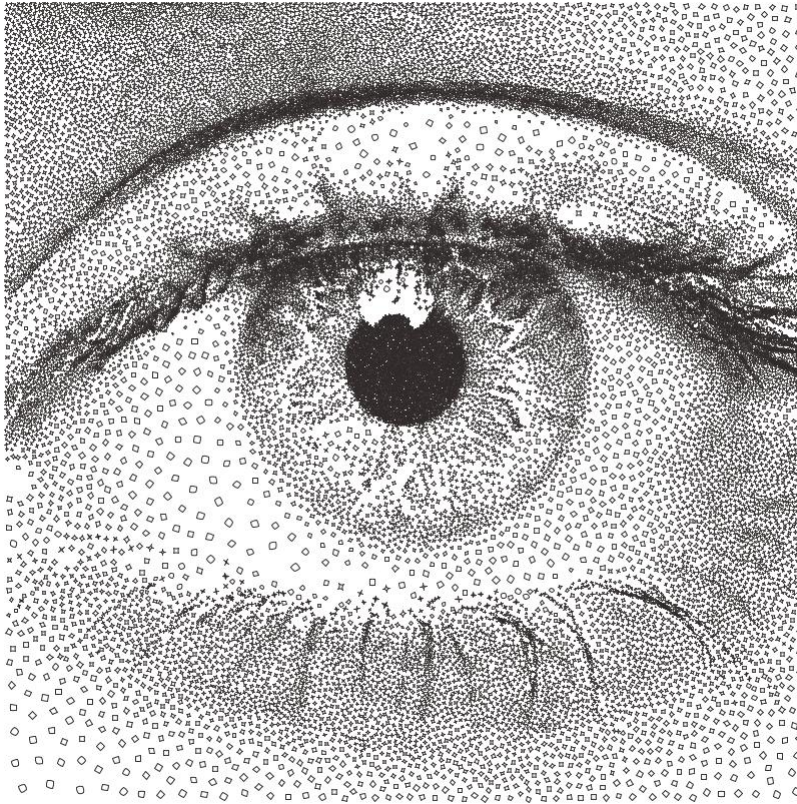
Settings

+ Inherits settings from:

- *Default LBG Settings*
- *Adaptive Circular Scribbles*

8.6.3 LBG Shapes

Transforms an image into a series of packed shapes



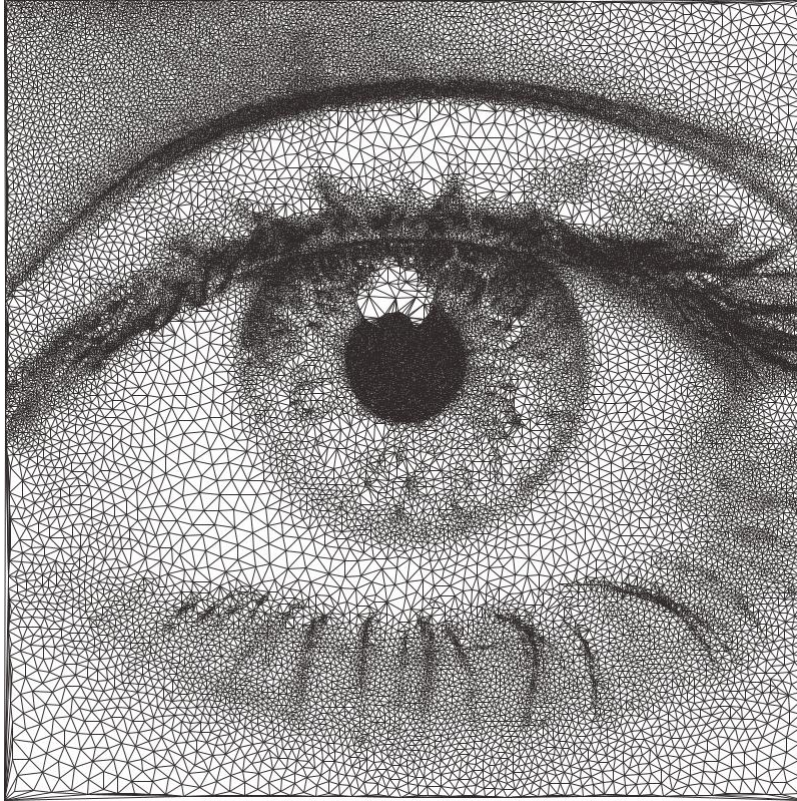
Settings

+ Inherits settings from:

- *Default LBG Settings*
- *Adaptive Shapes*

8.6.4 LBG Triangulation

Transforms an image into a series of connected triangles joining all the points generated using [Delaunay Triangulation](#)



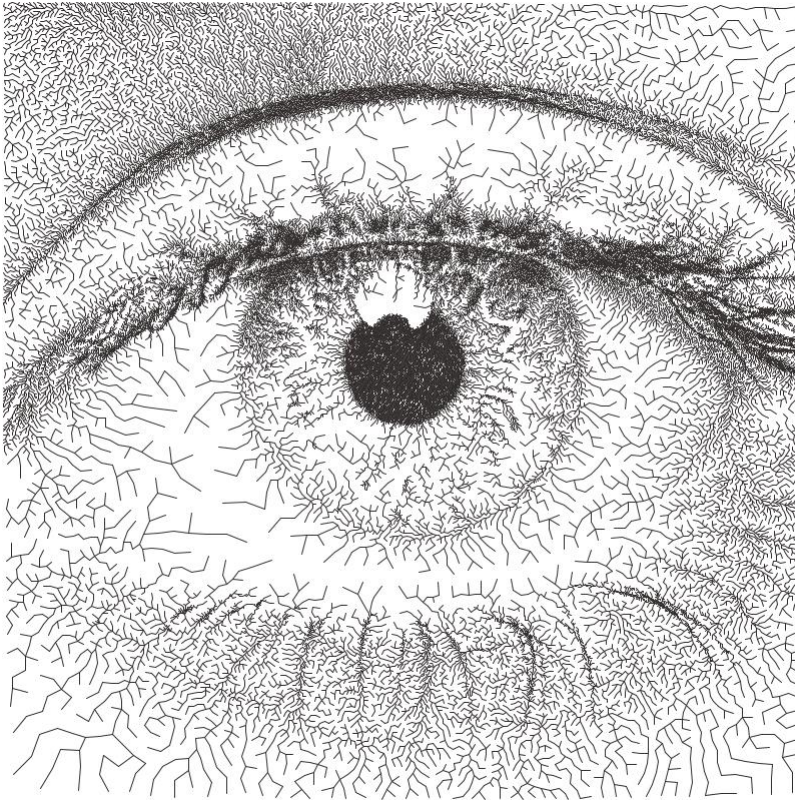
Settings

+ Inherits settings from:

- *Default LBG Settings*
- *Adaptive Triangulation*

8.6.5 LBG Tree

Transforms an image into a Minimum Spanning Tree, which connects all the points generated into a minimum length tree.



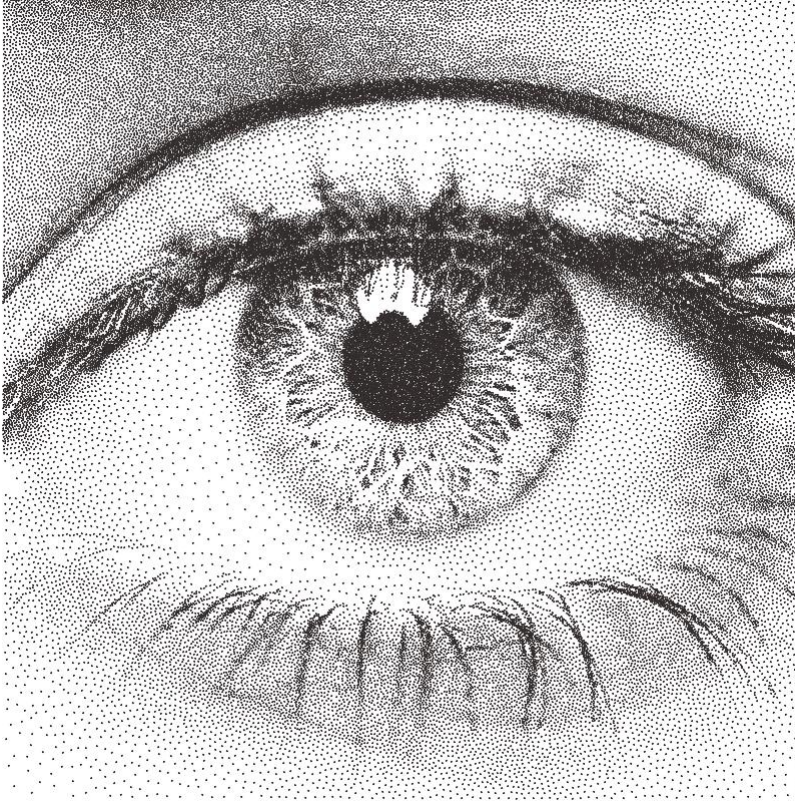
Settings

+ Inherits settings from:

- *Default LBG Settings*
- *Adaptive Tree*

8.6.6 LBG Stippling

Transforms an image into a series of dots placed at each point generated.



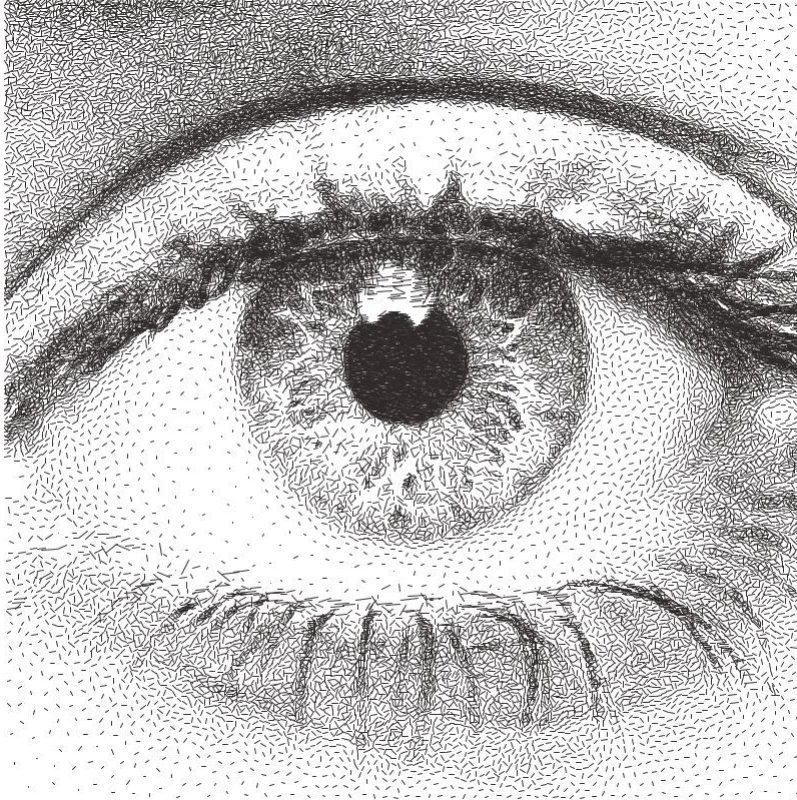
Settings

+ Inherits settings from:

- *Default LBG Settings*
- *Adaptive Stippling*

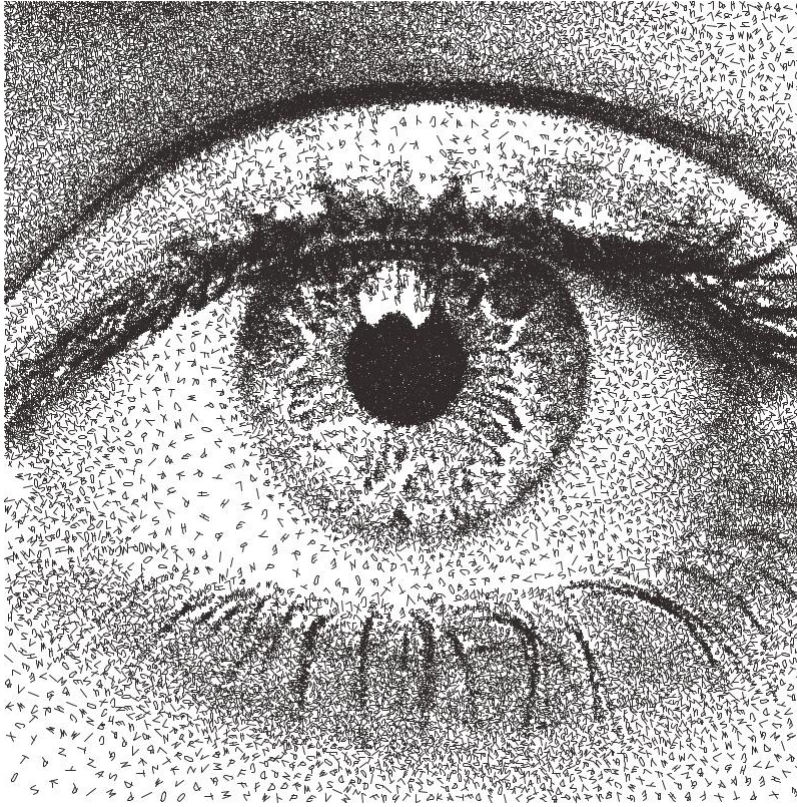
8.6.7 LBG Dashes

Transforms an image into a series of dashes placed at each point generated.



8.6.8 LBG Letters

Transforms an image into a series of letters placed at each point generated.



