



FURNACE... ADVANCING THE ART OF DIGITAL VISUAL EFFECTS

FURNACE is a sophisticated suite of 2D image processing plug-ins, designed to enhance workflow and boost productivity for digital artists.

Taking advantage of over seven years' research into advanced image processing algorithms, notably motion estimation technology, Furnace provides digital visual effects artists with a wealth of tools to quickly and effectively tackle a diverse range of everyday compositing tasks.

Wire, rig and flicker removal, a world-class retimer, grain reduction, dust-busting, image stabilisation, auto rotoscoping, image segmentation and much more, Furnace features a whole host of plug-ins, which you'll find yourself using on a daily basis.

The Furnace development team were honoured with a 2006 Scientific and Engineering Award® from the Academy of Motion Picture Arts and Sciences® for their roles in the design and development of Furnace. The Academy considered the Furnace toolset's modularity, flexibility and robustness to have set a high standard of quality for optical flow based image manipulation.

Furnace seamlessly integrates with some of the world's leading compositing, editing and DI systems including Autodesk Media and Entertainment Systems®, Baselight, Film Master, Nuke, Scratch and Shake. Go to www.thefoundry.co.uk to obtain a free 15 day trial and the latest information on supported host systems.

Algorithm n. 1. a logical arithmetical or computational procedure that if correctly applied ensures the solution of a problem.

Motion estimation or the maths behind tracking every pixel in a moving image is an area in which we have pioneered a new generation of algorithms. Furnace is the only toolset to utilise motion estimation technology to solve such a diverse range of compositing issues and we continue to lead the way in motion estimation technology applications. Advances in technology combined with seven years' research and development into advanced image processing algorithms has given us the opportunity to revisit many of the existing Furnace plug-ins to optimise output, enhance speed and improve the user experience.

Since its launch in 2002, Furnace has been adopted by hundreds of post facilities across the globe and today thousands of digital artists look to Furnace to help ease the routine processes involved with the production of first class digital images.



THE FOUNDRY



Established in 1996, The Foundry is a leading developer of visual effects and image processing technologies that boost productivity and workflow in film and video post production. The Foundry has grown considerably since its early days, we now successfully license our sophisticated image processing technology to third parties, hold a portfolio comprising three Academy Award® winning products including high-end compositing application Nuke and operate offices in London and Los Angeles. Our innovative products are renowned worldwide and support a wide range of host platforms including After Effects, Autodesk® Media and Entertainment Systems, Avid DS, Baselight, Film Master, Fusion, Nuke, Scratch and Shake.

In addition to product development The Foundry has used its considerable influence to drive the development of an open standard for visual effects plug-ins known as OpenFX. OpenFX is gaining wide acceptance by host and plug-in developers, such as Autodesk®, Assimilate, Digital Vision, FilmLight, Grass Valley, Soluciones Gráficas por Ordenador (S.G.O.), Photon and others.

Other products from The Foundry... If you are looking for a stunning collection of 2D visual effects look no further than **Tinder** and **Tinderbox**; incredibly versatile collections featuring a vast array of fast, organic effects, a bunch of everyday tools and a host of blurs, generators and warpers. If it's a superior blue/greenscreen keyer that you are after, check out **Keylight**. If you require a powerful desktop compositing application take a look at **Nuke**; a production proven visual effects tool that brings speed, functionality and flexibility to your VFX pipeline.

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FURNACE 4... NEXT GENERATION MOTION ESTIMATION

Furnace 4 has the ability to separately calculate, pre-generate and utilise motion vectors. Many of the Furnace plug-ins use motion vectors and rather than calculating the vectors on a per plug-in basis it is now possible to calculate them once using F_VectorGenerator. This new technique has many advantages although the most significant is speed enhancement. If pre-generated vectors are not available, each plug-in has the ability to generate its own motion vectors. Furnace 4 also benefits from optimised results, speed enhancements and a more intuitive user interface.

