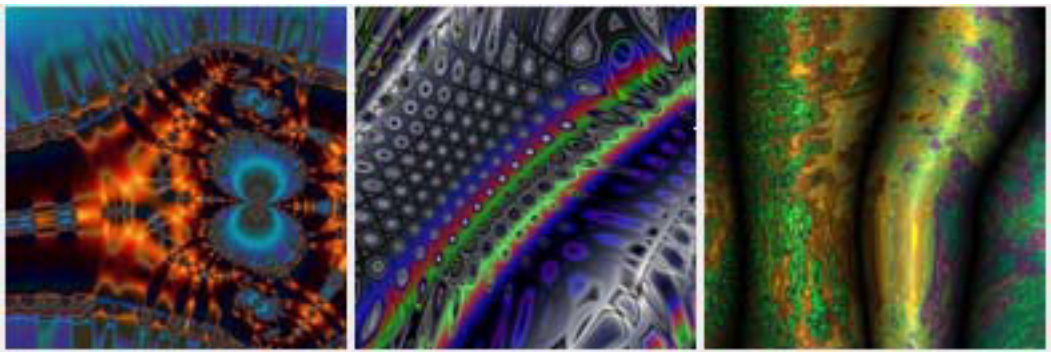
Welcome to ArtMatic !



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ArtMatic is a unique kind of program: a modular, patchable graphics, animation and audio synthesizer. Its modular design and rich component set allow you to create stunning images, animation, video effects and sound. The applications for this tool are endless. Imagine creating fractal art, 3D scenes, and stunning video effects with the same tool! Anyone can create breathtakingly vibrant images, psychedelic animation, and exciting new sounds. Demanding pros and amateurs alike will find countless uses for this exciting application.

ArtMatic can create:

- **Pictures** - an incredible number of stunning pictures can be created during even a short session of a few minutes. Be sure to have enough disk space!
- **QuickTime Movies** - ArtMatic features several animation modes to render high resolution QuickTime movies.
- **Sounds** - Strange, exciting sounds can be automatically generated from ArtMatic's mathematical "structures". Don't worry, no mathematical skills required.

Here are just a few uses for ArtMatic:

- Create digital fine art,
- Create animation sequences for music and art video,
- Create unique video effects for processing QuickTime and DV movies,
- Create CD cover and label art,
- Create background images for web pages and brochures
- and much, much more.

How does it work?

While complex mathematical principles and sophisticated graphic functions underlie ArtMatic, you don't need to be a math whiz or experienced graphic designer to achieve amazing results with ArtMatic. Follow the simple steps described in the QuickStart, and you will be creating ArtMatic images and animations in minutes. To get started, all you have to do is choose a structure from the **Structures** pop-up menu and click on the Randomize All button (the largest of the three dice) to explore a new picture-generating system.

If you want to torture your brain, you can think of each system as an Nth-dimensional universe where the image you see is a two-dimensional view from a particular point. Changing parameter values moves you to different locations in this rich universe. You will discover that every picture-generating system can create a vast array of striking images.

Learning to use ArtMatic

ArtMatic is a rich environment which can be explored in a number of ways. It can be used in a 'Zen' way in which you roll the dice and mutate to explore, or it can be used in a more directed fashion. We have provided a series of tutorials for those that want to master this amazing tool. We have also provided a wide range of example files that you can use as starting points for your exploration. **Be sure to explore** as many examples as you can--the range of images ArtMatic can create is truly astonishing -- so astonishing that it often surprises its own creators!

What's New in ArtMatic Pro 2.5

About This Chapter

This document provides a quick summary of the new features for users already familiar with ArtMatic 1.2 and ArtMatic Pro 2.0. ArtMatic Pro 2.5 introduces major changes to ArtMatic and ArtMatic Pro's architecture. Now, it is not only an extraordinary art synthesis tool but also a terrific image and video manipulation tool capable of creating spectacular image and video special effects using either ArtMatic's traditional gradient-based synthesized color or **true color**!

ArtMatic Pro is no longer just for the 'zen-mode' creation of images. Its new features open up astonishing capabilities for image design, and the new Getting Deeper advanced tutorials will help artists master this amazing new tool.

"Zen-mode explorers" will find that ArtMatic Pro can create an even wider range of images than before, and those users that seek greater control in manipulating and creating images and animation will find spectacularly expanded control and flexibility as well as a wealth of new primitives that include true 3D and true color (RGB) manipulation.

Here is a quick overview of the major changes introduced since ArtMatic Pro 2.0:

- ArtMatic structures now have a time-based third global input which systems can tap
- **True color** RGB color mode which allows for native color processing of color images and QuickTime movies,
- Four input pictures/movies per file,
- High quality animation mini-preview of animation in the main window (shortcut: command-h),
- New **compilation** feature permits a complete ArtMatic structure to be exported and used as a single component in other ArtMatic files,
- Recursion and iteration features permit the design of new fractals,
- True 3D components and textures for generating and manipulating 3D objects and solids,
- Expanded and improved shading model
- Many new components and component types,
- A host of new components for RGB and HLS manipulation,
- More flexible tree manipulation and construction functions
- **Connection dialog** for custom connections between components
- Parameter/function locking to make locked parameters immune from changes from the Mutations dialog or clicks on the small die.
- Pict/Movie popup for selecting and changing input movies and pictures
- Input Movie Setup command in the **Animation** menu
- Re-organized and upgraded Preferences, Edit Camera Path and Parameter Envelopes dialogs
- Direct numeric entry of parameter values (via the Parameter Envelopes dialog)

ArtMatic 1.2 users may also want to read the appendix Added In 2.0 for a summary of features found in ArtMatic Pro 2.0 that were not found in earlier versions of ArtMatic.

Important Compatibility Note for Users or ArtMatic Pro 2.0

We have tried to make ArtMatic Pro 2.5 compatible with files created in earlier versions. However, due to the way the complex, dynamical systems work and due to bug fixes in some components, some files will not appear the same in version 2.5 as in earlier versions.

It is strongly recommended that you make backup copies of all files created with older versions in case one or more of your files renders differently with version 2.5. We also recommend that you keep a copy of the ArtMatic version used to create those files in case you need to re-render them. In particular, systems that use the **sin x + sin y** or **sin x * sin y** 2D-scalar (2-in/1-out) components will be different. If the files have keyframes, the keyframes will no longer be as created and may need to be re-created from scratch.

Finding input pictures/movies. ArtMatic 2.5 has a new method for finding movie and picture files referenced by ArtMatic files. When ArtMatic can't find a movie or picture referenced by a file being opened, a message will appear in the **Tool Tips** area while it searches for the file. Pressing the Escape key will cause ArtMatic to give up looking for the file.

New Getting Deeper Tutorials

A new chapter has been added to the documentation which provides lessons and information that will be of interest to any user that wants to learn to control and manipulate ArtMatic Pro. Click here to read the new chapter.

NEW FEATURES

The rest of this chapter covers the most significant new additions to ArtMatic Pro 2.5. In addition to the changes covered here in detail, there are a wealth of new components.

Third Global Input (time/z-dimension/counter)

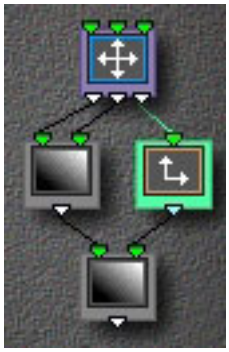
In earlier versions of ArtMatic, only two values could be fed into the top of the structure tree. Version 2.5 introduces a third global input which is fed to all systems that have a three-input tile at the top of the tree **or** a tile with an open third input in the interior of the tree. This third input (called the third global input or time) is a value which is steadily incremented over the course of an animation.

There are many ways to use and interpret the value which is actually a simple counter that starts at 0 and is incremented over the course of an animation. It can be viewed as a time input since its value increases steadily with the passage of time and provides a simple means of modulating the system over time. It can be used as a control source for those components that use the final input as a control source (**z Wipe** or **Packed RGB z Sort**, for example). It can also be used as a third spatial co-ordinate which increments over time. When used in this last way, you can think of the canvas as being a 2D slice of a three-dimensional space. With each incrementing of the third global input, the canvas is moved along the third dimension so that each frame is a slice from another point along the z-axis.

The third input's value is 0 at the beginning of an animation and a fixed value at the end that is the same in all systems regardless of the elapsed time. The value increases steadily between 0 and the fixed value over the course of the animation. To modify the counter's normal behavior, insert a 1D scalar (1-in/1-out) component in the tree to scale or alter the values. In this way, time can be made to cycle or accelerate or even change at random.