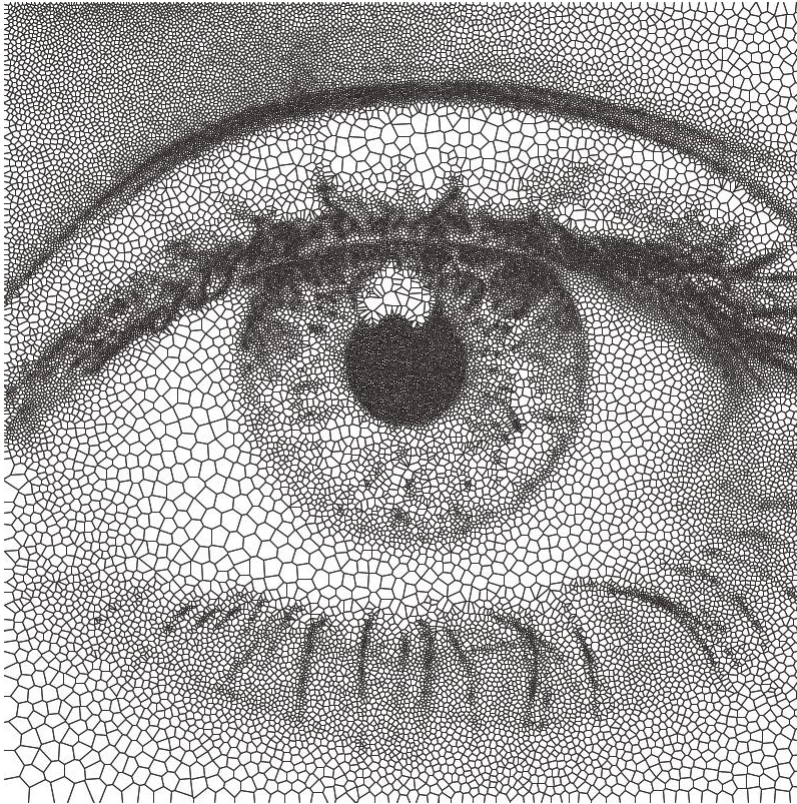
Settings

+ Inherits settings from:

- *Default LBG Settings*
- *Adaptive Letters*

8.6.9 LBG Diagram

Transforms an image into a Voronoi Diagram which is generated from all of the evenly distributed points.



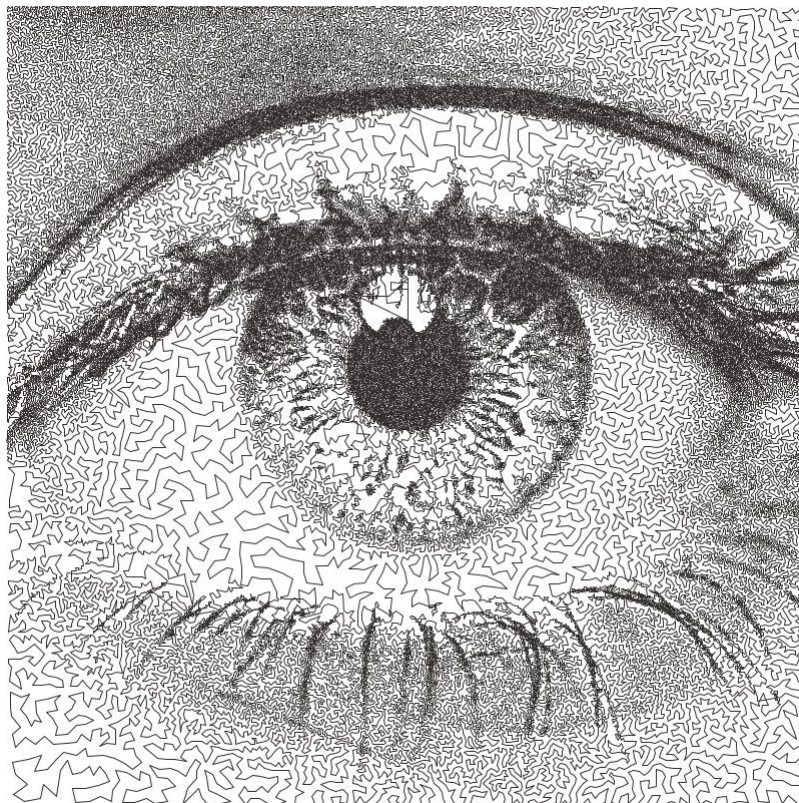
Settings

+ Inherits settings from:

- *Default LBG Settings*
- *Adaptive Diagram*

8.6.10 LBG TSP

Transforms an image into a single continuous line, or alternatively multiple individual continuous line segments.



Settings

+ Inherits settings from:

- *Default LBG Settings*
- *Adaptive TSP*

8.7 Voronoi PFMs

All Voronoi PFMs utilise a [Weighted Voronoi Diagram](#) to determine the distribution of brightness in the original image and then use this diagram to generate new styles.

8.7.1 How do they work?

- 1) Randomly scatter points over the image proportional to the images brightness
- 2) Calculates a voronoi diagram based on these points.
- 3) Calculates the weighted centroids of each cell in the diagram using brightness data.
- 4) Use the generated centroids to re-calculate the voronoi diagram.
- 5) Return to step 3

The process finishes when the specified number of **voronoi iterations** have been performed.

8.7.2 Default Voronoi Settings

Voronoi Sampling

Point Density

Values: Number (Safe Range: 1 -> 1200)

Controls the overall density of the drawing.

The number of generated points will be proportional to the images size. i.e. a A4 and A3 drawing with the same density would have a similar amount of points

Point Limit

Values: Number (Safe Range: 0 -> 1000000)

Controls a hard limit for the amount of points to be generated. Only has an effect if the the number is lower than the amount that would be generated by the given Point Density The limit will be ignored when set to 0.

Luminance Power (Voronoi PFMs)

Values: Number (Safe Range: 1 -> 50)

Used when randomly scattering points over the image, it affects how biased the scattering is towards darker areas of the image, typically using the same value for Density Power yields the best results.

Density Power

Values: Number (Safe Range: 1 -> 50)

Used when calculating the centroids of the voronoi diagram, it affects the calculation's bias towards darker areas of the image, typically using the same value for Luminance Power yields the best results.

Voronoi Iterations

Values: Number (Safe Range: 1 -> 100)

How many times to re-calculate the voronoi diagram. More iterations will result in a more accurate representation of the original image.

Voronoi Accuracy

Values: Number (Safe Range: 1 -> 100)

Controls the quality of the voronoi calculation, decreases processing times.

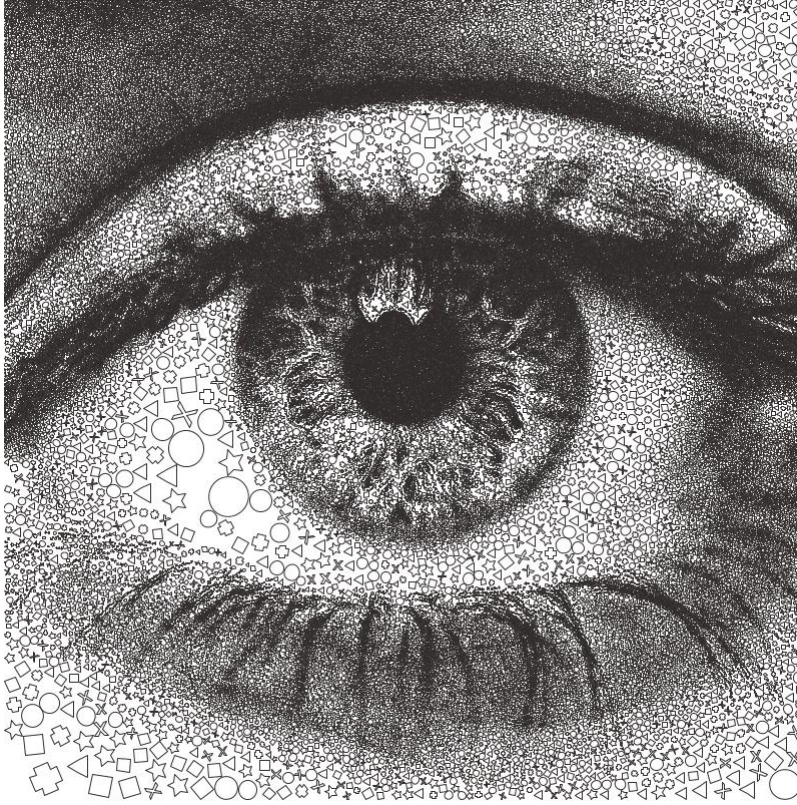
Ignore White (Voronoi PFMs)

Values: Boolean (True | False)

When **True**, the PFM will filter out points in white areas of the image.

8.7.3 Voronoi Shapes

Transforms an image into a series of inscribed shapes for each cell of the voronoi diagram.



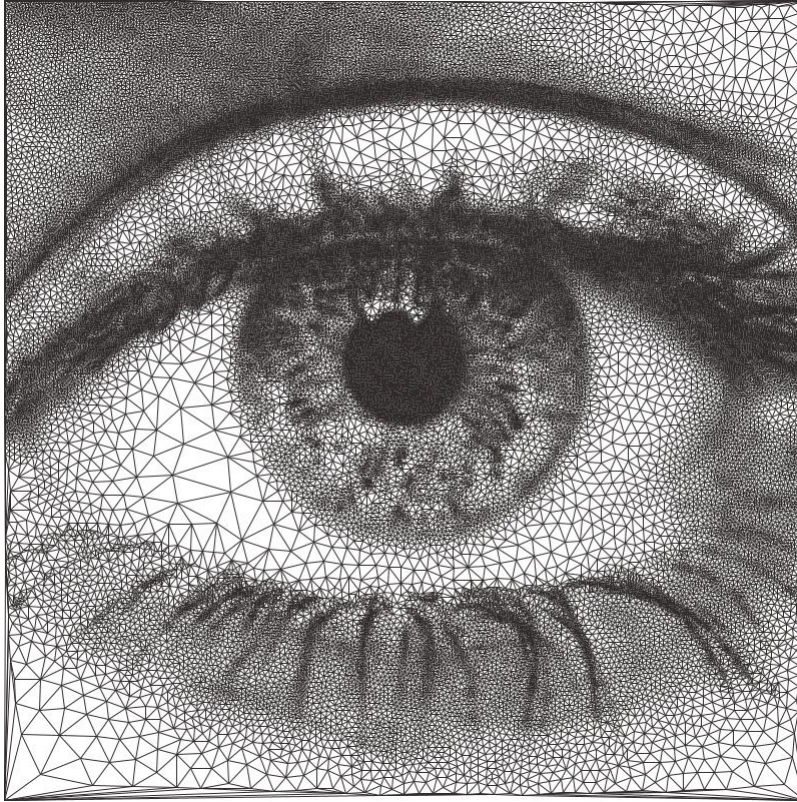
Settings

+ Inherits settings from:

- *Default Voronoi Settings*
- *Adaptive Shapes*

8.7.4 Voronoi Triangulation

Transforms an image into a series of connected triangles joining all the *centroids* in the voronoi diagram using [Delaunay Triangulation](#)



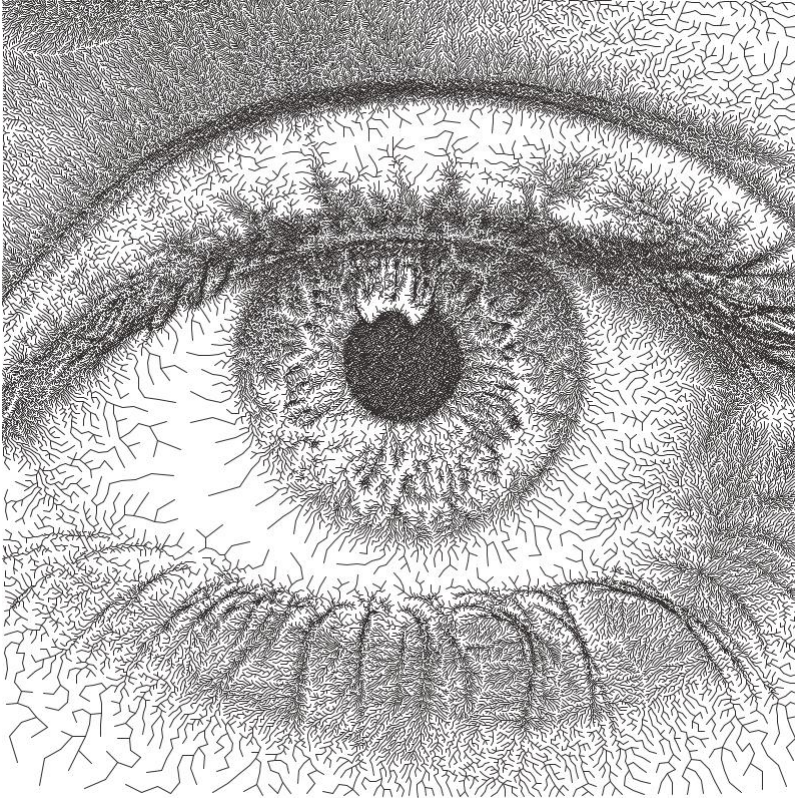
Settings

+ Inherits settings from:

- *Default Voronoi Settings*
- *Adaptive Triangulation*

8.7.5 Voronoi Tree

Transforms an image into a Minimum Spanning Tree, which connects all the *centroids* in the voronoi diagram into a minimum length tree.



Settings

+ Inherits settings from:

- *Default Voronoi Settings*
- *Adaptive Tree*

8.7.6 Voronoi Stippling

Transforms an image into a series of filled circles for each *centroid* in the voronoi diagram, the size of the “stipple” is relative to the sampled brightness of the cell the centroid belongs to.



Settings

+ Inherits settings from:

- *Default Voronoi Settings*
- *Adaptive Stippling*

8.7.7 Voronoi Dashes

Transforms an image into a series of dashes at each *centroid* in the voronoi diagram.