Go to www.thefoundry.co.uk to download the software and obtain a free 15 day trial.

"Our artists are employed across a wide variety of high-profile projects. To guarantee we continue to meet clients' demands we require sophisticated digital tools to help us get the job done. The Foundry's Furnace is an impressive digital toolset that delivers time and time again, a first-class collection of tools, which should be on any Shake artist's wish list."

Nick Cannon, Head of Technology, Film, MPC

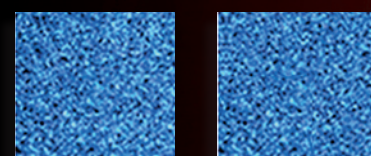


Image: TM and © 2006 Twentieth Century Fox. All rights reserved. X-Men Character Likenesses TM & © 2006 Marvel Characters, Inc. All rights reserved.

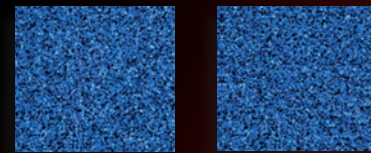
Image from X-Men: The Last Stand, MPC's VFX crew used The Foundry's Furnace to create breath-taking visual effects.

GRAIN MANAGEMENT

ReGrain and **DeGrain** are a pair of advanced grain management tools. **DeGrain** is an intelligent solution designed to remove the maximum amount of grain without damaging the image. **ReGrain** duplicates grain either from a sample image or stock footage and applies it to a new sequence. The images on the left show exaggerated samples of grain from Kodak 320 and 500 film stock. Furnace's **ReGrain** was used to sample and synthesise the images on the right.



Kodak 500 ReGrain



Kodak 320 ReGrain

"The Foundry's Furnace shouldn't be called plug-ins - they're so much more - powerful hardcore image manipulation tools."

Mike Seymour, InCase Sydney & Co-founder fxguide.com

DeNoise is a noise and grain removal plug-in that uses advanced motion estimation technology along the direction of motion, thus reducing the noise without introducing any of the artefacts typically associated with noise reduction.



Original image After using DeNoise

MATTE / ROTO ASSIST TOOLS

ColourMatte quickly and cleanly pulls a foreground key from an object against any background. **ColourMatte** is particularly good at coping with partially transparent edges such as hair or fur and works well on motion-blurred images.



Original image Extracted matte using ColourMatte Output composited over grey

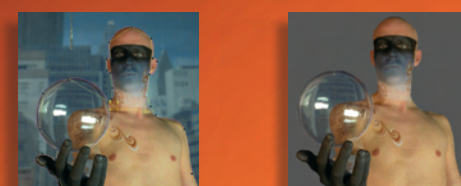
MotionMatte, given a sequence with a foreground object moving relative to the background, **MotionMatte** generates a segmented version of the foreground and associated alpha matte, with minimal user intervention.



Original image Extracted matte using MotionMatte Output composited over grey

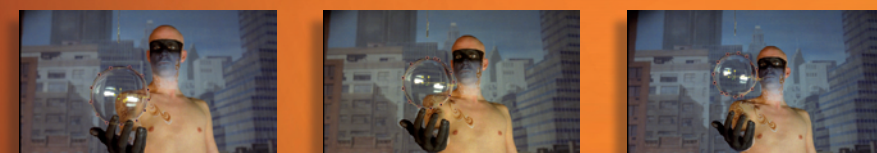
MatteToRoto will take a matte from any source, for example, **MotionMatte** or **Keylight** and transform it into a standard Shake roto shape. **RotoShape** converts. Raw vector masks into Shake roto shapes and vice versa for improved interoperability.

EdgeMatte is designed to save rotoscoping time. Roughly outline the object to be roto'd and **EdgeMatte** will snap to the edge, producing an articulate roto and alpha matte of the object. As opposed to conventional 'snap-to' tools **EdgeMatte** uses advanced algorithms to ensure the edge shape produces an accurate but realistic outline of the object.