This new input is very handy for controlling an animation. Previously, when using keyframe animation, changes during an animation only occurred if the values of some parameter sliders were different in different keyframes. Now, time can be used to manipulate a system even if all its parameters stay constant.

A simple example. In the folder "Doc. Example Files" is a file called "Simple Time Explorer" which contains a simple system with 3-inputs at the top.



The topmost component simply scales the three incoming values (x co-ordinate, y co-ordinate, and time). The amount of scaling is provided by the A, B and C parameter sliders. For this example, no scaling is done. The x and y co-ordinates are passed unchanged to the **Ax+By+C** component which simply generates a tilted plane. In this case, the parameters have been sent to send out 0 for all points (essentially a plane with no tilt). The last component is another **Ax+By+C** component. There is one other component in the tree. It is the scale component which is connected to the rightmost (the z/time output) of the topmost component and whose output feeds the 'y input' of the final component in the system.

Click on the file's keyframe and click the **Add** button which creates a second identical keyframe. Now click the **Animate Keyframes** button. Note that the result is a gradual color change over time. In previous, versions of ArtMatic, animating between identical keyframes would also yield a static result. You can simulate ArtMatic's old behavior, by clicking on the scale component's tile and clicking Parameter A's lock icon then dragging the slider to 0. This causes the z-value to be a constant 0. If you now animate the keyframes, nothing will appear to happen. Notice that you can change the response to time by changing the 1-in/1-out component. For example, you can use the **Random** component to randomize the color change.

Important notes about 'time'. This new input has a few side effects which may seem surprising. **First**, it is important to keep in mind that the third global input is fed into open inputs that are in the middle of the tree (as in the picture at left); hence, time can influence trees that have only two inputs at the top. **Second**, the counter's value increments with the passage of time **even if it flows through locked tiles**. (Parameter locking only prevents a tile's parameters from changing. It has no influence on the values that flow through the component.) **Third**, when you add a keyframe in a system that makes use of the third global input, the image may change when the keyframe is added. This happens because, while you are editing, the third input has the time value of the most recently viewed keyframe (or the value it had when animation was stopped). ArtMatic is only able to calculate the correct time value when the keyframe is actually added.

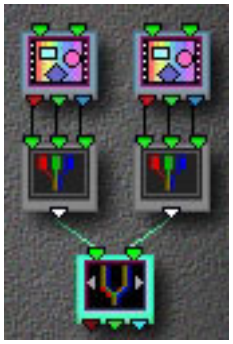
Examples. Many of the example files we have provided make use of this time input. Several examples are found in the folder **Doc. Example Files:Time Examples**. You can also search the main example library for "time" to find more examples.

True Color (RGB/HLS) Color Handling

In all earlier versions of ArtMatic, the final output color was strictly determined by the active gradient (palette) and the shading algorithm. As a result, input pictures and movies were always rendered with the colors of the gradient. In the new version, ArtMatic adds true color RGB color output which can directly generate 32-bit color output and which bypasses the file's gradient and shading algorithm. When the tree's final component has three outputs, the output values are not mapped to a color in the active gradient. Rather, the outputs are treated as the RGB (red, green, blue) values of the final image. This makes possible the creation of a wide range of images not possible in earlier versions. The most obvious impact is that it is now possible to process color pictures and movies while preserving their original colors. It is even possible to do advanced color processing and manipulation of these images to create amazing new special effects. ArtMatic even has new components that provide HLS and gamma processing.

Gradients & RGB color. Gradient-based shading is still used in all systems that terminate with a single output value (or a two-output tile--which is actually treated as two parallel one-output tiles). It also available in RGB-based systems through the use of new components which can either mix gradient-based and RGB branches of a tree or convert gradient-based branch to RGB. If the final component is not a three output component, the structure tree's output is fed into the shading component which determines how the output values are mapped to the colors of the selected gradient. If the final component has three outputs then the **RGB Color Model** is used.

New color components. Several new **movie/pict** components have been added to take advantage of this new color model. In addition to the 2D-scalar **movie/pict** component introduced in ArtMatic Pro, there are now 2-in/3-out **movie/pict** components for using the movie/picture's true colors.



A number of new components have been added for the manipulation true color images--including HLS (hue, luminance, saturation) manipulations. Because ArtMatic components are limited to four inputs per component, a new **Pack** component has been added which combines three input values into a single special value which can be passed to the special components that know about packed inputs. **Pack** makes a **packed component** with two inputs equivalent to a component with six inputs, which is necessary for components that mix two or three color pictures or movies. In the example structure shown at left, there are two identical parallel branches whose first component is the **color pict/movie** component which is followed by the **pack** component. The system is terminated by the **Packed RGB Crossfade** which takes two packed inputs and acts as a mixer for the two input images. Only components that have the word "packed" in their title know about packed inputs.

A number of new three output components (with two, three or four inputs) have been added for color processing, mixing and texture generation. Be sure to check out the example files to see the wide range of images and effects which are now possible.

New Shading Model and Shading Options Pop-up Menu

A number of refinements have been made to ArtMatic's original shading model (which is now called gradient-based coloring or shading) to provide additional control of the "fog" and "shadow" effects which previously were automatically assigned and only available to some shading algorithms. The names of some of the advanced shaders have been changed to reflect a refinement of the advanced shading algorithms. The **fog** and **shadow** effects that were available in only some algorithms are now universally available through the new **shading options** pop-up menu that is available below the main **shader pop-up menu**. These options (called **depth cueing** and **global shading)** are also available to RGB-based systems.

The advanced shading algorithms turn these new options on and off rather than having them built directly into the shader. This new interface makes fine control of these effects possible as well as making the effects available to all systems.

Component marked with depth cueing glyph

Depth cueing. Depth cueing simulates the color-filtering effect that the atmosphere has on the perception of distant objects. Depth cueing works by assigning a color (the first auxiliary color) to be associated with depth/distance. This color is superimposed on the image in relationship to the depth /distance. As the distance increases, so does the brightness and opacity of the depth color. ArtMatic now provides direct manipulation of depth cueing which can be used for both distance effects and purely decorative effects. Previously, there were several algorithms whose names contained the word **fog**. To be consistent with the new **shading options**, the shading algorithm names have been changed to use the more-technically-correct **depth cueing** which refers to a technique that simulates depth/distance effects.

Depth cueing color note. The depth cueing color (the first auxiliary color) is now always visible/available even if Depth Cuing is turned off. This color is used in RGB-based systems wherever the value **infinity** is encountered. Infinity is used for the areas outside the boundaries of 3D objects and where the **infinity gate** component is used.

Component marked with global shading glyph

Global shading (shadows). Another new shading option is **Global Shading** (or shadowing) that can be turned on via the options menu. Global shading creates shadows and light in the image by modulating the luminance (brightness) of the image's pixels. Where the shading component generates low values, the image will be dark (shadowed), and where it generates large values, the image will be brighter. As with depth cueing, you can now choose the component that provides the shadows (global shading). As in previous versions, the shaders with the words "global shade" make use of this technique. The shadow computation is no longer built into the shaders themselves. Rather, the algorithms with "global shade" in their names, simply turn the **Global Shading** option on in the **shading options** menu.

Controlling depth cueing and global shading. Previously, these effects were built directly into the shading algorithms, and ArtMatic

automatically picked the components it used to provide the depth cueing and global shading. Now, these effects are turned on and off via the **shading options** pop-up, and you can override the automatic selection and choose the components used to provide the effects. It is even possible to have branches of your tree whose only purpose is to provide depth and shadow effects. These options are available regardless of the active shading algorithm. To **turn on depth cueing or global shading**, pop up the options menu and choose a depth cueing or global shading option. To turn the options off, select either **Depth Cueing Off** or **Global Shading Off**.

Automatic or manual control. By default, ArtMatic selects the components that control the depth cueing and global shading (according to the rules described in the Shaders chapter of the manual). You can override the automatic selection by choosing **Component Sets Depth** or **Component Sets Shade** which causes the selected tile to be used to provide the effect. A small shaded glyph (as shown in the illustrations above) is used to indicate components that have been manually assigned. **Restoring automatic shade/depth control.** If you have used the **Component Sets Depth** or **Component Sets Shade** commands and want ArtMatic to restore its automatic depth/shading choice, select the **Fog and Shade Automatic** item from the **shading options** popup menu. Note that **Fog and Shade Automatic** may have a check mark even if depth and shading are turned off. The check mark merely indicates that if shading/depth are turned on that ArtMatic will choose the components automatically.