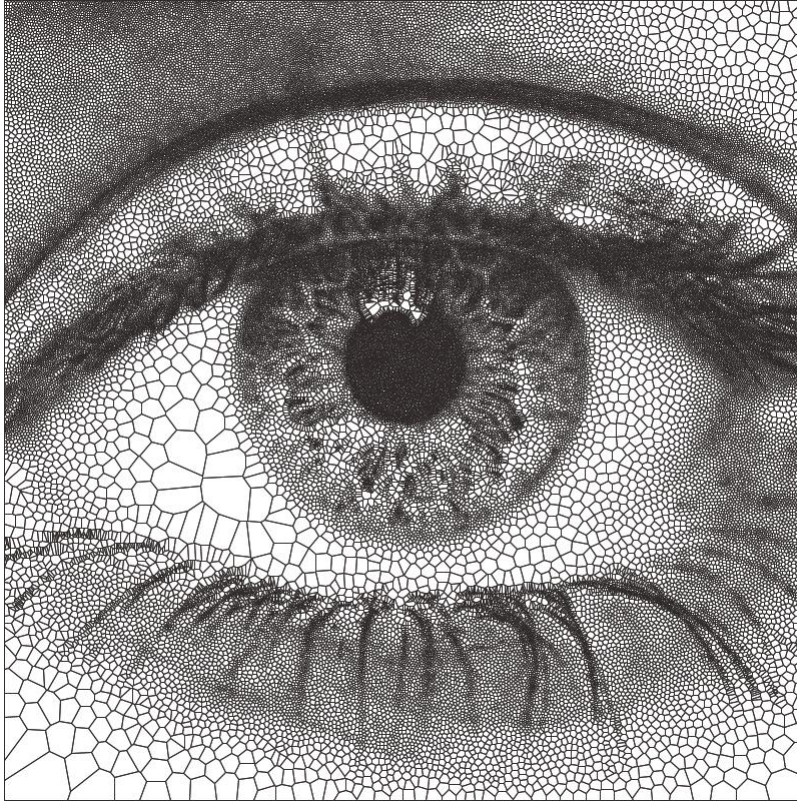
Settings

+ Inherits settings from:

- *Default Voronoi Settings*
- *Adaptive Dashes*

8.7.8 Voronoi Diagram

Transforms an image into a Voronoi Diagram.



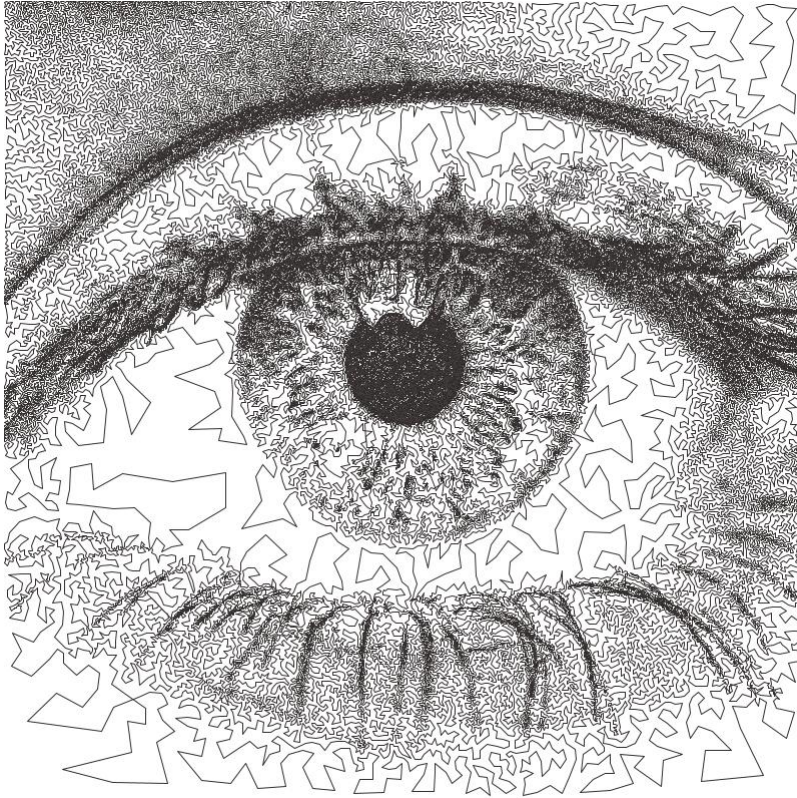
Settings

+ Inherits settings from:

- *Default Voronoi Settings*
- *Adaptive Diagram*

8.7.9 Voronoi TSP

Transforms an image into a series of connected lines for each *centroid* in the voronoi diagram with the shortest distance. By solving the Travelling Salesman Problem.



Settings

+ Inherits settings from:

- *Default Voronoi Settings*
- *Adaptive TSP*

8.8 Grid PFMS

Grid PFMs create styles using a grid, great for creating some classic half-tone drawing styles but also much more stylised drawings where the grid is only a starting point and the points may diverge away from it.

They work especially well with *CMYK Separation* and *Colour Match*

They also process very quickly due to the simplicity of generating the starting grid.

Quick Tip: Grid PFMs often work better with thicker pens 0.5mm + as this helps to introduce contrast to the grid.

8.8.1 Default Grid PFM Settings

Grid

Uniform Spacing

Values: Boolean (True | False)

When **True**, the Grid Spacing will be the same on both the X & Y Axis and the *Grid Y Spacing* variable will be locked.

When **False**, the *Grid X Spacing* and *Grid Y Spacing* can be different.

Grid X Spacing

Values: Number (Safe Range: 1.0 -> 32.0)

Controls the number of columns in the grid.

Grid Y Spacing

Values: Number (Safe Range: 1.0 -> 32.0)

Controls the number of rows in the grid, only usable if *Uniform Spacing* is **False**.

Shape Scale

Values: Number (Safe Range: 0.01 -> 4.0)

Controls the shape of the generated Shapes, a value of 1.0 will occupy all the available space in the grid.

Values higher than 1.0 will use more than the available space and cause shapes to overlap.

Values lower than 1.0 will use less than the available space.

Rand Offset X/Y

Values: Number (Safe Range: 0.0 -> 64.0)

Introduces a random X/Y offset to each grid position, introducing some natural noise to the grid.

With values higher than 0, the grid positions will no longer be uniform.

Interleave

Values: Boolean (True | False)

When **True**, every odd row will be offset by the grid spacing, creating interlocking grid points.

When **False**, the grid will be uniform.

Grid Style

Brightness (Grid PFMs)

Values: Number (Safe Range: 0.0 -> 2.0)

Controls the brightness applied as a pre-processing step to the source image, see *Brightness (Adaptive PFMs)*

Contrast (Grid PFMs)

Values: Number (Safe Range: 0.0 -> 2.0)

Controls the contrast applied as a pre-processing step to the source image.

The quality of Drawings from Grid PFMs can vary massively on the contrast and brightness so these controls are included for simplicity though they behave the same as adding a contrast filter in the Pre-Processing tab.

Threshold (Grid PFMs)

Values: Number (Safe Range: 0.0 -> 100.0)

Controls the cut-off luminance to stop generating grid points. Lowering the Threshold will prevent points being drawn in bright areas of the image.

Threshold Feather

Values: Number (Safe Range: 0.0 -> 100.0)

Controls a dithering process applied when a Threshold has been introduced.

When the Feather is 0 the threshold will be a hard cut-off, due to the linear nature of the grid this can become quite obvious with some settings / image combinations.

In these situations introducing a feather will add some randomness to if points are drawn or not, resulting in more gradual cut-off.

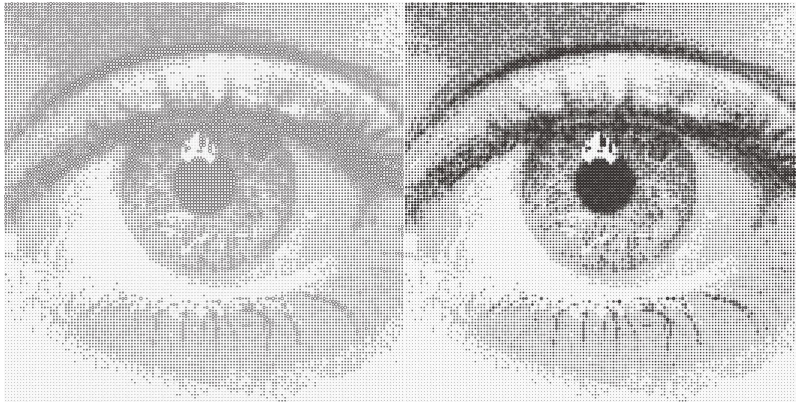
Concentric Fills

(Grid Shapes / Letters Only)

Values: Boolean (True | False)

When **True**, the generated shapes will be filled entirely with the pen, a continuous fill consisting of progressively smaller shapes will be generated, this is useful for introducing some more tone/contrast into the final drawing.

When **False**, no fills will be generated.



Convergence

Values: Percentage (Range: 0.0 -> 100.0)

Causes grid points to converge towards the darkest areas of the image making the grid no longer uniform but having the effect of emphasising edges and contrast in the image.

This is great for creating stylised results and is used in many of the default grid presets.

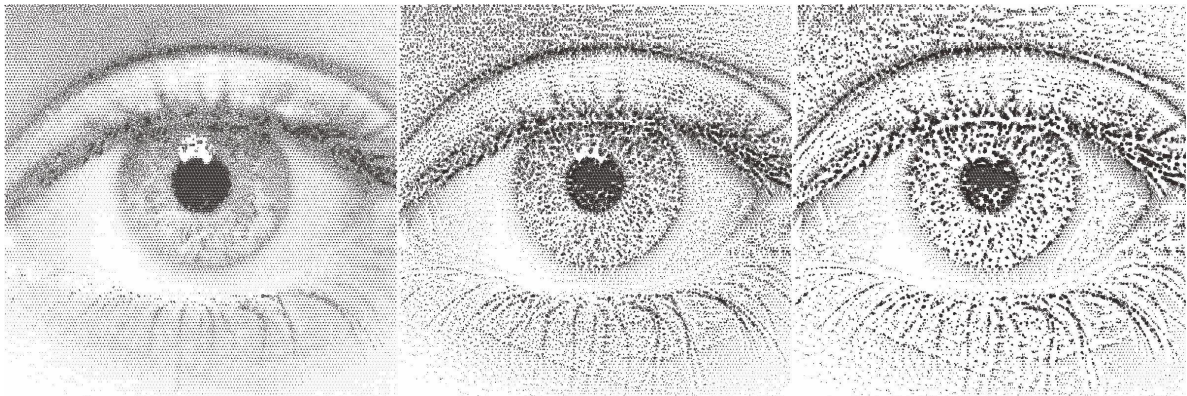
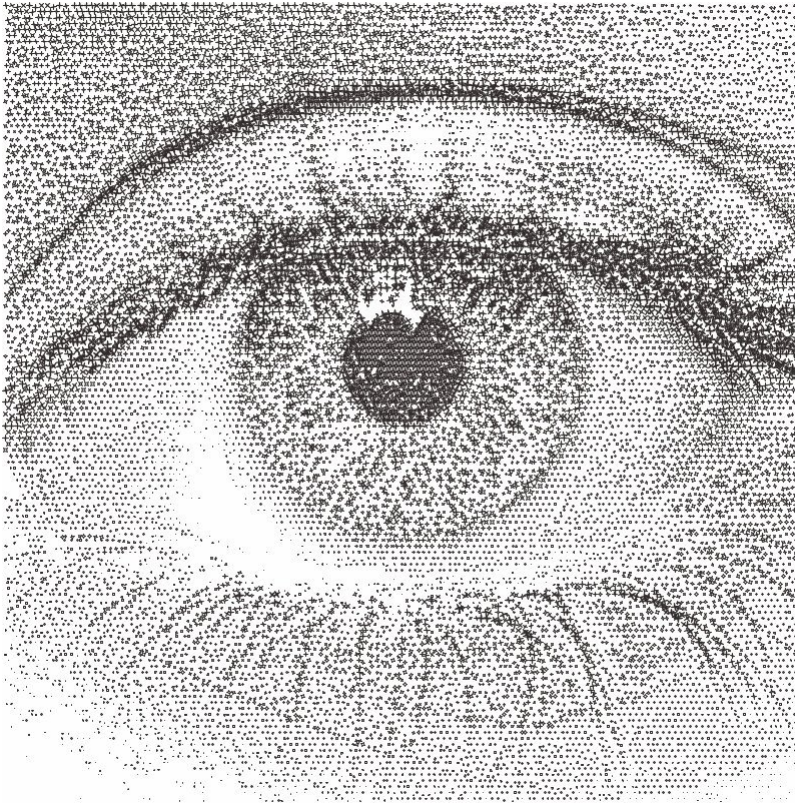


Fig 1. Convergence = 0, Fig 2. Convergence = 50, Fig 3. Convergence = 100

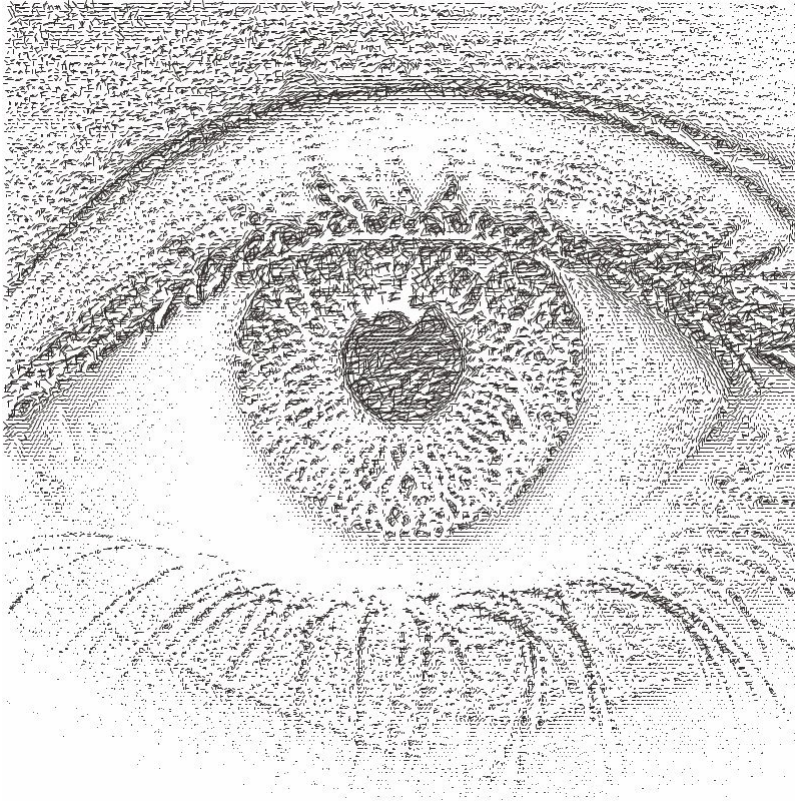
8.8.2 Grid Shapes



+ Inherits settings from:

- *Default Grid PFM Settings*
- *Adaptive Shapes*

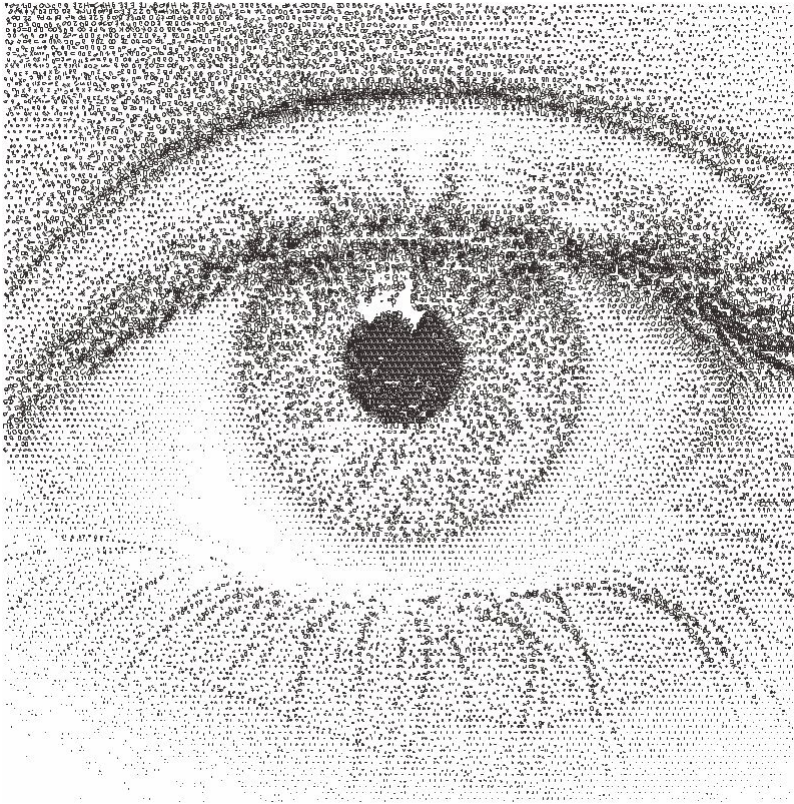
8.8.3 Grid Dashes



+ Inherits settings from:

- *Default Grid PFM Settings*
- *Adaptive Dashes*

8.8.4 Grid Letters



+ Inherits settings from:

- *Default Grid PFM Settings*
- *Grid Shapes*
- *Adaptive Letters*

8.9 Composite PFMS

Composite PFMs offer different ways to combine multiple PFMs together to create new styles.

8.9.1 Default Composite PFM Settings

Drawing Styles

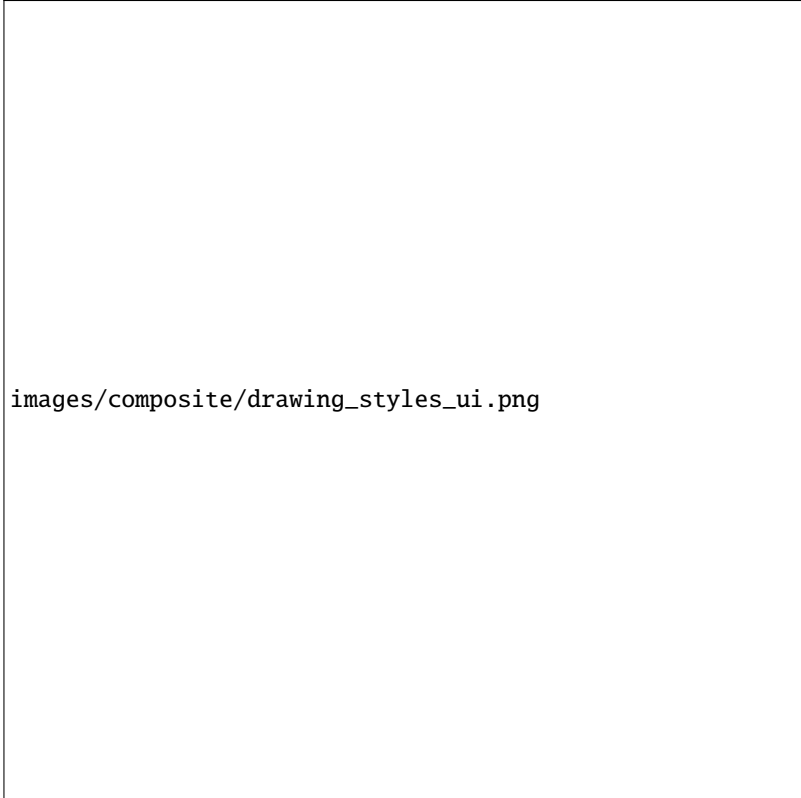
Drawing Styles

Values: Special

A configurable list of Drawing Styles.

A **Drawing Style** consists of a Path Finding Module and a Drawing Set. When run the PFM will be run with the given Drawing Set and added to the final drawing.

Upon clicking the “Drawing Styles” button in the PFM Settings you’ll be presented with this window.



images/composite/drawing_styles_ui.png

Here you can configure the Composite PFM's enabled Drawing Styles. You may add as many Styles as you wish and by selecting each one in the list on the left of the window you can configure the settings of the Path Finding Module on the right.

- **Name**
Defaults to the selected PFM, but can be changed by the user.
- **Weight**
Only visible for specific Composite PFMs

Typically the selection of PFMs for the various tiles of the mosaic is random and the random selections can be changed with the *Random Seed*.

However, when the weight is changed, the random selection will be weighted (similar to pen weights) and the number of tiles in the mosaic drawn in that style will be proportional to its weight.
- **Drawing Set:**
The selected Drawing Set. Change it by double clicking the current value. To create more Drawing Sets see **Drawing Slots** at the bottom of the Pen Settings tab.

Note: It's also possible to stack multiple composite PFMs inside each other, when Composite PFMs are stacked selecting the "Drawing Styles" button will open another identical window, but the title of the window will change, indicating where in the chain of PFMs you currently are. This should be considered an Experimental feature and may result in crashes due to the complexity of deep stacks of mosaic pfms.

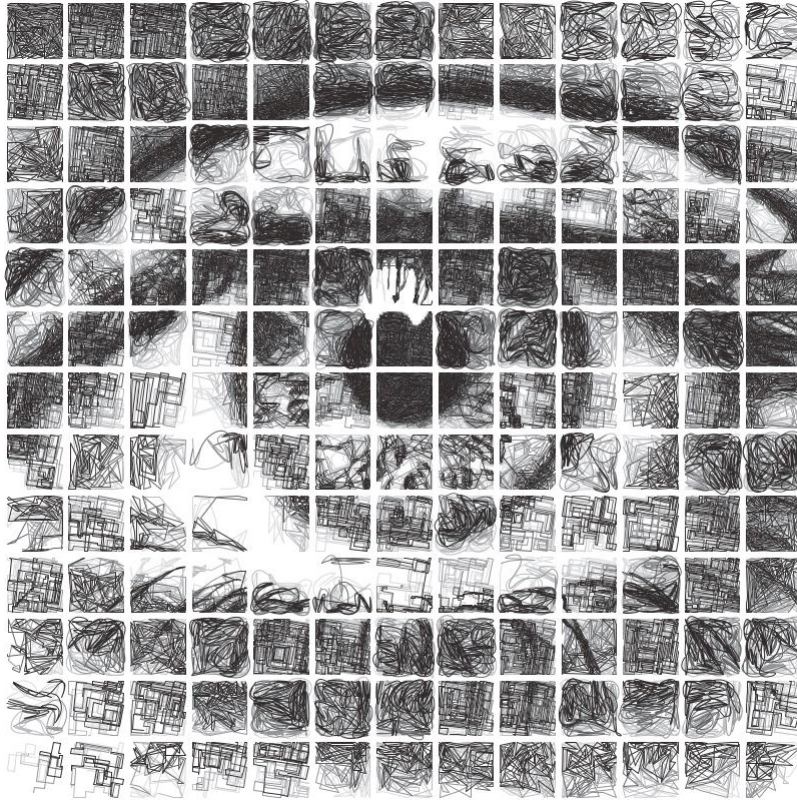
Draw Outlines (for Mosaic PFMs only)

Values: Boolean (True | False)

When **True**, the shapes used to generate the mosaic will also be output as Shapes, giving each Mosaic Cell/Tile a sharp outline.

8.9.2 Mosaic Rectangles

Divides an image into a series of rectangles which can are then distributed randomly amongst the enabled Drawing Styles



Settings

Tiles

Square Tiles

Values: Boolean (True | False)

When **True**, instead of rectangles the PFM will only produce Squares, the row & row padding sliders will be disabled.

Columns

Values: Number (Safe Range: 1 -> 64)

Controls the number of columns along the x axis and therefore affects the total number of tiles in the mosaic.

Rows

Values: Number (Safe Range: 1 -> 64)

Controls the number of rows along the y axis and therefore affects the total number of tiles in the mosaic.

Column Padding %

Values: Percentage (Range: 1 -> 100)

Controls the border of the rectangle on the left and right as a percentage of the tiles width.

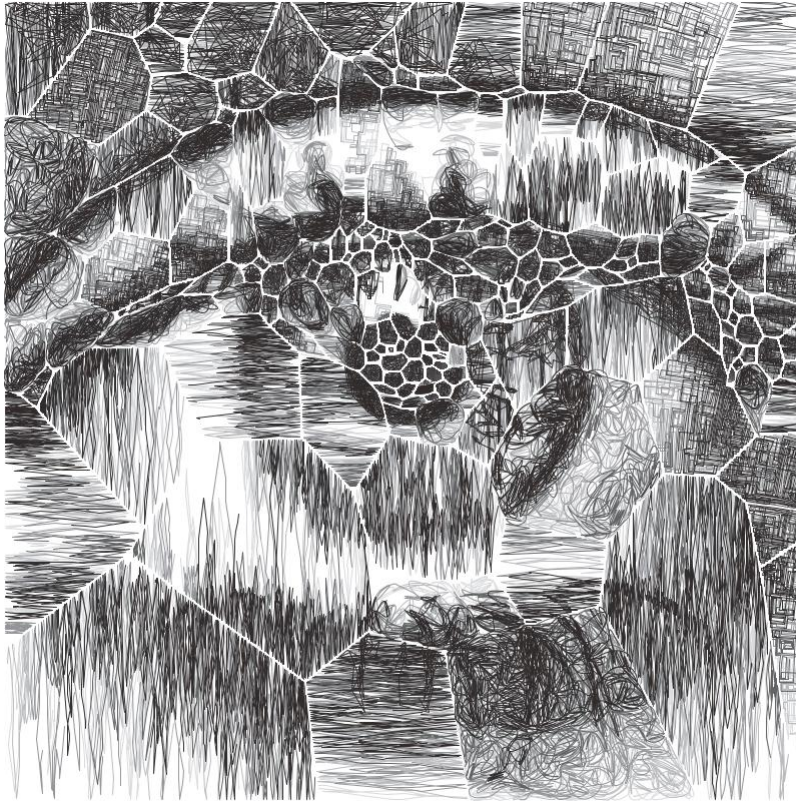
Row Padding %

Values: Percentage (Range: 1 -> 100)

Controls the border of the rectangle on the top and bottom as a percentage of the tiles height.

8.9.3 Mosaic Voronoi

Divides an image into a Voronoi Diagram, each cell is distributed randomly amongst the enabled Drawing Styles.



Settings

Tiles

Tile Count (Mosaic Voronoi)

Values: Number (Range: -20 -> 20)

Controls the number of Voronoi Tiles to generate / how many times to split the input image.

Offset Cells

Values: Percentage (Range: -20 -> 20)

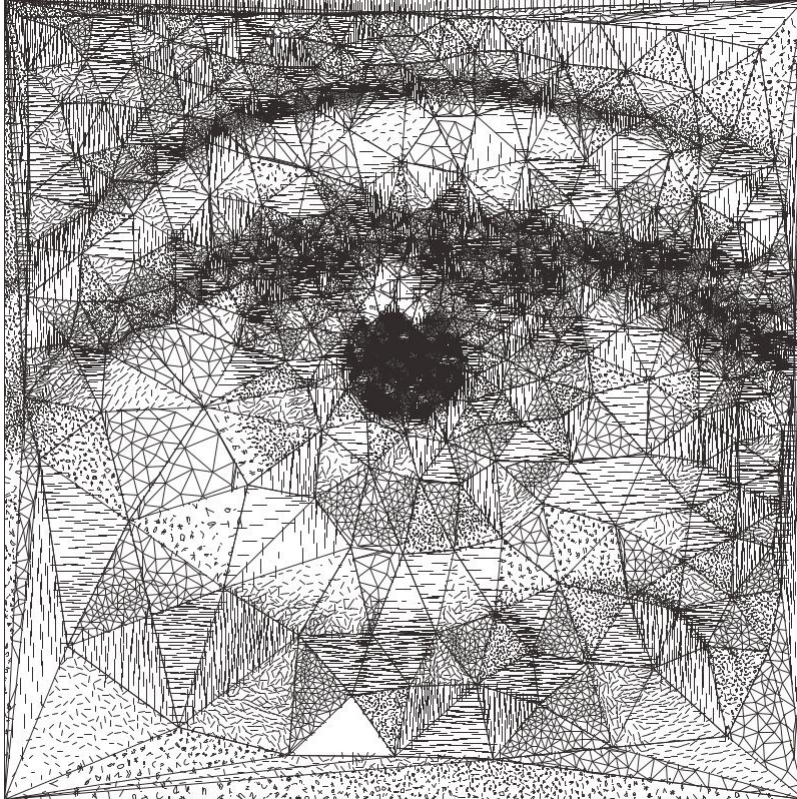
Shifts the border of the generated Voronoi Tiles. Negative values will shrink the cell, positive values will grow the cell. Note: Negative values may result in nothing being drawn in cells if they become too small.