Input roto and output edge generated by EdgeMatte Foreground extracted using EdgeMatte

RotoTracker will track a roto shape through a sequence, keeping it accurately attached to an object even as it changes shape. **Tracker** is a multi-point tracker that has been designed to robustly track the most challenging of regions. The plug-in is particularly good at handling regions of occlusion (where the tracking point goes behind another object or off the edge of the image).



Frame sequence using RotoTracker

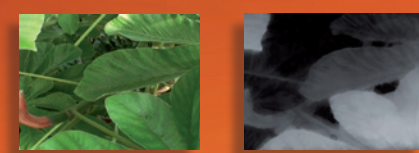
OPTICAL FLOW

Kronos uses The Foundry's advanced motion estimation technology to build in-between frames in a sequence. **Kronos** can be used to speed up (with motion blur) or slow down an image sequence. You have the option of supplying foreground mattes, to give retimed objects tight crisp edges and the latest version will detect and account for occluded regions of the image.



Retimed images using Kronos from Orange Commercial

Depth calculates the relative motion within an image sequence in order to produce a depth matte. This depth matte is based on the principal that depth is inversely proportional to motion.



Original image Output image using Depth

FrameRepair replaces damaged or missing frames. When David Beckham accidentally kicked a ball at the Time-Slice rig, damaging a camera, Tim MacMillan of Time-Slice Films thought all was lost. **FrameRepair** quickly replaced the missing frame by interpolating pixels from images either side, producing a seamless repair.



Previous frame Missing frame created using FrameRepair Next frame

MotionSmooth temporally averages an image sequence by performing motion compensated temporal median filtering. Unlike a standard frame blended average this plug-in smooths an image sequence without creating half mix frames, producing a much cleaner and more accurate result.

MotionBlur utilises advanced image processing to add organic looking motion blur to a sequence. Blur can be added automatically based on the amount of motion in the sequence or the shutter time can be set manually.



Original image After using MotionBlur

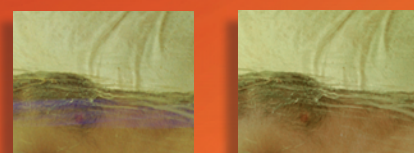
VectorGenerator utilises our next generation motion estimation engine to produce accurate sets of vectors between frames. By using **VectorGenerator** you only need to calculate the vectors once and you can input them into many of the Furnace plug-ins, saving bundles of time. **VectorWarper** allows the user to warp an image sequence using vectors from a different image sequence. This plug-in can be used creatively to produce unusual temporal image effects. **VectorConverter** is a tool designed to convert images representing motion vector fields originating from other vendor applications, into the vector format used in Furnace by providing a simple interface to rewire, scale, offset and invert the colour channels.



Original image Vector field generated using VectorGenerator

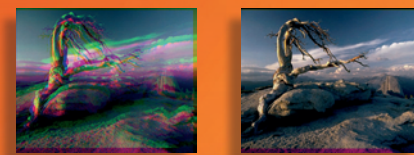
REPAIR & RESTORATION

ChannelRepair is designed to repair film damage that only affects some of the channels of film, e.g. water, chemical or mechanical damage to the top layer of the film. The algorithm uses information from the clean channel(s) to make a seamless repair.



Original image Repaired image using ChannelRepair

ColourAlign automatically removes any discrepancy in the global alignment of the three colour channels in an image.



Original image After applying ColourAlign

Contrast is designed to enhance the colour contrast within an image. It is adaptive and spatially varying. Based on its analysis of the scene content it automatically calculates a different curve transformation for each pixel in the image and true colour is enhanced.



Original image Enhanced image using Contrast

DeFlicker1 and **DeFlicker2** are fully automated plug-ins designed to remove luminance flicker in a sequence. **DeFlicker1** is particularly good at coping with flicker that does not originate from the original scene, e.g. ageing film, dust and chemical exposure. **DeFlicker2** is designed to remove in-scene flicker, poorly synchronised light rigs, stray light etc. Both of our **DeFlicker** solutions can remove multiple over-lapping phase different flickers, while adapting to cope with motion in the sequence.