Shortcuts. Two keyboard shortcuts have been added to facilitate using these new features. Type **s** (not command-s) to turn on global shading and assign the selected component for use as the shading component. Type **d** to turn on depth cueing and assign the selected component the depth cueing function.

Tutorials. These features are explored in the Shading Tutorial found in the QuickStart 3 chapter of this manual.

Mini-Preview

Type command-h (or choose **Preview** from the **Animation** menu) to see a small high-quality preview of the animation. Preview plays the animation using the last animation method (keyframe or random path) viewed. To change the animation type that is used by preview, press the **Animate Keyframes** or **Random Path Animation** button.

Multiple Input Picts/Movies Per File

ArtMatic Pro now allows each file to reference up to four input pictures or movies which makes possible an astounding range of special effects. ArtMatic can now be used to directly perform complex transition effects as well as to combine ArtMatic-generated images with existing pictures and movies. The range of possible effects is overwhelming. We recommend taking a look at the provided example files to get an idea of just some of the amazing things that you can now do. Keep in mind that anywhere that a picture is used as an input, a movie or DV stream can also be used. If you have video captures or QuickTime movies, we recommend that you explore the exciting effects that can be achieved with ArtMatic Pro by using your movies as input sources in any of the example systems we have provided.

We have modified the user interface for selecting input sources and assigning them within the system. A new **input source popup menu** () has been added to select and change the pictures in use by the system. Click and hold the mouse button to popup the menu. **To add a picture or movie as an input source**, select any empty slot from the new input source popup menu. **To replace a picture or movie** already in use by the ArtMatic system, hold down the option key, pop up the menu, and select any slot that is in use. A dialog box will appear that permits you to choose the picture to use in place of the existing picture. **To assign a picture to a particular tile**, select any tile that uses a movie/pict component then select the input source from the popup menu.

Parameter & Function Locking

Parameter locking. It is possible to lock parameters to prevent them from being changed by any operation that normally changes parameter values. Parameter changing operations include: random path animation, the Mutations dialog, keyframe animation, and the randomize parameters die (the lefthand die).

To lock all tiles, shift-click any unlocked parameter. **To unlock all tiles**, shift-click any locked parameter. This makes it possible to use the **Mutations** dialog to explore variations of only a few parameters.

Function locking. It is possible to lock the function assigned to a tile so that it is immune to operations that mutate function assignments (such as when you roll the big dice or use the **Mutations** window with the "mutate functions' option). To lock a tile so that its function will not be changed, lock all three parameter locks when the tile is selected. Note that even if the component has no parameters, all three locks must be locked to lock the tile.

Locking parameters and functions is a great way to explore ArtMatic systems. Parameter/function locking makes it possible to use mutations and the large die to explore subtle refinements of systems. For example, you might have a system that uses a few tiles to provide the texture for a surface. You could lock all of the parameters and functions of the system except for the tiles that provide the texture and then use the big die or the **Mutations** window to discover new textures created by function mutation that affects only the few components that provide the texture.

A note about parameter locking and keyframes. When parameters are locked, keyframe animation uses the last values assigned to the locked parameters when animating the system. As a result, any parameter changes stored between keyframes are ignored while the parameters are locked. The parameter changes are not lost however, just ignored. When the parameters are unlocked, any parameter changes stored in the keyframes will be honored during animation.

Compiled Trees

One of the most powerful features added in ArtMatic Pro 2.5 is the ability to export a structure tree as a compiled tree that can be used as a component in another ArtMatic file. This makes it possible to create extremely powerful building blocks of your own and to create extraordinary new images never before possible. Advanced users will find that they can even design their own fractal algorithms. Be forewarned, the use of compiled trees allows you to create structures that take a **very very** long time to calculate--especially on slow machines. We have supplied a large number of example files which make use of compiled trees and recommend that intermediate and advanced users explore them in some detail. The new Compiled Trees & Iteration chapter covers compiled trees and iteration in detail and provides a tutorial on the construction of iterative trees.

> **PLEASE NOTE!** When exploring our example files, you should probably not adjust the **Recursion** or **Iteration** parameters of compiled trees. Each recursion level requires significant additional processing. Increasing the amount of recursion can completely tie up even a fairly power computer in some cases. So, we recommend that you leave these parameters alone unless you are adventurous and patient and have a good understanding of how recursion and compiled trees work.

How compiled trees work. The **File** menu has a new command called **Export Compiled**. When a structure is exported as a compiled tree, the structure tree and the file's keyframes are saved as a compiled tree. A compiled tree **does not** contain any color information (i.e. the gradient and shading algorithm are not part of the compiled tree). This tree can now be used as a component in another ArtMatic file. To use compiled trees, simply click on a selected tile to pop up the component popup menu and choose the **Open Compiled Tree** component. A dialog box will appear that allows you to select the available **relevant** compiled trees. A relevant tree is one that has the same number of inputs and outputs as the selected component. For example, if you export a tree that has two inlets at the top and two outlets at the bottom, it can only be used within tiles that have two inputs and two outputs. Note that compiled trees do not include camera path information, and, as a result, any movement performed via camera path animation is not stored in the compiled tree.

Keyframes and compiled trees. When compiled trees are used as components, their keyframes are imported and blended with those in the parent tree. This is a very powerful mechanism that allows you to build compiled trees that act as animation primitives or macros. If the parent tree has fewer keyframes than the subtree, new keyframes are added to the parent tree and adjusted so that the motion programmed in the subtree's keyframes is preserved.

Editing/viewing embedded compiled trees. When using a compiled tree as a component, the compiled tree is copied into the parent

and becomes independent of its original source. The subtree can be viewed and further modified from within the parent. Typing 'e' when a compiled tree component is selected allows you to edit and view the subtree. There are some restrictions when editing subtrees. A subtree's basic structure cannot be changed though you may change the components assigned to the subtree's tiles. To prevent subtree structure changes, all structure editing tools are disabled while editing a subtree. Type 'e' again to leave subtree editing mode.

Re-exporting compiled trees. While editing a subtree (as described above), it is possible to re-export the tree by choosing **Export Compiled**. Only the subtree is exported when in subtree editing mode.

Importing compiled trees. It is possible to create a new ArtMatic system derived from a compiled tree. To do this, choose **Import Compiled** from the file menu. The file's structure and keyframes will now match those of the compiled tree and replace whatever structure and keyframes were present prior to choosing the command. Note that compiled trees do not contain camera path information.

Recursion. While compiled trees are not re-entrant (a tree can't be compiled if it contains a compiled tree), many of the compiled tree components have a recursion parameter which feeds the components output back into the input a specified number of times. Recursion makes possible the creation of new fractal and fractal-like components. See the examples provided with ArtMatic Pro. By default, the recursion parameter should be set to 0 since recursion only makes sense with structures intended to be recursive.

> **Note**: To avoid systems so complex they could bring even powerful systems to a halt, it is not possible to export a structure as a compiled tree if the structure already contains a compiled tree.

Tutorials. Many of these features are explored in the Compiled Trees Tutorial found in the QuickStart 3 chapter of this manual.

Expanded Tree Editing Capabilities

ArtMatic Pro 2.5 provides considerably more flexibility when editing the structure trees than did ArtMatic Pro 2.0. Previously, ArtMatic did not like inconsistent (incomplete) trees (i.e. trees with unconnected inputs and outputs in the middle of the tree) and placed limitations on the editing operations you could perform.

While there are still some limitations, most have been removed since it is sometimes necessary to temporarily leave a tree in an inconsistent state. Removal of the limitations has made it possible to accidentally leave a tree in an inconsistent state which you should avoid. While incomplete trees are not forbidden, they may behave surprisingly when their parameters are mutated or animated or when used as compiled trees. So, it is a good idea to make sure that trees are complete except for those cases where the incompletion is intentional.

In addition to the new tools described below, a few new commands have been added to the **Insert** menu. These commands are fairly self-explanatory and covered in detail in the User Interface chapter of the manual.

> **Troubleshooting note**. If your tree behaves strangely, the first thing to do is to check for unconnected inputs in the middle of the tree. While unconnected inputs are sometimes allowable, they can lead to surprising results and should be avoided in most cases. The primary exception to this rule is that it is sometimes desirable to have an unconnected third input to a three-input function which allows time to be accessed directly from the inside of the tree. Techniques for connecting unconnected inputs are covered later in this chapter.

Structures Area

A new **Structures** area has been added to the right of the **canvas** to provide convenient access to the most commonly used editing commands (some of which correspond to commands in the **Insert** popup menu and some of which correspond to commands in the new **Replace** popup menu ) As with all of ArtMatic's tools, you can find a tool's name by mousing over the tool and observing the **Tool Tips** area at the lower-right of ArtMatic's window. Unless otherwise noted, these tools are activated by a single click.