+ Inherits settings from:

- *Default Composite PFM Settings*
 - *Default Voronoi Settings*
-

8.9.4 Mosaic Triangulation

Divides an image into a Mosaic using Delaunay Triangulation. Each triangle is distributed randomly amongst the enabled Drawing Styles.



Settings

+ Inherits settings from:

- *Default Composite PFM Settings*
 - *Mosaic Voronoi*
 - *Default Voronoi Settings*
 - *Adaptive Triangulation*
-

8.9.5 Mosaic Segments

Generates a mosaic out of detailed segments using Simple Linear Iterative Clustering (SLIC Image Segmentation), the shapes it generates represent the shapes present in the original drawing much more accurately than Mosaic Voronoi.

Generating accurate segments means this PFM will pause for up to 20 seconds before processing.



Settings

Segments

Segments

Values: Number (Safe Range: 1 -> 5000)

Controls the total number of segments to generate with SLIC Image Segmentation. Higher values will take longer to process and may crash for certain images / computers.

Iterations

Values: Number (Safe Range: 1 -> 100)

Controls the accuracy of the SLIC Image Segmentation, more iterations = longer processing time, more accurate segments.

Compactness

Values: Number (Safe Range: 1 -> 100)

Adjusts the outline of the segments generated, high values = flatter cells, formed of straight lines, low values = messy cells, with rough outlines

+ Inherits settings from:

- *Default Composite PFM Settings*
 - *Mosaic Voronoi*
-

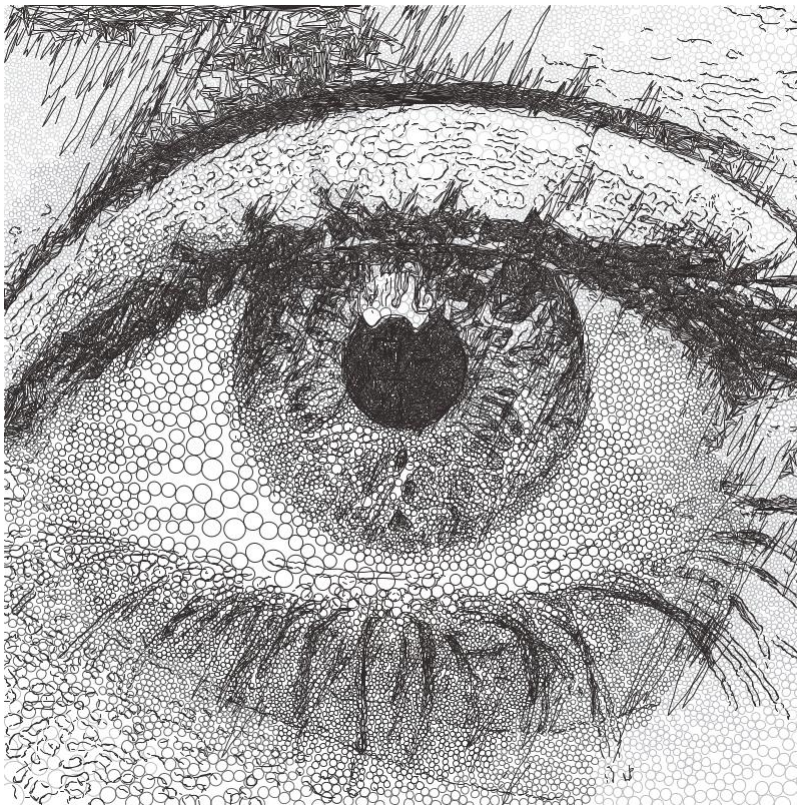
8.9.6 Mosaic Custom

Note: Mosaic Custom is under revision

8.9.7 Layers PFM

Layers all of the Drawing Styles on top of each other, with each Style being run once and covering the entire image.

The Drawing Styles are layered in the order they are listed in the Drawing Styles menu.



Settings

Layers

Keep Lightened Image

Values: Boolean (True | False)

When **True**, the Layers PFM will take the *Lightened Image* (see ___`Erasing` for more details) at each stage in the plotting process and pass it onto the next PFM.

The *Lightened Image* is typically only used by Sketch PFMs, , so if you are layering multiple Sketch PFMs enabling this option will limit the amount of overlap as each Sketch PFM will essentially start where the last finished. If you have other types of PFMs layered after a Sketch PFM with **Keep Lightened Image** enabled their outputs will also be affected.

Layer Distribution

Values: NONE | ORDERED PER PFM | ORDERED

Which allows finer control over the distribution of pens between layers

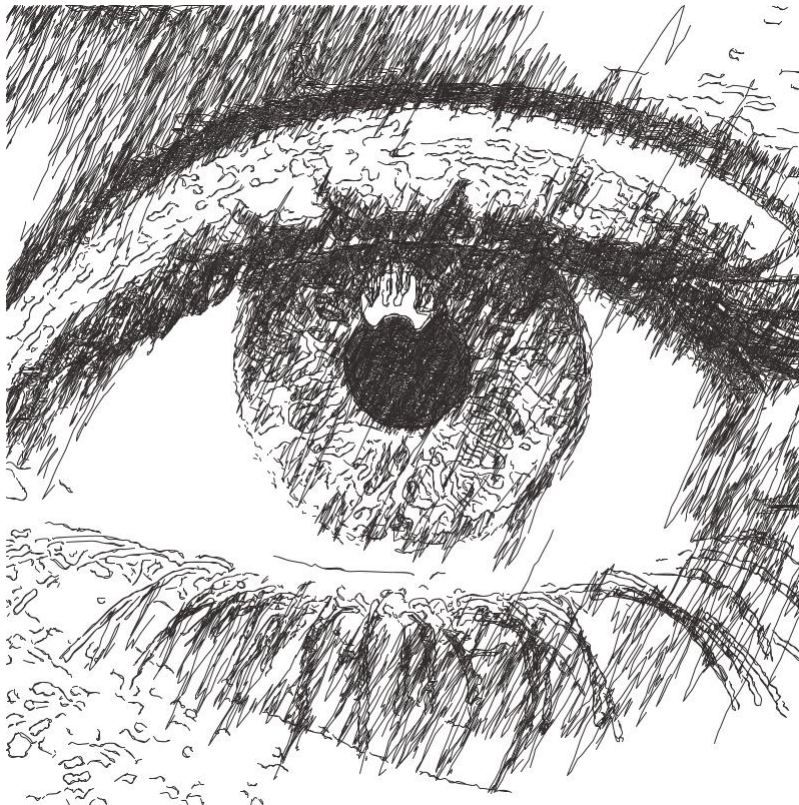
- **NONE:** Layers will be distributed separately.
- **ORDERED PER PFM:** Layers which use the same PFM and Drawing Set will be distributed together, treating the first layer as the darkest and the last layer as the brightest.
- **ORDERED:** Same as the above, but only distributes matches Drawing Sets and ignores the used PFM.

+ Inherits settings from:

- *Default Composite PFM Settings*

8.10 Special PFMS

8.10.1 ECS Drawing



Settings

Edges

Draw Edges

Values: Boolean (True | False)

Disables/Enables edge detection.

Edge Blur

Values: Number (Safe Range: 0 -> 50)

Affects the pre-filter blur applied before edges are detected. Higher edge blur will result in less edges but the edges will be smoother.

Edge Detail

Values: Number (Safe Range: 0 -> 255)

Controls the amount of edges which are generated: lower detail -> less edges : higher detail -> more edges.

Edge Simplify

Values: Number (Safe Range: 0 -> 100)

Simplifies the generated edges, removing unnecessary vertices.

Edge Distortion

Values: Number (Safe Range: 0 -> 100)

Introduces noise to the generated edges, giving them a rougher more inaccurate appearance.

Contours

Draw Contours

Values: Boolean (True | False)

Disables/Enables contour detection.

Contour Blur

Values: Number (Safe Range: 0 -> 99)

Similar to Edge Blur but for contours. Has a greater impact on the amount of contours and quality of the contours.

Contour Detail

Values: Number (Safe Range: 0 -> 255)

Controls the amount of contours which are generated: lower detail -> less contours : higher detail -> more contours.

Contour Simplify

Values: Number (Safe Range: 0 -> 100)

Simplifies the generated contours, removing unnecessary vertices.

Contour Distortion

Values: Number (Safe Range: 0 -> 100)

Introduces noise to the generated contours, giving them a rougher more inaccurate appearance.

Shading (ECS Drawing)

Draw Shading

Values: Boolean (True | False)

Disables/Enables shading. The shading component uses a simplified version of the Sketch Lines shading feature, you may choose to disable the shading entirely and overlay another Sketch PFM using PFM Layers.

Shading Accuracy

Values: Number (Safe Range: 0 -> 100)

Controls the accuracy of the shading: lower -> less accurate, more stylised : higher -> more accurate, less stylised

Shading Detail

Values: Number (Safe Range: 0 -> 100)

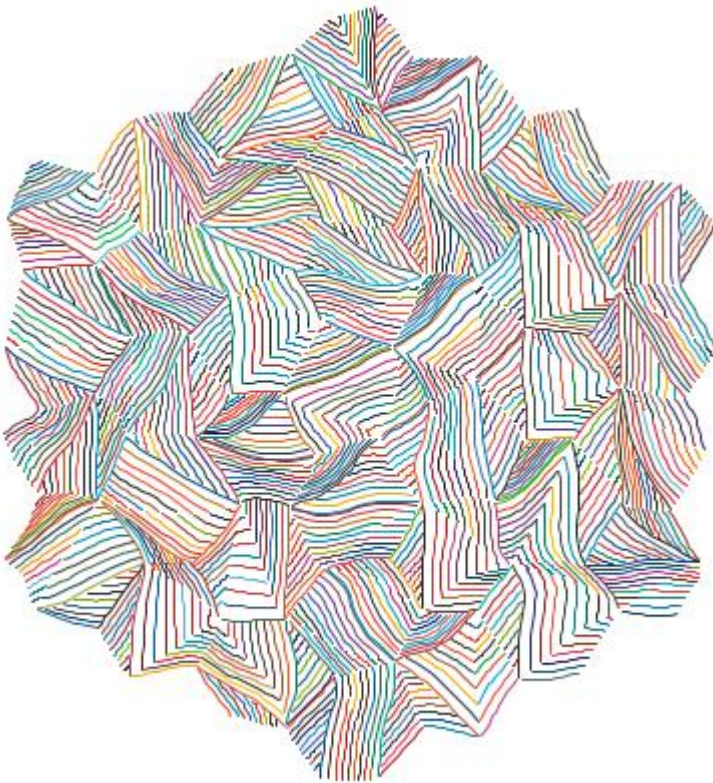
Controls the luminance at which shading will be stopped: lower -> less shading : higher -> more shading

Shading Length

Values: Number (Safe Range: 0 -> 150)

Controls the maximum length of the lines which make up the shading.

8.10.2 SVG Converter



Settings

Shape

SVG Path

Values: SVG File Path

The path to the SVG to be used. If this isn't set it will use the current imported SVG, if there isn't one the PFM will produce no output. You can use this PFM as part of a Layers PFM, to layer SVGs together, when you run the PFM like this you can set the SVG Path to use an SVG which hasn't been imported.

Shape Clipping

Values: Boolean (True | False)

When enabled Solid Shapes will "clip" the shapes below, meaning if a shape is covered by another in the SVG only the visible part will be drawn, this only occurs for solid shapes, individual lines won't clip the shapes below.

Derive Drawing Set

Values: Boolean (True | False)

When **True**, a new Drawing Pen will be generated for each colour in the SVG, allowing you to access them each as layers. This opens up possibilities for splitting SVGs by colour using a per/layer export, or even re-assigning colours to your SVG, once the SVG Converter PFM has been run you'll have access to change the colour of lines with all the tools available with a default drawing.

Hatch Fill

If shapes in the SVG have solid fills, hatch fills will be used instead which can easily be drawn by a pen plotter

Shape Filling (Hatch Fill)

Values: Boolean (True | False)

When enabled Hatch Fills will be generated.

Spacing (Hatch Fill)

Values: Number (Safe Range: 1 -> 10)

The distance between the hatch lines. This is relative to the pen width so a spacing of 1.0 will draw over the entire shape with no gaps, a spacing of 2.0 will leave spaces the same width as the pen.

Min/Max Rotation (Hatch Fill)

Values: Number (Safe Range: 0 -> 360)

Controls the rotation of the generated hatch lines

Link Ends (Hatch Fill)

Values: Boolean (True | False)

Links the resulting hatch lines to create one continuous line (for some shapes this may not always be possible)

Crosshatch (Hatch Fill)

Values: Boolean (True | False)

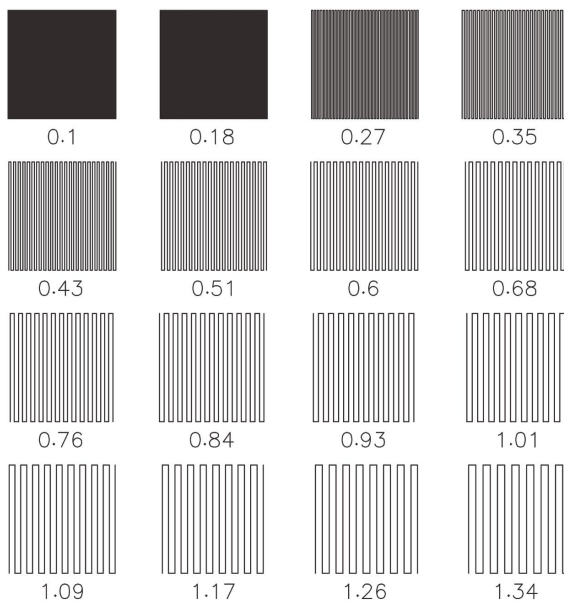
Creates an additional set of perpendicular Hatch Lines

Video Tutorial

<https://youtu.be/Bg8BtUWhoJc>

8.10.3 Pen Calibration

Generates Pen Calibration tests which can be used to select the most accurate nib size for “Rescale to Pen Width”. Choose a suitable Nib Size range for the pen you wish to test and then plot the test. Then set your Pen Width for future plots with that pen to the highest nib size which has no gaps between the lines.