DeBlur, unlike most solutions this is not a simple sharpen filter, it's a smart solution designed to automatically remove global motion blur or out-of-focus blur from a sequence.



Original image After using DeBlur

DirtRemoval automatically detects and cleans dirt, dust and hairs from a film scan. The repaired regions can be marked in the alpha channel for easy identification. Alternatively, the artist can identify which parts of the image are to be repaired by roughly painting the region in the alpha channel of the input sequence. In either case the resulting sequence will be blemish free with no new artefacts introduced.



Original image Image cleaned using DirtRemoval

MatchGrade copies the colour look from a reference sequence and applies this to the source image. This technique involves a non-linear transformation of the colour histogram and is useful for balancing and colour matching plates to the master grade.



Image requiring a grade Desired image grade



Image generated using MatchGrade

ShadowRemoval removes translucent objects such as shadows from a sequence. The artist loosely highlights the area to be removed and **ShadowRemoval** will perform a seamless extraction of the unwanted object.



Original image Image using ShadowRemoval

WireRemoval is an automatic tool for removing straight or curved wires from a sequence, whilst preserving the images grain and background detail. **WireRemoval** comes with a whole bunch of tools to tackle variable width over the wire's length, as well as wire tracking and automatic colour correction. **ScratchRepair** removes scratches from film. **ScratchRepair** is a smart solution designed to seamlessly remove vertical, horizontal and curved lines whilst minimising damage to the image.



Original image After using WireRemoval

RigRemoval removes unwanted foreground objects from a clip. The artist loosely highlights the foreground object, and provided there is sufficient motion of the foreground relative to the background, visible fragments of background elsewhere in the sequence are extracted to fill the rig region. In this example the man has been removed.



Original image After using RigRemoval

MATCHMOVING TOOLS

Align can be used for stabilisation and match moving. In its most basic form it attempts to line up two images without having to select tracking points.



Source image Unaligned image Aligned image Output image using Align

Correlate spatially or temporally realigns one clip with another. If you have two panning shots from a hand held camera that pan at slightly different speeds, **Correlate** can align them by picking the best matching frame from the clip and then move it into position. The plug-in also allows you to match the colour grade of the clips. (**Correlate** is only available for Autodesk® Media and Entertainment Systems)

SmartZoom makes it possible to zoom in on an object without losing picture detail. Given a sequence of frames looking at the same object, **SmartZoom** takes the different sub-pixel information in each frame to produce a single higher resolution output image.



Original image Enhanced image using SmartZoom

MotionMatch tracks planar regions in a sequence. The plug-in allows an artist to create new image elements such as hand-painted frame repairs and logo replacements and accurately patch them over a complete clip, taking any perspective changes, rotation and zooms into account.



Original image Output image using MotionMatch

SmartPlate takes a sequence of images and aligns each frame to produce a single large image. Moving foreground objects can be removed to generate a huge clean plate.



Original image Output plate generated using SmartPlate

TEXTURE GENERATION

BlockTexture, **PixelTexture** & **Tile** are all texture replication algorithms. They have many uses, for example hiding unwanted objects, generating sheets of texture for 3D texture mapping, or crowd duplication. In this example **BlockTexture** was used to bring the crowd forward by sampling from another part of the image. **SmartFill** seamlessly removes unwanted items from a picture. This technique realistically fills a region using pixels from the surrounding area. It's ideal for removing film blotches or unwanted objects left in shot.



Original image New image using BlockTexture

Splicer stitches together arbitrarily shaped images or parts of an image. Given a rough join position, the plug-in automatically finds the most visually believable seam along the border between the images. Possible uses of **Splicer** include generating backgrounds, removing foreground elements and creating large clean plates.



Original image a. Original image b.



Clean plate image generated using Splicer

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