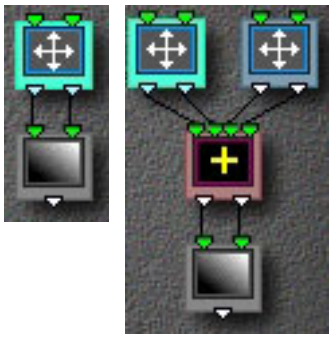
The Tools

 **Delete selected** - Delete the selected tile.

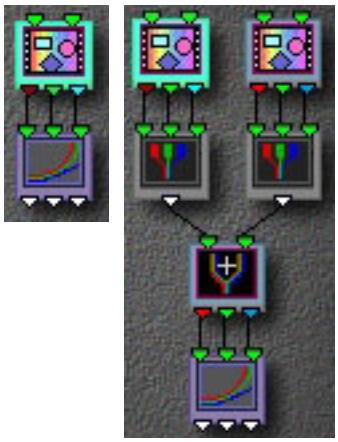
 **Insert After** - Add a new tile after the selected one. The new tile will have as many inlets as the selected tile has outlets. The new tile will have the number of outlets necessary to connect it to the tile which follows it.

 **Insert Before** - Add a new tile before the selected one.

 **Make group** - Replace the selected component with a group that consists of a new identical component and another new component to mix the outputs of the original and the added components. If the selected component has three outputs then a pack component is added to each branch of the group as well as illustrated below.



A system before and after applying **Make Group** to a 2D vector tile.



A system before and after applying **Make Group** to a 3-in/3-out tile

 **Add branch** -Add a new tile which branches off the selected tile. This command forks a branch at the selected tile.

 **Complete Tree -** This handy tool adds the components necessary to mix any parallel branches whose outputs are open. An open output is one that is not connected to the input of any tile. Normally, a tree should have only one component with an open output. This tool saves a number of steps when creating structures that have parallel branches that you want to contribute to the final output. Tree

completion is discussed in greater detail below and in the user interface chapter.

 **Replace** popup - Click and hold the mouse button to pop up a list of commands that can be used to replace the selected tile.

Disconnecting tiles. It is now possible to disconnect a component (and those that follow it) from the tree by using the **Insert** pop-up menu's **Disconnect** command. This is a handy way to break a long branch into two parallel branches.

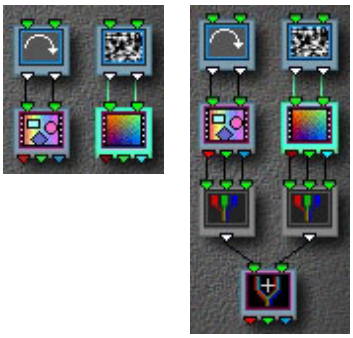
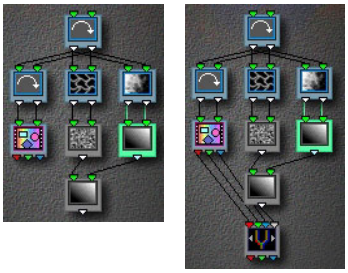
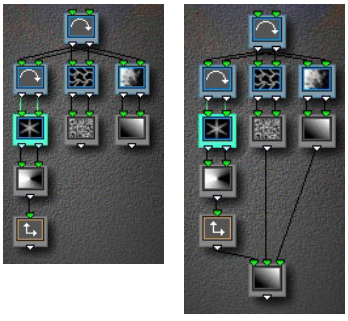
Editing restrictions. There are a couple of editing limitations worth noting. There is a limit to the number of columns (four) and the number of rows (ten) that an ArtMatic structure can have. Compiled trees within the tree can be effectively used to work around this limitation.

Branch order "instability". While editing the tree structure, ArtMatic may occasionally switch the order of the branches. You should watch out for this behavior when deleting tiles from a branch. You can swap the position of two parallel branches (that are not connected at the bottom) by typing '**m**' (for main component). Note that this only works if the branches are open at the bottom. If the two branches are joined at the bottom, delete the component that joins them before typing **m**.

Tree Completion

Because ArtMatic uses the output of a single component (the first component of the last row) to create an image, trees should be **complete** (i.e. have only one component with an unconnected output) except for cases where an unconnected output is used for depth cueing or global shading. Because you will often find yourself needing to connect parallel branches while editing tree structures (especially if you are creating a system with several pictures or 3D objects), the **complete tree** tool has been provided to automatically complete incomplete trees.

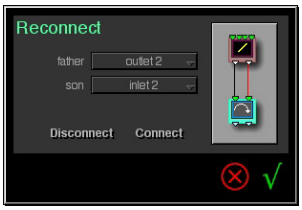
When the **complete tree** tool is clicked, ArtMatic will mix the branches of the tree by adding and connecting the appropriate components. For example, to mix **two parallel RGB** branches, ArtMatic will add any required **pack** components then mix the branches with a packed RGB mixer. **Mixed systems** that feature an RGB branch and a 1D gradient-based branch will be mixed with the appropriate 4-in/3-out mixing component. **Multiple 1D branches** will be mixed with a two or three to one mixer. In rare cases, ArtMatic may not be able to determine how to mix the system, in which case a beep will sound when the **complete tree** tool is pressed. If this happens, you will have to add some tiles yourself to complete the tree. If there is an RGB branch and a two output branch to mix, for instance, a **2D Scalar** (2-in/1-out) component should be added at the end of the two output branch. The table below shows a few examples of structures before and after application of this tool. You can often save yourself a lot of work by using this tool.

Two RGB Branches	RGB Branch and 1D Branch	Three 1D Branches
		
To combine two RGB branches, Artmatic adds the necessary pack components as well as the mixer.	ArtMatic mixes an RGB and a 1D branch with the 4-in/3-out version of **RGB Interpolate.**	Three 1D branches are mixed with a 3D scalar component.

Connection Dialog

Re-connecting loose inputs and joining branches. There are a number of common editing operations which can leave tiles with unintentionally unconnected inputs, and there may be situations where you want to change the parent of a particular tile. There are two ways to change the connections between a child tile and a parent tile found higher on the tree. Automatic connection (**command-click)** forces an automatic connection from a child to a parent tile. The new connection dialog (**option-command-click**) allows for custom manual connection of tile inputs and outputs. Both methods require that the parent tile be higher on tree than the child tile and can be used to either connect loose or open inputs or to change a tile's parent.

Automatic connection. Automatic connection is the quickest way to change a tile's parent or force connection of unconnected inputs . To force an automatic connection, select a child tile then **command-click** a tile higher in the tree that will become the tile's parent. Be aware that choosing a parent tile from another branch will sometimes cause ArtMatic to re-arrange the tree's layout. **Undo** can be used to undo this automatic re-patching if the results are undesirable. ArtMatic does its best to determine whether you are trying to completely change the parentage of the child, or whether you are simply trying to connect and open input. In some cases, ArtMatic will not be able to determine an appropriate automatic connection. In such cases, use the **Connection Dialog** described below.



Connection Dialog. For greater control of child/parent connections, use the **connection dialog**. It allows you to create (or break) connections between any inputs and outputs of child/parent tiles and even to split parentage between tiles. To invoke it, click on the child tile and **option-command-click** any tile higher on the tree. The dialog displays the parent and child tiles and provides two ways of establishing connections.

1. Direct editing. Click on a parent output then click on the child's input to which to connect it.
2. Via the father/son pop-up menus. Choose the father's output, choose the son's input then press either the **connect** or the **disconnect** buttons.

> **An exercise**: Use the connection dialog to horizontally flip an input image. **Hint**: start with the **RGB 1 Channel** structure (available from the structures popup) and use the connection dialog to re-arrange the connections between the first and second components in the tree.

Editing Tips

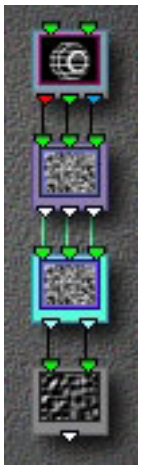
Joining branches at the top. If a tree has parallel branches you would like to connect at the top, simply choose the Insert menu's **Insert Global Rotation**. ArtMatic inserts a rotation tile at the top of the system to which both branches are connected. You can change the component to something other than rotation if you desire.