Settings

Layout

Nib Size Min

Values: Number (Safe Range: 0.1 -> 2.0)

The smallest nib size to test.

Nib Size Max

Values: Number (Safe Range: 0.1 -> 2.0)

The largest nib size to test. If your pen is larger than 2.0, enter the value manually in the text field.

Test Count

Values: Number (Safe Range: 0 -> 2.0)

The number of calibration tests to run.

Test Size

Values: Number (Safe Range: 10.0 -> 40.0)

The width/height in mm of each nib size test.

Spacing X/Y

Values: Number (Safe Range: 0 -> 40.0)

The grid spacing in mm between each test in the grid.

Rotation

Values: Number (Safe Range: 0 -> 360.0)

Controls the angle of the lines in the generated line tests.

Line Tests

Values: Boolean (True | False)

Generates simple hatches line tests.

Circle Tests

Values: Boolean (True | False)

Generates concentric circle tests.

Text

SVG Font (Pen Calibration)

Values: SVG Font

The SVG Font to use to draw the labels for each nib size test.

Title

Values: Text

An optional title to draw at the top of page, you can leave this blank to have no title.

Font Size

Values: Number (Safe Range: 1.0 -> 8.0)

The height in mm of the label/title text.

PEN SETTINGS





Created using Sketch Lines PFM & 8 different pens

DrawingBotV3 supports the creation of multi-layer plots where every layer can have it's own custom *Drawing Pens*. The current selection of pens is referred to as the *Drawing Sets*.

The *Drawing Pens* and *Drawing Sets* can be re-configured to experiment with combinations or to accurately match your own collection of pens.

These configurations can be saved as *Presets*

9.1 Drawing Pens

Each drawing pen has the following settings.

Enabled: active if the should be used in the current plot, disabling it will make the pen completely inactive not just make it invisible. To view individual pens change “Display: “ to “Selected Pen” and then highlight a pen in the table.

Type: typically the manufacturers name, or “Special” in the case of **Special Pens**

Name: typically the name given to the pen by the manufacturer, or the user defined name

Colour: the rgba colour of the pen, which can be customised

Weight: dictates how many shapes this specified pen should draw, a higher weight will increase the number of geometries the pen draws but decrease the amount other pens will draw, pens with equal weight will draw the same number of shapes.

Stroke: the pen's width (*subject to change*) currently this is relative to pixel size rather than actual pen size, unless "Rescale to Pen Width" has been enabled.

%: not user editable, the percentage of shapes which are being drawn by this pen

Shape Count: not user editable, the number of shapes which are being drawn by this pen

9.1.1 Default Drawing Pens

Currently the following manufacturers pen's are included as default. in the future more will be added.

- Bic Cristal Ballpoint
- Bic Intensity
- Bic Intensity Pastel
- Copic Original Markers
- Copic Sketch Markers
- Sakura Pigma Micron
- Diamine Ink
- Staedtler Fineliners
- Winsor & Newton ProMarker

9.1.2 Special Drawing Pens

These Drawing Pens provide some unique style for digital only outputs

- **Original Colour:** The rendered colour will be sampled RGBA from the original image
 - **Original Colour (Inverted):** The rendered colour will be sampled RGBA from the original image with an Invert Filter applied.
 - **Original Grayscale:** The same as Original Colour but grayscaled.
 - **Original Grayscale (Inverted):** The same as Original Colour (Inverted) but grayscaled.
 - **Original Red:** The rendered colour will be sampled Red Channel from the original image
 - **Original Green:** The rendered colour will be sampled Green Channel from the original image
 - **Original Blue:** The rendered colour will be sampled Blue Channel from the original image
 - **CMYK Colors:** Must be activated via *CMYK Separation*
-

9.2 Drawing Sets

A collection of Drawing Pens which can be saved as a *Preset*

9.2.1 Special Drawing Sets

- **Original Colour:** A Drawing Set which includes one “Original Colour” Pen.
 - **Original Grayscale:** A Drawing Set which includes one “Original Grayscale” Pen.
 - **CMYK Separation:** Selecting this Drawing Set will active *CMYK Separation*
-

9.3 Distribution Type

Affects how the shapes in the drawing are divided between all of the pens in the drawing set. The best choice is chosen by the PFM when it is first run, but it can be changed to create unique styles.

Even Weighted: All active pens will draw a percentage of shapes relative to their current *weight*, the shapes are divided between pens in the order of the specified *Distribution Order*

Random Weighted: All active pens will draw a percentage of shapes relative to their current *weight*, the shapes are divided between pens randomly ignoring *Distribution Order*

Random Squiggles: Unlike classic *Random Weighted* distribution, random squiggles will only change pen when a *Squiggle* (continuous path without pen lifts) is finished, hence reducing plotting time.

Luminance Weighted: Distributes pens according to each shape’s luminance in the original image, works especially well with non-Sketch PFMs by reintroducing multiple pens to the plot in a more aesthetically pleasing way than alternative distribution types.

Preconfigured: Pens are distributed by the *Path Finding Module*. Used by *CMYK Separation* & *Colour Match* and some specialist PFMs.

Single Pen: Draw all lines with the first active pen in the list according to the *Distribution Order*

9.4 Distribution Order

Dictates the order in which shapes are distributed between pens, it also has the affect of changing the render order of the pens.

Darkest First (Default): The shapes generated by the *Path Finding Module* will be distributed to the pens from Darkest Pen to Lightest Pen. As the first lines drawn by Sketch PFMs are always the darkest lines in the image this will typically produces the best results and is therefore the default.

Lightest First: The reverse of Darkest First, maps the shapes from the Lightest Pen to Darkest Pen

Displayed: The shapes generated by the *Path Finding Module* will be distributed to the pens from Top Pen to Bottom Pen in the displayed list. This can create some interesting results where the tonal ranges of the image are mixed.

Reversed: The reverse of Displayed, maps the shapes from Bottom Pen to Top Pen in the displayed list.

9.5 Colour Separation

- **Default:** The colour of each pen is chosen after processing by the user, and pens are selected based on Distribution Type and Distribution Order
 - **CMYK:** Runs the drawing multiple times for the 4 standard print colours Cyan, Magenta, Yellow & Black (Key), perfect for creating colour plots with few pens. Read more here [CMYK Separation](#)
 - **Colour Match:** Allows you to represent the colours in the original image using pens of your choice. Read more here [Colour Match](#)
-

9.6 Blend Modes

This is purely a rendering option and has no effect on the final plot, it can be used to create more accurate previews in specific circumstances or if you're art will only be digital this can be fun way to play with the colours and blending of lines.

Note: There is a known bug where some blend modes will not be exported properly when rendering an image file.

CMYK SEPARATION



Before + After CMYK Separation

CMYK Separation is the process of splitting an image into representations of Cyan / Magenta / Yellow / Key (Black). These split images are then processed separately and re-combined to produce representation of the source image using only four pen colours!

DrawingBotV3 allows you to automate the CMYK splitting process and will automatically split the image for you and pass each image into the selected *Path Finding Module*, all PFMS are supported. The final plot will be made up of 4 layers one for each CMYK pen.

10.1 How to use

- 1) To activate CMYK go to the **Pen Settings** panel and change **Colour Separation** to **CMYK** or select the **CMYK Separation** Special Drawing Set.
- 2) A dialog will appear asking you if you wish to apply the recommended settings, hit **Apply**. This will activate a Special Drawing Set which has all of the CMYK colours already configured & also activate the *Darken* blend mode.
- 3) You then will need to press **Start Plotting** again to generate the final plot.
- 4) You can then also use the **Configure** button to change the multiplier for each pen to achieve the perfect weighting of colours. It's best to change these values after you've made an initial plot with your own pens so you can judge the colour balance properly.

10.1.1 Notes

The rendering you see in the viewer is only a representation and may differ from the final plot. Some experimentation may be needed to achieve a good balance of CMYK. It is strongly recommended that you specify the drawing areas size and active **Rescale to Pen Width**

CHAPTER ELEVEN

COLOUR MATCH





Before + After Colour Match Using 60 Staedtler FineLinners

Colour Match allows you to represent the colours in the original image using pens of your choice.

The feature can be used with any PFM to create loads of interesting results!

Using *CMYK Separation* is also a good option to generate drawings which match the colours in the original image.

11.1 How to run 'Colour Match'

- 1) To activate Colour Match go to the **Pen Settings** panel and change **Colour Separation** to **Colour Match**.
- 2) Next add all of the pens you wish to use, the more colours the better, though you can also be creative here and use only a small range of colours combined with blacks and grey to create more stylised drawings.
- 3) Then press **Start**, Colour Match will first compare each pen to original image and then start plotting.

11.2 Options

You also have a few options to configure colour match further, found to the right of the Colour Separation drop-down.

- **Colour Accuracy** - Increasing the Colour Accuracy will increase the quality of the colour match and prevent pens drawing over areas if they are a bad colour match, generally 95% provides the best results. Colour Accuracy relates to a Delta-E colour measurement in the following way
 - 100: No colour difference
 - 99: Slight colour difference
 - 98: Small colour difference
 - 97: Medium colour difference
 - 96: Large colour difference
 - 95: Very large colour difference
- **Brightness Multiplier** - Decreases the overlap of the pens in the image
- **Smooth Distribution** - Uses a different Algorithm to find the start point for each shape which results in a more even distribution of pens across the entire image, only affects Sketch PFMs
- **Pen Limit** - Limits the number of pens which can be used when matching, if this value is set to 18, only the 18 best matched pens will be used. If this value is set to 0, there is no limit.
- **Use Canvas Colour** - Adds an invisible pen which matches the colour of the Canvas, helps to avoid drawing unnecessary lines.
- **Line Density** - from Sketch PFMs” - the line density control found in the Sketch PFMs can also be used to control the Colour Match output.

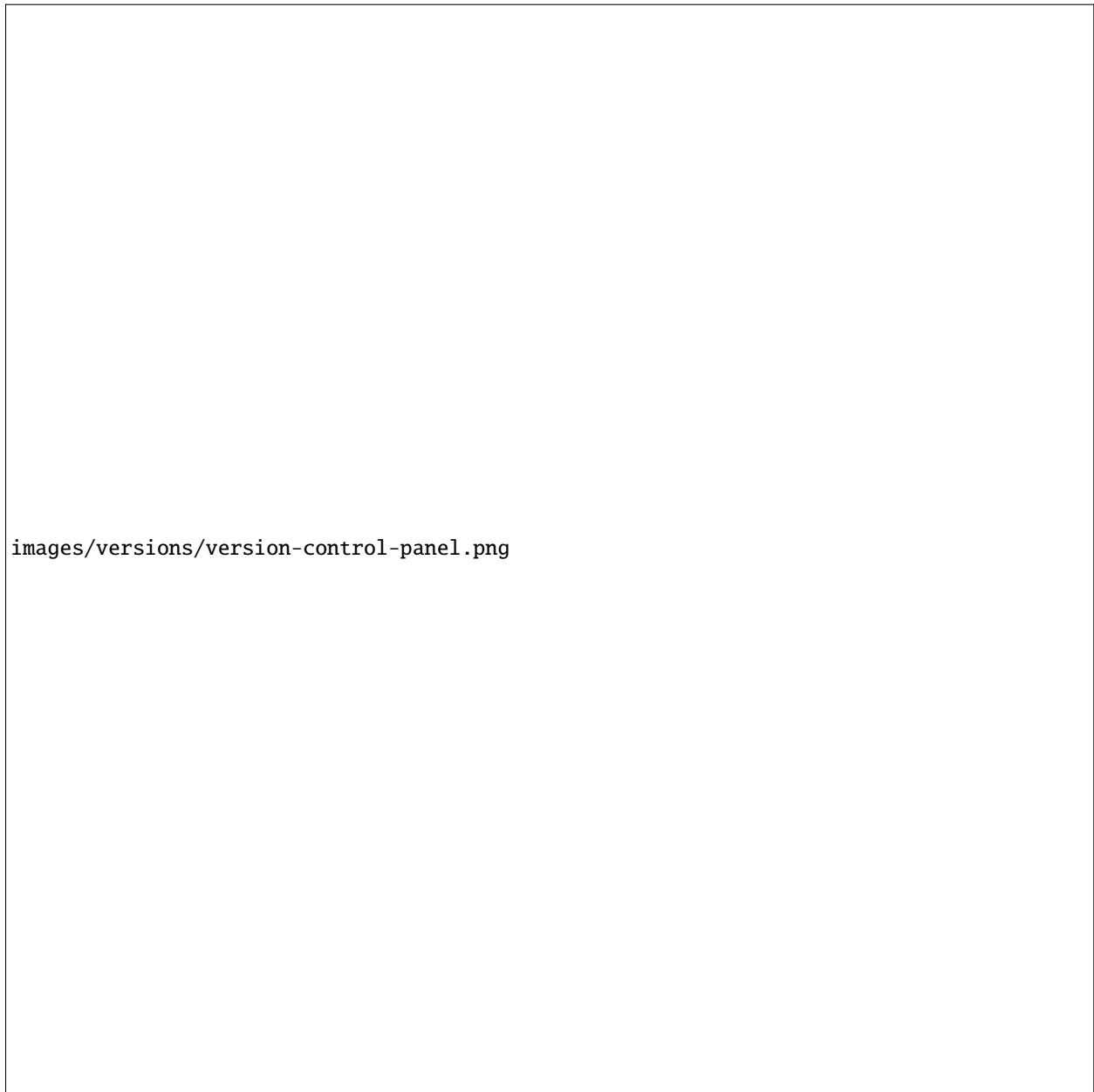
11.3 Tips for using the “Colour Match” feature

- Use a bright, saturated image, murky images or ones with a limited colour palette may perform poorly.
- Use all the pens of a specific manufacturer, i.e. Use the presets for the set of 60 Staedtler Fineliners, then use the Pen Limit feature, to limit selection to approx 18+ pens allowing colour match to choose your best matched pens for each plot.
- Use as many pens as you can, the more pens you use the better matched the colours will be.