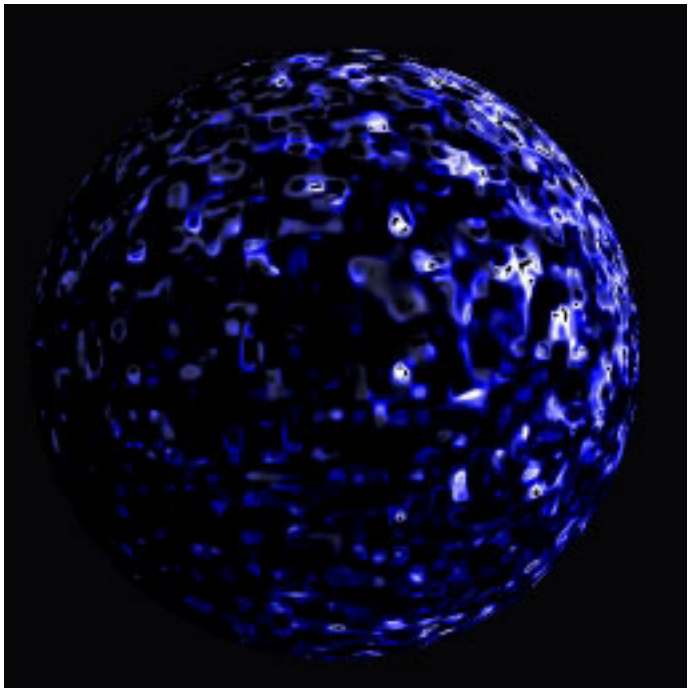
Adding filters. When building complex trees or experimenting with mutations or random path animation, you may find it helpful to insert filter components to restrict the range or modify the values being fed into some but not all of a component's inputs (or outputs). New editing commands have been added to make this possible. See the new Inserting Filters tutorial lesson to learn this powerful technique.

'True' 3D Objects

ArtMatic Pro 2.5 provides a number of components that generate 'real' 3D solids. The Examples folder contains some great examples of 3D objects which we recommend that you examine and dissect. These components (which include **3D Tube**, **3D Cube**, and **3D Sphere**) have either 2 or 3 inputs and 3 outputs. The three outputs for these systems provide the x, y and z co-ordinates of the solid being generated. The inputs that precede the 3D component define the space within which it is created (any warping of the space that

occurs before reaching the 3D tile will result in a warping of the generated solid--and any preceding **Scale** or **Rotation** components will rotate or scale the solid). The components which follow the 3D component define the solid's surface as in the example below. Because 3D object components define untextured space rather than a surface, the they will generally be followed (at some point in the system) by a component or components to shade or texture the surface.





A simple structure that yields a 3D Sphere. See the file **Simple Sphere** found in the **Documentation Examples** folder.

A simple exploration of 3D surfaces

In this section, we will explore some of the properties of ArtMatic 3D objects and some techniques to use with them. The image shown above was produced by the file "Simple Sphere" which is found in the **Documentation Examples** folder that accompanies this manual. Open the **Simple Sphere** example file. It simply has a **Sphere** component followed by several noise components which eventually reduce the three outputs to one so that ArtMatic can use the current gradient to color the surface. These components provide the image surface.

Click on the **Sphere** component's tile. Adjust its three parameter sliders and notice how it moves in the space in relation to the texture which covers it. When the sphere moves, it doesn't take the texture with it but moves within the texture's plane. It is as if you have a silk cloth with a textured pattern stretched on a frame before you and a small sphere in your hand. If you take the sphere, reach around the cloth and press the sphere so that its outline is visible through the cloth and slide the sphere, the sphere will be moving under the texture rather than taking it with it. Most of ArtMatic's 3D objects have this relationship to their shading/texture. There are a few 3D objects (whose names include the word **parametric**) which behave differently and take their textures with them.

The texture can also be animated. Click on any of the noise components and mouse over the parameter sliders to find the component's phase parameter. Adjust the fader and repeat for each of the noise components. Click on the **Add** button to add a keyframe. Continue adjusting the phases and adding keyframes. Now watch the animation by pressing the **Animate Keyframes** button. To see a higher quality (but smaller) preview of the animation, type **command-h**. Observe how the surface moves though the sphere stays in place. With some experimentation, you will find that you can simulate the rotation of a planet, simply by adjusting the phase parameters of the noise components.

Infinity and backgrounds

3D components generate the value **infinity** for areas outside of the solid (for such objects as spheres and cubes which have a well-defined outside). For simple systems such as that found in **Simple Sphere**, you can change the background against which the solid appears by setting the right-hand colors of the gradient in use. In more complex systems with multiple branches it is possible to have

the solid appear against a background provided by a picture, movie, or an ArtMatic subtree. The Documentation Examples folder provides several files for exploring these possibilities: **Cube & Pict** in which a 3D cube moves against a static background picture when animated and **Cube & Compiled** in which the background is synthesized by ArtMatic. Such systems can yield stunning animation.

There are a couple of features to note in these more complex examples. Both files make use of a particular 2-in/3-out component whose purpose is to take a non-RGB ArtMatic subtree and generate an RGB representation so that the branch can be mixed with a color picture or another subtree that generates RGB (true color). There are a couple of 2-in/3-out components that perform this function. For more details see the **Components Reference** chapters of this manual. The other key feature that both files have in common is that they use the **Packed RGB Crossfade** component to mix the background and foreground. This component can be used to mix the output of two branches into a single image. This component has just one parameter **Interpolate** which mixes the two images that feed it. This component however treats **infinity** specially. Wherever it sees infinity, the image is treated as transparent. In our example files, the left-hand image in the mix is the background and the right-hand image is the sphere or cube in the foreground With interpolate set to its maximum value, the sphere or cube is opaque **except** for the areas of infinity which surround it.

Moving On

In combination, the new features vastly expand ArtMatic Pro's capabilities. To get the most out of ArtMatic, we recommend that you perform the advanced tutorials found in the new Getting Deeper chapter and browse the Component Reference chapters which have been improved and include detailed descriptions of the large number of new components. A number of new chapters have been added to the manual and all chapters have been updated and are worth revisiting for users that want to get the most out of ArtMatic Pro.

System Requirements

CPU: Macintosh PowerPC with 32 megabytes or more of memory.

System: 8.0 or higher with QuickTime 3.0 or higher.

Minimum Monitor Size: 800 * 600.

Monitor color depth: 32 (16 millions)

IMPORTANT! *Virtual memory can interfere with the sound features*. If you experience erratic behavior, open the Memory control panel and make sure that virtual memory is turned off. It should be noted that some OS upgrades turn this feature on automatically without informing the user.

Memory tip: ArtMatic can run in a memory partition as small as 12 megabytes. ArtMatic 2.0 has improved its memory handling when saving pictures. The application no longer needs a large memory partition to save large files. You may need to increase the memory partition if you are creating systems that use nested (compiled) trees or movie/picture inputs.

Performance note: ArtMatic will run on any Power Macintosh. With a slow processor (less than a 300 Mhz 604 chip) real-time animation and sound will be choppy and complex systems may be slow to render/display.

Overview

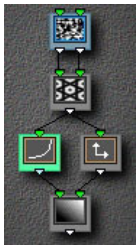
This chapter provides a brief Overview of ArtMatic. A more detailed overview is provided in the Concepts chapter.

ArtMatic is a unique program which uses mathematical functions to generate images, animation and sound. The program's design is such that one can create astounding images and animation without needing to know anything about math or the underlying functions by using its randomization and mutation features though if one learns about the components and tree structures one can design images and effects **possible with no other tool**. ArtMatic uses a simple, intuitive interface that can be learned in a few minutes but which will reward one with an endless variety of images. With some practice and a little systematic exploration, one can develop the ability to finely tune and control the images which ArtMatic creates. The provided tutorials progressively teach you how to get the most out of ArtMatic by starting with the basics and eventually introducing the concepts and methodology

Like fractal-based programs, ArtMatic relies on simple mathematical formulas that yield rich and complex results. ArtMatic, however, is much more than a fractal explorer (in fact, only a few of ArtMatic's functions are fractals). Its component trees are akin to the complex systems of chaos and complexity theory where modest changes in input can yield dramatic changes in output and where systems of mathematical equations generate a huge range of images from geometrical-type images to clouds of stars to bubbling, liquid surfaces to spinning planets to description-defying images of ineffable beauty.

Elements

ArtMatic's central display area is called the **canvas**. It can be thought of as a window on a vast world of which only a small portion is visible. New portions of this world can be brought into view by clicking on the canvas and dragging left, right, up or down. Using the zoom tools or the up and down arrows, you can zoom in or out. Some systems are so rich that merely zooming in or out or dragging the canvas can produce dramatically varying results.



At ArtMatic's core is the tree of mathematical equations called the **structure**, **structure tree** or **component tree** which is presented as a configuration of linked tiles called components. Each tile has a particular mathematical function (also called a **component**) associated with it. Clicking on a tile pops up a list of the available functions. When a tile is selected, its parameters (or settings) can be edited using the parameter sliders at the bottom of the page. There is a popup menu for choosing from a variety of basic structures which can be further modified (by adding and deleting tiles). Any particular structure together with a particular set of function assignments is called a **system**. Any particular system is capable of producing a wide array of images by either modifying the system's parameters.

The output of the structure tree is processed by a shading algorithm or **shader** which determines how the system is drawn and how colors are assigned. The colors used by the system are taken from a special kind of editable color palette called a **gradient** or **gradation**. ArtMatic provides simple yet powerful tools (described in the User Interface chapter of this manual) to create and modify these palettes. Note that there are different sets of shaders in the **Explore (black and white)** and **Sound** modes than when on either of ArtMatic's color pages.

A system's parameters can be changed in a number of ways. You can click on tiles and move the parameter sliders by hand, click on the left-hand die to jumble all the parameters (while leaving the component assignments unchanged), or use the **mutations** dialog which allows you to see many variations of the system at once.

In an abstract way, you can think of the area visible on the canvas as a location in a multi-dimensional universe. Every time a parameter changes or the canvas is magnified or offset, you are taken to a new location in the universe. ArtMatic features **keyframes** which allow you to store intriguing locations by clicking in any empty slot in the left-hand toolset (or by clicking the **Add** text button). Keyframes can also be used to create **animation** which can be saved as QuickTime movies.

Important note about keyframes! While keyframes have their own parameters and color gradients, all keyframes in a file use the same system (function assignments) and shader. If any function assignment or the shader is changed, each keyframe will change.

Modes/Pages

ArtMatic has four basic **modes** or **pages** which determine what sort of art it generates, whether black and white images, tiled color images, color images, or sounds. **Animation** can be rendered from all but the Sound page (where one renders sound files instead). At the top of the ArtMatic window are tabs which let you switch between pages. The tabs in left to right order are:

- ***Explore (****black and white):* This mode is used to create grayscale images and animation. The grayscale transitions are smoother in this mode than when using a grayscale palette in the color mode. A limited number of shaders is available in this mode. ***Tip***: Black and white animations can be used with movie editing programs to create astounding wipe and fade effects when these movies are used as mask layers.
- ***Tiles*** *(color):* The current picture is displayed as a symmetrical tiled pattern that repeats horizontally and vertically. This is useful for creating patterns to be used for the Macintosh desktop or as Web page backgrounds.
- ***Explore*** *(color)*: This is ArtMatic's ***default mode*** and is used for creating color graphics and animation.
- ***Sound****:* ArtMatic can also be used to generate drones, waveforms and rhythmic sequences from animated systems. Sound is generated when the system is animated by deriving pitch information from the canvas as the sound generator circles over the canvas. More information about sound generation can be found in the Sound Mode Tools section the user interface section of this manual.

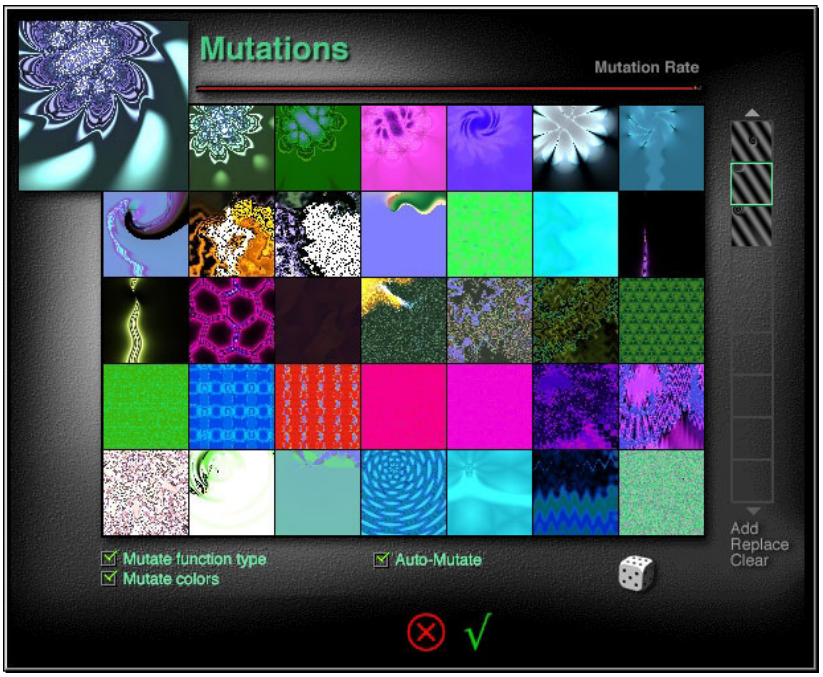
Animation

ArtMatic provides powerful tools for rendering stunning high-resolution abstract (and some not-so-abstract) animation. Note that due to the complexity of ArtMatic's images, real-time animation is done at a low resolution, but the QuickTime rendering is done at high resolution with anti-aliasing. There are two basic types of animations which it can create. **Keyframe animation** creates animation by morping from one keyframe to another. **Random path animation** uses a pre-defined pseudo-random curve to modify the system's parameters.

This topic is covered in greater detail in the Animation chapter of this manual.

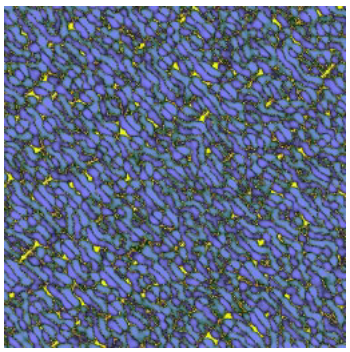
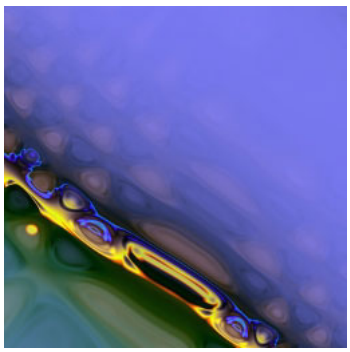
Exploring

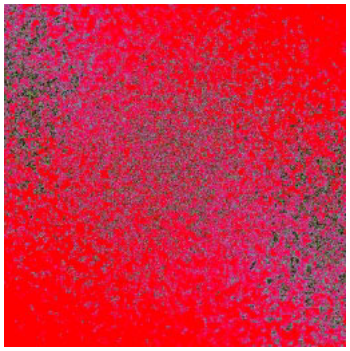
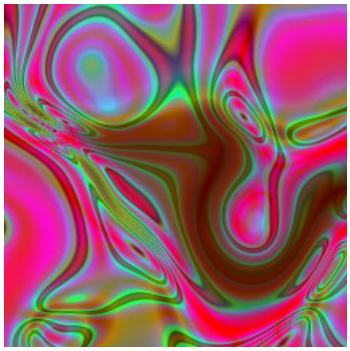
The best way to get a sense of what ArtMatic can do is to spend some time exploring on your own and examining the provided sample files which will give you an idea of the incredible variety of image and animation you can create. The **mutations** window is an invaluable aid for finding starting point. By turning all its options on, you can explore a vast variety of systems with just a few clicks of the mouse (remember that if function mutation is turned on all your keyframes will be affected).