VERSION CONTROL

Allows you to save different versions of your project as you go.

As the software has many options it's easy to forget the specific settings you used therefore saving a version is a good way to keep track of the styles.



images/versions/version-control-panel.png

Fig.1 - The Version Control panel, with 3 different versions saved, the panel has been dragged out of the settings panel and resized, you can do the same by dragging the panels header and resizing the new window

12.1 How to Create Versions

- Option 1: Use the **Save Version** button in the bottom left of the user interface.
- Option 2: Press the **Add (Plus)** button in the **Version Control** panel.
- Option 3: Use the Keyboard Shortcut **Shift + V** (from v1.6.4)

12.2 Reviewing Versions

Open the **Version Control** settings panel, or go to **View / Version Control**

Here you'll see a list of all the versions you've created, if you've created none the list will be empty.

For each version you'll see the following details.

- **Image** - A thumbnail preview of the version the date it was created.
- **Rating** - User editable rating out of 5 Stars for the drawing.
- **Name** - User editable name for the version, defaults too the name of the PFM used.
- **Date** - Date & Time the version was created
- **Notes** - User editable notes, to help identify versions later on.
- **File** - The image used to create the drawing, which will vary if you import different images into the same project.

There are some buttons at the bottom of the **Version Control** panel.

- **Add (Plus)** - Creates a new version.
- **Delete (Minus)** - Deletes the selected version, will be grayed out if no version is selected.
- **Load Version (Eye)** - Opens the version in the current project, any current settings will be changed, so if you wish to go back save another version of your project first.
- **Move Up (Up Arrow)** - Moves the selected version one position up in the list.
- **Move Down (Down Arrow)** - Moves the selected version one position down in the list.
- **Clear Versions (Reset Arrow)** - Deletes all of the current versions, clearing the list.

You can also right-click each version to see the following options.

- **Load Version** - Same as above.
- **Save as Project** - Saves the version as it's own DrawingBotV3 project to be opened later.
- **Move Up** - Same as above.
- **Move Down** - Same as above.
- **Delete** - Same as above.

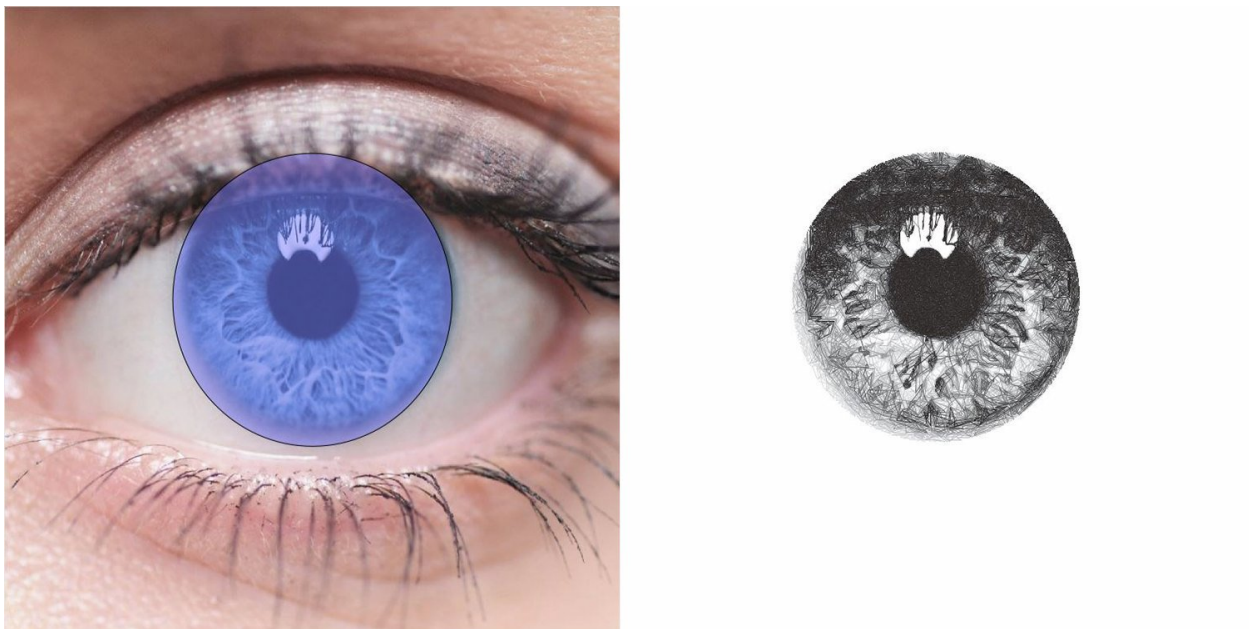
You can also select a version and press the Eye Icon too open it in the current project.

MASK SETTINGS

Settings panel allows you to mask areas of the image, you can add various shapes mask, you can move, resize, rotate, skew with the controls in the viewport area.

You can also import custom masks as SVGs, they will keep their original sizing so you can create detailed masks by importing an SVG with the same dimensions as in drawing area controls.

Note: Masks will increase the processing time and complex masks may cause the PFM to take a long time to process or fail to process.



e.g. Fig 1. The masks as configured in DrawingBotV3 - Fig 2. The Final Drawing

13.1 Select

When active Masks can be selected in the viewport and move, resize, rotate, skew.

When selected a mask can be in **Scale Mode** or **Rotate Mode**

You can tell the mode apart by the shapes drawn at the corners of the shape, in **Scale Mode** the shape's handle will be squares, in **Rotate Mode** the shape's handles will be circles.

13.1.1 Moving Masks

Select the mask and hold left click to drag it around the viewport, release Left Click to confirm or ESC to cancel.

You can also move masks in 1mm increments with the arrow keys (LEFT, RIGHT, UP, DOWN).

Shift Down: When the Shift Key is held, the mask will only move on one axis.

13.1.2 Resizing Masks

Enter **Scale Mode** by clicking the shape until the handles on the corners are squares.

Hold Left Click on one of the handles to resize the shape, release Left Click to confirm or ESC to cancel.

Shift Down: When the Shift Key is held, the mask will be resized from the centre.

Ctrl Down: When the Ctrl Key is held, the mask will be resized uniformly.

If *Grid Snapping* is enabled, the resizing will move in 1mm increments.

13.1.3 Accurate Resizing

Select the Mask you wish to resize precisely.

At the bottom of the Mask Settings panel you'll find the text fields for X,Y,W,H (Start X, Start Y, Width, Height), change these settings to resize the selected mask.

Once selected the settings at the bottom of the Mask Settings panel will no longer be grayed out.

Here you can define an exact size for the mask, specifying the Start X / Start Y (**X, Y**) and Width / Height (**W, H**) of the mask

13.1.4 Rotating/Skewing Masks

Enter **Rotate Mode** by clicking the shape until the handles on the corners are circles.

Rotating: Hold Left Click and drag any of the corner handles of the shape to rotate the mask, release Left Click to confirm or ESC to cancel.

Skewing: Hold Left Click and drag any of the edge handles of the shape to skew the mask, release Left Click to confirm or ESC to cancel.

Shift Down: When the Shift Key is held, the mask will be rotated/skewed around the handle opposite the current one, the red marker indicates the anchor point being used.

Ctrl Down: When the Ctrl Key is held, the mask will be rotated in 15 degree increments, currently has no effect on skew.

13.2 Edit

When active individual vertices which make up each mask can be edited in the viewport, giving you a finer level of control, especially useful if you want to edit custom masks created with the *Draw* tool

13.3 Draw

When active you can draw your own custom mask in the viewport out of lines or bezier curves.

13.4 Grid Snapping

When enabled masks will snap to 1mm increments when dragged around.

13.5 Soft Clip

A special setting which effects the inner processing of the Path Finding Module used.

Some path finding modules support “Soft Clipping” where some shapes may touch or fully overlap the edges of the mask but the Path Finding Module will direct them to avoid the masked out area.

Soft Clip can result in some more organic looking masks whereas with it disabled shapes will be clipped sharply at the end of the mask.

13.6 Mask Controls

Here the controls you will find in the **Mask Settings** panel.

- **Enable Masking:** When disabled all the masks will be bypassed completely and the settings will be grayed out.
- **Display Masks:** Controls the visibility of masks, when disabled no masks will be visible.

For each mask you’ll see the following details.

- **Enable** - a checkbox which allows you to bypass specific masks.
- **Name** - the name for the mask, defaults too the mask’s shape.
- **Type - the type of the mask, controls what effect the mask has on the drawing, there are the following options.**
 - **Add:** If only *Add* masks exist, the drawing will only draw within the *Add* masks. If there are also *Subtract* masks, the *Add* will be performed first, and the *Subtract* masks may then remove from the *Add* masks
 - **Subtract:** If only *Subtract* masks exist, the drawing occupy the area not covered by masks. If there are also *Add* masks, the *Subtract* masks will take priority, and anything covered by a *Subtract* mask will not be included in the drawing.

There are some buttons at the bottom of the **Mask Settings** panel, some of these options can also be accessed by right-clicking a specific mask.

- **Add (Plus)** - Creates a new mask, the following types are available

- Rectangle - Adds a rectangular mask
- Circle - Adds a circular mask
- Star - Adds a star shaped mask
- X - Adds an “X” shaped mask
- SVG - Adds an SVG Mask, complex SVGs may fail to open as masks, the SVG should consist of only closed shapes and no paths. SVGs generated with DrawingBotV3 can also be used.
- **Delete (Minus)** - Deletes the selected mask, will be grayed out if no version is selected.
- **Duplicate (Eye)** - Duplicates the selected mask.
- **Move Up (Up Arrow)** - Moves the selected mask one position up in the list.
- **Move Down (Down Arrow)** - Moves the selected mask one position down in the list.
- **Invert Masks (Swap Arrows)** - Swaps the mask types so ADD -> SUBTRACT & SUBTRACT -> ADD
- **Clear Versions (Reset Arrow)** - Deletes all of the current masks, clearing the list.

13.7 Undo / Redo

Masks Settings support Ctrl + Z and Ctrl + Shift + Z to undo/redo specific actions, make sure the viewport is highlighted for the action to be registered.

EXPORTING DRAWINGS

DrawingBotV3 allows you to export Drawings in a variety of file formats.

All export options are accessed via the “File” drop down where you can select an *Export Mode* and an *Export Format*

Note: The export options will be greyed out if no drawing is loaded. Press **Start** and wait for processing to finish.

14.1 Export Modes

- **per/drawing**
The standard option, exports the drawing as a single file with all of the pens included.
- **per/pen**
Exports a separate file for each active pen in the drawing.
- **per/group**
Exports a separate file for each group in the drawing, when using Layers PFM or any Mosaic PFM other PFMs will only have one ‘group’
- **per/n pen**
Allows drawings with multiple pens to be split into a certain number of pens. Useful when exporting for Vintage Plotters which have automatic pen changes.

14.2 Export Formats

- **SVG Formats**
 - **Export SVG**
Export a standard SVG which will be compatible with any software which supports SVG import, each pen will be in a separate group.
 - **Export Inkscape SVG**
Exports a special SVG which can be imported into Inkscape with the layers preserved.
- **Bitmap/Image Formats**
 - **Export Image File**
Exports a bitmap image of the drawing, the exported image will be the scaled depending on the current “Export Resolution” PPI which is defined in Export Settings/Image & Animation, if you are using “Original Sizing” this will be the same resolution as the source image.

- **Export Reference Image**
Exports a bitmap image of the reference image, this is image used to create the final plot with all the cropping / image filter settings applied.
- **Vector Formats**
 - **Export PDF**
Exports the drawing a vector PDF file.
 - **Export GCode**
Exports the drawing as a GCode file, see [GCode Settings](#)
 - **Export GCode Test Drawing**
Exports a GCode test file which draws the extremes of the drawing area.
 - **Export HPGL**
Exports a HP-GL (Hewlett-Packard Graphics Language) file, which can be sent to Vintage Plotters manufactured by HP, Roland and many others.
- **Animation/Video Formats**
 - **Export Animation - Image Sequence**
Exports a image sequence animation of the drawing being created, using the same scaling as export created with *Export Image File*, see [Image Sequence Settings](#)
 - **Export Animation - H.264**
Similar to *Export Animation - Image Sequence*, used for creating a H.264 MP4 animation of the drawing being created.
 - **Export Animation - ProRes 422**
Similar to *Export Animation - Image Sequence*, used for creating a ProRes MOV animation of the drawing being created.

Export to vtype: [vtype Integration / Export](#)

14.3 Quick Export

Drawings can be exported instantly using the keyboard shortcut **Ctrl+E**, you can also use **File/Quick Export**. By default this will use **per/drawing / Export SVG** or the export format & mode selected in your preferences

This option is also accessible by going to .

14.4 Export to vtype

Drawings can be exported directly to vtype for further processing / optimisation.

More details here: [vtype Integration / Export](#)

14.5 Path Optimisation

When enabled vector outputs (e.g. svg, pdf, gcode, hpgl) will be optimised before being exported. *Path Finding Modules* which utilise curves will bypass Path Optimization by default to avoid curve flattening.

Line Simplifying: Simplifies lines using the *Douglas Peucker Algorithm* which will find a similar curve/polyline with fewer points to reduce file size / plotting time within the given tolerance.

Line Merging: Merges start/end points within the given tolerance, this reduces the amount of pen lifts required and decreases plotting time.

Line Filtering: Removes lines shorter than the given tolerance

Line Sorting: Sorts lines to minimise air time, the algorithm will sort lines by finding the first line which starts at the same point as the current line or the first line within the given tolerance, otherwise it will use the nearest line of those which haven't already been connected.