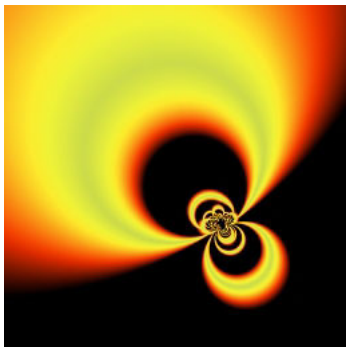
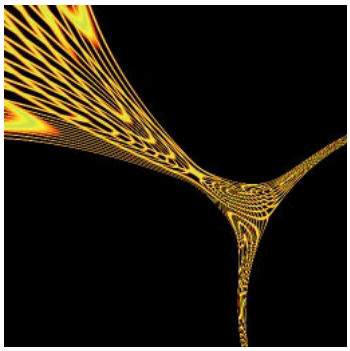
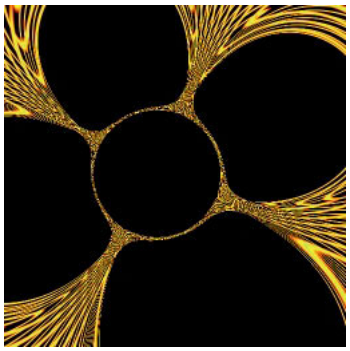
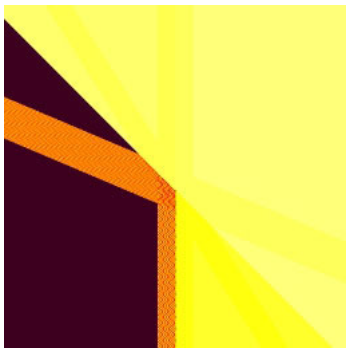
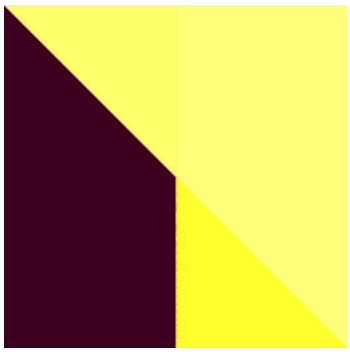
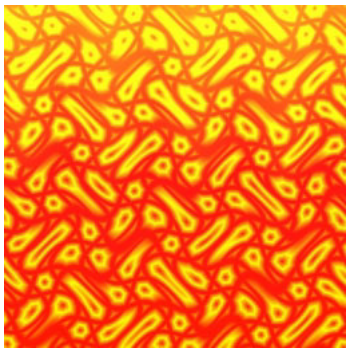


Once you have found a starting point, save it as a keyframe by clicking in an empty keyframe slot. Use the small left-hand die button to randomize the parameters, Zoom in and out to explore the system from up close and afar. You will be amazed at the worlds that you will find when zoomed in very close and very far with some systems. When you are zoomed in close, it is useful to drag the canvas left, right, up and down. If the system includes fractal or iterative functions, you can increase the resolution using the iterations preference found in the Preferences dialog.

The table below will give you an idea of how rich a single ArtMatic setting can be. Each table row consists of images created by zooming in and out (and dragging the canvas left and right) on a system but making no parameter changes. Imagine how different the images would have been if the parameters had changed too!

QuickStart - The Basics

This tutorial chapter introduces you to techniques for getting started with ArtMatic Pro, which is a very powerful tool that provides many methods and levels of exploration. We recommend that all users both read **and perform** each of the tutorial chapters. (Even experienced users will discover new techniques and exposure to new features.) This chapter guides you through exploration of ArtMatic but does not explain the hows-and-whys of ArtMatic. To learn more about how ArtMatic works, you will want to read the Overview and reference chapters of the manual.

We strongly encourage you to explore the many example files we have provided, since ArtMatic is capable of creating an extraordinary range of images which often surprises the most experienced users (including the program's creator, Eric Wenger).

ArtMatic can be used to both discover images (what we call "Zen-mode" exploration) and design images and fractals. It is also a very powerful tool for manipulating pictures and QuickTime movies. This first tutorial chapter introduces the basic techniques for discovering new images (or "systems"). The other tutorial chapters introduce you to techniques for manipulating the ArtMatic structure tree and for creating complex images.

Quickest Start Tutorial - The Basics

Before we start, move the mouse around, mousing over the various tools, and notice that there is green text in the lower-righthand corner that displays tool names and other helpful information. These Tool Tips are a great help when you are first learning ArtMatic. You will notice that, for the most part, all icons and text act as tools that you can click or click & drag to manipulate ArtMatic.

Find A Structure

Whether you are an expert or a novice, you will often want to let ArtMatic generate a system that will be the starting point of your exploration.

Choose a basic tree structure. Click on the **Choose Structure** selector  and choose a structure from the list which pops up. Don't worry about which structure to choose or what the structures' icons do. All of them produce amazing results.

Mutate the system. Click the large middle die  to shuffle the assignments of the system's tiles. If you aren't intrigued or enticed by what you see, click the die again. Keep in mind that if you zoom far in or far out you may discover surprising details not visible at the default zoom level. When you find something that captures your interest, it is time to move on to the exploration stage. Remember that the range of images possible from any one configuration of any single structure is mind-boggling. In the exploration phase, you will explore the possibilities of the configuration given you by the "big die".

> **Super-mutate** - Control-click the large die to let ArtMatic both choose a random structure and shuffle the tile assignments.

Explore the structure

ArtMatic systems sometimes generate images whose visible details dramatically different when zoomed in or out or when the canvas area is scrolled.

Zoom in/Zoom out. There are several ways to zoom in and out on a system:

- **Zoom buttons**  - Press either of the zoom buttons   to continuously zoom in or out. While ArtMatic is zooming, it switches to low resolution rendering. As soon as you release the mouse button, ArtMatic re-renders the system at high resolution.
- **Plus and minus keys** - Press the '+' or '-' key on your keyboard to zoom in or out by a factor two.
- **Arrow keys** - Press the up or down arrows keys to zoom continuously.

Scroll the Canvas. The image display area is called the Canvas. Click and hold the mouse button anywhere in the Canvas and drag left or right to scroll it.

Using keyframes to save locations. When you find an intriguing location, click on the keyframe palette's **Add** button. A thumbnail of the image is added to the palette. Whenever you find an intriguing location, add it as a keyframe. Clicking on a keyframe recalls its settings. Keyframes can also be used to animate a system. All keyframes share the same tile/function assignments, structure, and color shader. So if you roll the big die or change the color shader, you will notice that all the keyframes will change.

Stroll a random path. Any one ArtMatic system has nearly infinite possibilities. **Random Path Animation** provides one method of exploring this huge image space by continuously changing the parameters of every tile in the system. Click on the Random Path Animation button  to start the random walk. When you find a position you like, click on the pause button and add a keyframe so that you can return to these settings. Continue your random stroll by pressing option-spacebar to resume.

> **Note** realtime animation is done at low resolution since ArtMatic graphics are computationally very complex. When such animation is rendered to disk, the rendering is done with high resolution.

The speed of the random walk is controlled by the **Delta Time** setting. Smaller values result in faster changes and larger values result in slower changes. You can change the Delta Time setting in either the Preferences dialog or in the QuickTime Export dialog.

You can manually stroll the random path. Click on the Random Path Scroll button and drag left or right to manually stroll. *For fine control* of manual strolling, press and hold the option key then click and drag the Random Path Scroll button.

The small dice. By clicking either of the smaller dice, you can tweak the current system's settings. Click the die  at the left to shuffle the tiles' parameters. (The tile assignments are left alone but their settings are shuffled.) Click the die at the right  to randomize the current gradient's colors. When you find a variation you like, add it as a keyframe.

Change the gradient. The gradient is the color palette used to draw the system. Each keyframe can have its own gradient. To change the gradient, click on the Choose Colors tool  which pops up a menu of the gradient library. Mouse over the gradient and notice that the display changes. Click on any square to pop up the color picker. Choosing a color from the color picker replaces the old color with the selected one. There are several more tools available to manipulate gradients which are covered in detail in the User Interface chapter of this manual.

> **Note**: The gradient is used in all systems whose last component has two or fewer outputs. If your system has a three-output component in the last row, you will need to choose another structure for gradient manipulation to have an effect.

Mutations Dialog. Choose **Mutations** from the Edit menu. Click on any of the thumbnails and watch the new mutations that are created. Turn on **Mutate Colors** and click on any thumbnail and note the color variations. Turn off the **Auto-Mutate** checkbox. You can now click on thumbnails without triggering new mutations. This makes it possible to add multiple mutations as keyframes. To add a mutation as a keyframe, click on the mutation then click on the **Add** text button. To create new mutations, you can turn **Auto-Mutate** on again or click on the die button or the large parent image found at the upper-left of the mutation set. Set the **Mutation Rate** control (near the top of the dialog) to its maximum value by clicking at the tool's right edge. Now, set the Mutation Rate near the minimum value and notice that the mutation is very subtle.

Note: Be careful of the **Mutate Function Type** checkbox. Function assignments are shared by all keyframes. If you turn this option on, all keyframes will be effected.

The **Mutations** dialog is a very powerful tool for exploring and refining ArtMatic systems. See the User Interface chapter for more information about its features.

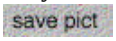
Animation

ArtMatic Pro can create incredible animation by morphing between keyframes or by animating the random path. Even if you think that you are only interested in still images, we recommend that you explore ArtMatic animation as it is capable of creating wondrous surprising images like nothing you have ever seen. You will notice that all of the files in the main examples library have two or more keyframes. When exploring these files, we recommend previewing the animation (as described below).