Line Multipass: Draws over each Geometry multiple times based on the required 'Passes' number. Often plotting over a line multiple times will result in a more consistent final result if a pens ink doesn't always run smoothly or if the plotter moves too quickly for the pen.

14.6 SVG Settings

Edit SVG Settings in your preferences.

General Export Background Layer: By default the Canvas Colour will not be exported with the SVG as when plotting this may result in unwanted lines. However, for digital only outputs you may wish to add the canvas colour as a background layer.

Inkscape SVG Layer Name: Allows you to specify a custom layer naming for how the layers will appear in Inkscape. You can use two wildcards *%INDEX%* - the pens index position (1,2,3 etc.) and *%NAME%* - the pens name. - *%NAME%* - Default, names all of the layers according to the pens name (e.g. Black, Red, Green etc.) - *%INDEX%* - *%NAME%* - In some instances Inkscape will print layers in order of layer number, so this option can be useful. (e.g. 1 - Black, 2 - Red, 3 - Green etc.) - *Pen%INDEX%* - Useful if you are using the "Plot" extension with Inkscape for sending plots to vintage plotters as this requires the pen layers to be named in this format. (e.g. Pen1, Pen2, Pen3 etc.) - *Custom* - You can of course create your own custom layer naming scheme if you prefer.

14.7 HPGL Settings

HPGL Settings will appear when selecting **Export HPGL**, you can also configure them in preferences

HPGL Settings can be saved as *Presets*, this only includes the "Paper Size" i.e. Min, Max, X Axis Mirror and Y Axis Mirror.

All units are defined in HPGL units, which are 40 Units = 1 mm.

Layout

HPGL Range: This should match the hard-clip limits for your plotter for the current paper size, in the order Min X, Min Y, Max X, Max Y. When adding support for your plotter you should use the *OH*; to get the HPGL hard-clip limits.

Rotation: Allows you to change the orientation of your drawing within the Hard-Clip limits, it's best to leave this on *AUTO* which will automatically rotate the image if it extends beyond the hard-clip limits.

X Alignment / Y Alignment: If the drawing to be exported doesn't fill the Hard-Clip limits it will be aligned to the page using these settings.

X Axis Mirror: Flips all values on the X Axis.

Y Axis Mirror: Flips all values on the Y Axis.

Pen Configuration

Pen Velocity: Defines the Pen Velocity in mm/s that the plotter should be set too, a value of 0 will use the maximum speed of the plotter.

Pen Number: Define the first pen to use, subsequent pens will increment this number, a value of 0 will be ignored and use Pen 1.

Pen Force: Specifies the force to be applied when plotting when using high-end HP plotters like the HP7550.

Curve Flatness: All curves are converted to lines when generating HPGL files, this value specifies the maximum distance (in MM) that the generated lines can deviate from the original curves.

14.8 GCode Settings

GCode Settings can be saved as *Presets*

You must specify the Drawing Area size when using GCode export.

X/Y Offset: The offset from HOME on each axis, in the specified input units.

Curve Flatness: When enabled all curves in the drawing are converted to lines. This value specifies the maximum distance (in MM) that the generated lines can deviate from the original curves.

Center Zero Point: Should be enabled when using machines which treat 0,0 as the centre of the paper

Comment Type: DBV3 adds some comments to the generated GCode file to help differentiate outputs, however some machine require comments in a certain format to you can choose between **Brackets ()**, **Semi-Colons** or **None** to disable these comments.

GCode - Start: A user customisable start command

GCode - End: A user customisable end command

GCode - Pen Down: A user customisable pen down command

GCode - Pen Up: A user customisable pen up command

GCode - Start Layer: A user customisable pen down command, you can use the wildcard `%LAYER_NAME%` which will be replaced with the current pens name, useful if the machine can prompt the user to switch to a new pen.

GCode - End Layer: A user customisable pen up command, you can use the wildcard `%LAYER_NAME%` which will be replaced with the current pens name.

The outputted file will also include useful info such distance moved, points plotted, pen lifts.

Note: GCode export is not as reliable as SVG export and has only been added for convenience. It is not a replacement for more advanced SVG to GCode converters.

14.9 Image & Animation Export Settings

Resolution

Export DPI: Controls the DPI of exported Images / Animations, the resolution is derived from the Drawing Area's width/height. If "Original Sizing" is being used this will have no effect.

FPS (Frames Per Second): Used when calculating the amount of frames to export.

Duration: The length in time of the animation, can be set in Seconds, Minutes or Hours.

Frame Count: Always $FPS \times Duration$ in seconds, unless the frame count is higher than the Plotted Vertices, in which case the frame count will be the same as the number of vertices.

Geometries per frame: *Plotted Shapes / Frame Count*

Vertices per frame: *Plotted Vertices / Frame Count*

Note: The image sequence exporter using an Vertex Iterator which splits continuous paths across frames, which can result in missing lines depending on the nature of the source curve.

BATCH PROCESSING

Allows you to process entire folders of images into line-drawings. This is especially useful when converting image sequences. Batch Processing will maintain the file names of the original files, but with the new file extension. If you are exporting “per/pen” the files will have the suffixes “_pen1”, “_pen2” etc.

All settings like Image Filters / Path Finding Settings / Export Settings / Optimisation will be used.

- **Input Folder:** The source folder for the image filters you wish to process
- **Output Folder:** The destination folder for the processed files.
- **Export Options:** You may select as many File Formats as you wish and export these per/drawing and/or per/pen
- **Overwrite Existing Files:** If enabled when a file output for a specific file already exists in the Output Folder it will not be overwritten, if all file outputs for a specific file already exist it will not be re-processed.

PRESETS

DrawingBotV3 supports the saving / exporting of presets as .JSONS which can be saved for future use or shared with other users. Presets will be saved automatically and be available when you restart the software. The following preset types currently exist...

- *Drawing Area*
- *Pre-Processing*
- *Path Finding Module Settings*
- *GCode Settings*
- *Drawing Pens*
- *Drawing Sets*
- *vpype Integration / Export*

When you see the “Presets” drop-down menu this indicates settings which can be stored as a preset, you will have the following options.

New Preset: Saves the current settings as a new preset, a dialog will appear for you to name the new preset.

Update Preset: Writes over the selected preset with the current settings, only works on user created presets.

Rename Preset: Opens a dialog for you to rename the current preset, only works on user created presets.

Delete Preset: Deletes the selected preset, only works on user created presets.

Import preset: Allows you to import a preset json.

Export Preset: Allows you to export a preset json.

VPYPE INTEGRATION / EXPORT

DrawingBotV3 allows you to export directly to *vpype* which gives you quick access to advanced layout tools, pre-visualisation, SVG optimisation, HPGL output and more.

You can even store *vpype* commands as *Presets* to speed up your workflow.

17.1 Setup / Usage

To export a drawing to *vpype* go to **File / Export to vpype**, you'll see a new window, from here you can select an inbuilt preset or enter your own command and then trigger use the **Send Command** button to send it to *vpype*. Note: You must specify the *Path to vpype Executable* before you can send a command.

Command:

Any *vpype* command can be used, note however that there is an implicit read command added automatically so you don't need to use `vpype read <FILE>`. So the **command** entered will be used in this format.

```
vpype read "temp_vpype.svg" command
```

Output Wildcard:

You can replace the output file name in your command with the wildcard `%OUTPUT_FILE%`.

If this wildcard is added, when you press "Send Command" you'll be prompted to choose the name / directory to save the file. For example this would be a valid command, which would show you a save prompt.

```
linesort write "%OUTPUT_FILE%.svg" show
```

Bypass "Path Optimisation":

Enabling this will bypass DrawingBotV3's *Path Optimisation* and therefore use *vpype* commands exclusively to optimise your outputted drawing. This option is command specific and is saved alongside a command preset.

17.2 Finding the "Path to vpype Executable"

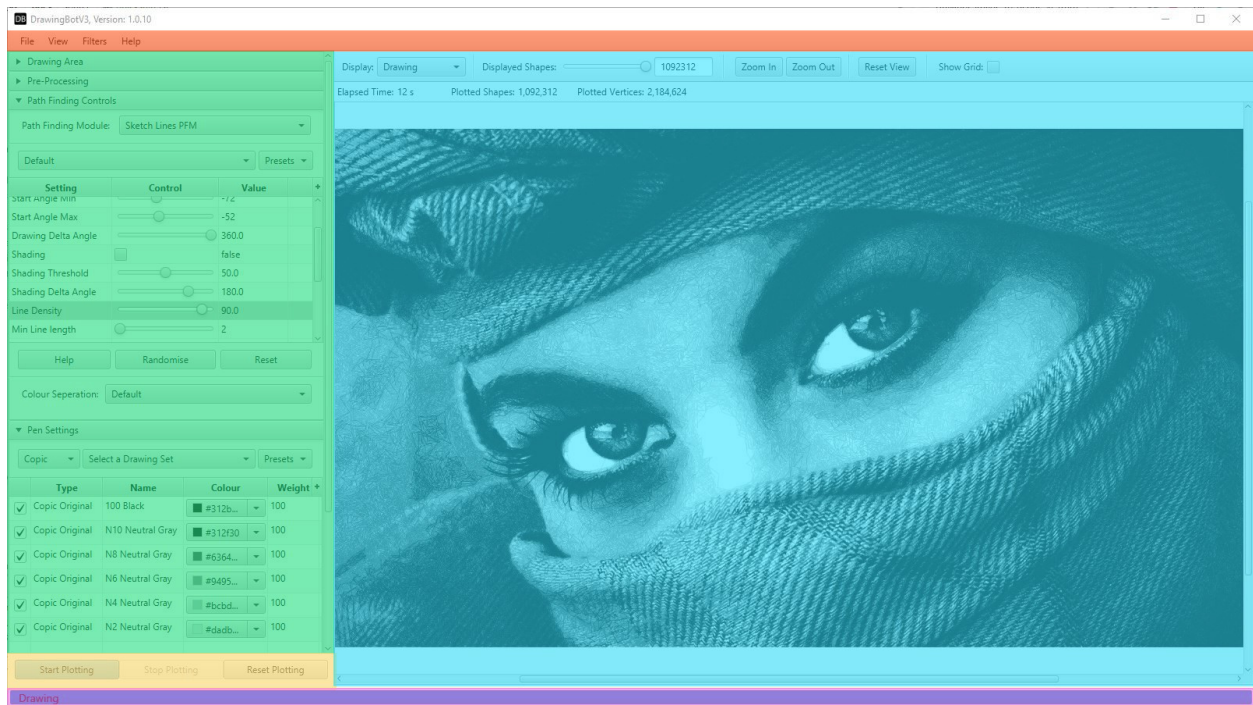
- 1) Open a terminal window and activate your virtual environment if you use one
- 2) Type `where vpype` (Windows) or `which vpype` (macOS and Linux)
- 3) Copy and paste the resulting path into the text field

You'll only need to do this once but if the *vpype* executable moves you will need to repeat this step.

CHAPTER EIGHTEEN

USER INTERFACE

This is a quick reference guide to areas of the user interface.



18.1 Toolbar

The toolbar gives you access to commonly used functions like importing / exporting. You can control which *Settings Panel* is currently open with the *View Menu*. You can also add Image Filters from the toolbar and configure the *Exporting Drawings*

18.2 Settings Panel

This area is split into multiple sections which each control different elements of the drawing

- *Drawing Area*
- *Pre-Processing*
- *Path Finding Controls*
- *Pen Settings*
- *Version Control*
- *Mask Settings*
- *Batch Processing*

18.3 Viewport

The viewport will show you a live preview of the current drawing, all the controls in this area, are **visual only** and will not affect the exported drawing. You can also drag + drop an image file here to import it. It has the following buttons.

Display:

- Image: Displays the filtered image, after resizing / pre-processing
- Drawing:
- Original: Displays the original source image.
- Reference: Displays the reference image being used by the Path Finding Module after it's inbuilt pre-processing has been applied.
- Lightened: Displays the image which has altered by the Path Finding Module, some modules will not alter the image.
- Selected Pen: Displays only the pen which is currently highlighted in the Pen Settings table.

Displayed Shapes: Allows you to display only shapes in the specified range, currently has no effect on the final output.

Zoom In: Increases the render size of the viewport

Zoom In: Decreases the render size of the viewport

Zoom In: Resets the render size of the viewport

Show Grid: Shows a reference grid to show the sizing of the image, *currently disabled*.

18.4 Plotting Controls

This area allows you to control the plotting process with the following buttons.

- **Start Plotting:** Begins the plotting process.
- **Stop Plotting:** Stops the plotting process **gracefully**, meaning the current *Path Finding Modules* will stop at the end of it's current process and save the drawing progress so far.
- **Reset Plotting:** Stops the plotting process **forcefully**, meaning the process will stop instantly and the drawing will be cleared

18.5 Progress Bar

This area will show status updates for the current task and its progress. This will be active while a drawing is being plotted / exported / rendered.

KEYBOARD SHORTCUTS

These are the Keyboard Shortcuts currently available.

19.1 General

- Ctrl + N - Create New Project
- Ctrl + O - Open Project
- Ctrl + S - Save Project
- Ctrl + I - Import Image
- Ctrl + E - Quick Export, see *Quick Export*
- Ctrl + F - Fullscreen Mode
- Ctrl + Z - Undo (for Mask Settings only)
- Ctrl + Shift + Z - Redo (for Mask Settings only)
- Shift + V - Save Version, see *Version Control*

19.2 Display Modes

- Shift + 1 - Switch to **Image** Display Mode
- Shift + 2 - Switch to **Drawing** Display Mode
- Shift + 3 - Switch to **Original** Display Mode
- Shift + 4 - Switch to **Reference** Display Mode
- Shift + 5 - Switch to **Lightened** Display Mode
- Shift + 6 - Switch to **Tone Map** Display Mode
- Shift + 7 - Switch to **Selected pen** Display Mode
- Shift + 8 - Switch to **Image Cropping** Display Mode
- Shift + 9 - Switch to **Exported Drawing** Display Mode

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