Animate Keyframes. If you haven't done so, create several keyframes as described in the steps above. To see a low-resolution, realtime approximation of the keyframe animation, click on the Animate Keyframes button  . To see a higher-quality (but smaller) preview, type command-H (or choose *Preview* from the Animation menu). A high resolution QuickTime movie can be rendered by pressing the QuickTime Export button  . Since QuickTime rendering can be time-consuming, we will leave this for you to explore on your own. **Note:** When this animation is created, it uses the time specified in the QuickTime Export You can change the animation's duration in the Preference dialog or in the QuickTime Export dialog. Animation is discussed in detail in the Animation chapter of this manual.

Viewing and Saving Your Work

View anti-aliased. Click on any keyframe to restore its settings. Click on the **Render Full Screen** tool  . ArtMatic displays the image with high-quality anti-aliasing. Click anywhere to dismiss the image. Anti-aliasing is also applied when pictures are saved or animations are rendered.

Save your work. Use the File menu's **Save As** command to save the current system and keyframes in ArtMatic's native format. This format is more compact than saving a picture but can only be read by ArtMatic. To save the image as a high resolution, anti-aliased PICT format file which can be opened in other programs, click 

. When you click the Save Pict tool, the Save Picture dialog box is displayed, which lets you choose the dimensions of the image that you would like to save. You can choose dimensions from the dialog's popup menu or type in your own dimensions. (Numerical values can also be changed by clicking and dragging up or down.) If you enter your own dimensions, press the **Preview** button found below the image to force the preview to be drawn with the new aspect ratio.

Save your work now, if you like the system that you have created. In the next lessons, you will be using example files to continue your exploration.

Color Shaders

When an ArtMatic system has a one-output component on the last row, ArtMatic uses a color shading algorithm to map the tree's output to the colors of the active gradient. The term *gradient-color system* describes such systems (as opposed to RGB or true-color systems which have a three output component at the bottom of the system). The tools shown at left are used to determine the color mapping or shading. For this exploration, we will use a very simple system so that the relationship between the shading algorithm, the active gradient and the resulting image will be easy to see. We encourage you to repeat these steps with systems of your own creation.

In this lesson, we won't describe how the shading algorithms work; the shading algorithms are covered in detail in the Shaders chapter of this manual; some users may want to take a look at the Shaders chapter before proceeding. For this lesson, you don't need to understand why the image is drawn the way that it is. What is important is to notice that the same system can appear very different when drawn with different color shading algorithms (also called color shaders).

Open the file **Simplest Case Color** that is found in the Documentation Examples folder located in the same folder as the documentation.

Choose a shading algorithm. Click on the **Choose Color Shader** tool to pop up the color shader popup menu. A number of choices are available. Choose Cyclic Clut and observe the image. Now, choose each of the available choices up to and including *Procedural C*.

Auxiliary Colors. Choose the next option: *D: Log + Depth Cueing + Color Filters*. Notice the three color squares that appear above the Choose Color Shader tool. These auxiliary color are available for some complex color shaders and when some shading options (discussed below) are selected. Click and hold the mouse button on the topmost auxiliary color to pop up the color selector. Choose black from the 'popular colors' squares at the left edge of the color selector. After choosing black, choose other colors. Repeat this for each of the three auxiliary colors. Note that these colors are global. The shader and auxiliary colors are common to all of the keyframes in the file. If you change the shader or aux. colors, every keyframe in the file will be affected.

Shading Options. Below the Choose Color Shader tool is the Shading Options popup menu 

. Pop up the menu and notice that there are a number of options (all of which are covered in detail in the Shaders chapter). Notice that *Depth Cueing Small* has a checkmark next to it. Depth cueing uses the first auxiliary color to filter the image. The complex shading algorithms whose names contain 'Depth' all turn this option on. You can control the amount of depth cueing effect by choosing the other depth cueing 'weights'. Now, use the Choose Color Shader popup menu and choose *Cyclic Clut*. The depth cueing is automatically turned off. You can turn it on manually by choosing any of the depth cueing options in the Shading Options popup menu.

Take some time to explore your own creations or examples from the examples library, and see how the images are affected by changing the color shader and shading options.

Tiles, Parameters and Locks

As explained elsewhere in the manual, the ArtMatic structure tree is a modular graphics synthesizer made up of components (tiles) that synthesize an image. It can also be thought of as a chain of graphics filters or as a programmable mathematical system. Each tile has a function associated with it, and each function can have up to three parameters that influence its behavior. The images created by the system are a combination of the tree structure, its tile assignments and the tile parameters. The Mutation dialog and the left-hand die both mutate these function parameters, but you can also edit them directly.

Parameter sliders. Find a structure to explore by control-clicking the large die until you find a system that intrigues you. Click on the tree's tiles and notice that zero to three parameter sliders are available for the selected tile. When you mouse over a parameter slider, the Tool Tips area displays the parameter's name and its setting. Explore how the image changes as you manipulate the parameters. As you explore, add a couple of keyframes.

Parameter envelopes. If you click on the letter that appears to the left of the parameter slider, the Parameter Envelope dialog appears.

You can change the parameter's 'envelope' (the values it has over the course of an animation) using this dialog. You can also, directly enter numerical values by typing into the fields that appear at the bottom of the dialog box.

> **Note**: For angle parameters, you can type the number of degrees (i.e. 30) and type 'd' to force ArtMatic to convert from degrees to ArtMatic's internal format.

Parameter locks. Notice that there are lock icons next to the parameters. You can use parameter locks to limit the parameters that are mutated by the system. **Shift-click** any unlocked parameter to lock all of the parameters. Selectively unlock some parameters. Open the **Mutations** dialog (make sure to turn off Mutate Function Type) and mutate the system. The system's mutations are restricted to modulations of the unlocked parameters. You can lock a tile's function assignment by locking all three parameter locks (you need to lock all three even if the function uses less than three parameters). The tile's function assignment won't change now if you roll the big die or use the Mutate Function Type option in the Mutations dialog. Try this for yourself. Shift-click any unlocked tile to lock all parameters and functions. Now, selectively unlock some parameters and open the Mutations dialog. Turn on the Mutate Function Type option.

To unlock all parameters, shift-click any locked parameter.

Continue with the next tutorial by clicking here

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QuickStart II - More Features & U.I. Tour

This tutorial chapter provides a tour of useful ArtMatic features and some simple but helpful techniques. This chapter does not provide detailed explanations of these features; conceptual information is left to the other chapters of this manual. While not required to perform the lessons in this chapter, we recommend that you read the Intro, Overview and Concepts chapters of the manual (either before or after performing these lessons) as they will give you a deeper understanding of this program.

Lesson 1 - Pict/Movie Components

Among the most popular and powerful new additions to ArtMatic Pro are the  Pict/Movie components which make it possible to use pictures, QuickTime movies, and iMovie DV streams in ArtMatic structures. These components make dramatic special effects and image manipulation possible. There are two basic types of Pict/Movie components: 2-in/1-out and 2-in/3-out. Both component type have two inputs which are interpreted as coordinates for the pixels (points) in the picture. The 2-in/1-out version of the component generates the brightness of the pixel found at corresponding position (0,0 is the picture's center). The 2-in/3-out version of the component generates the red, green, and blue values (RGB) of the corresponding point. The main examples library includes many examples of systems that use picture and movie inputs.

> **Note**: Anywhere that you can choose a picture, you can choose a movie. When a system is animated, ArtMatic will take consecutive frames from the movie thus making ArtMatic a powerful video effects tool.

1. Setting Up The Structure

Choose a simple structure. Choose the **basic** structure from the **Structures** popup menu. The structure starts with a 2D vector (2-in/2-out) component. The second component is a 2D scalar (2-in/2-out) component.

Set up the tree. For the first component in the tree, choose the **Rotate A** function. For the second component, choose the **Pict/Movie** component (note that this component is only available for tiles that have two inputs and one output or two inputs and three outputs).

Choose a picture. Unless you have replaced the file named **DefaultPicture**, you will see the U & I Software logo. By default, the picture named DefaultPicture (found in ArtMatic's home folder) is used when you use the **Pict/Movie** component. To use a different picture, click on the **Pict/Movie** tile to make it active. Now, mouse over the Choose Pict/Movie tool  and hold down the mouse button to pop up the Pict/Movie input selector. Choose any slot labeled **Open**. The Open File dialog appears to let you choose a picture. Choose any PICT format picture or QuickTime movie. If QuickTime translation is turned on, you will be able to choose any format picture. ArtMatic lets you use up to four different pictures or movies per file.

Replace the picture. To change the picture used by any slot, hold down the option key and (with the option key still held down) select any picture/movie from the popup. The Open File dialog is presented for you to choose another picture.

2. Simple Picture Manipulations

Tiling/Zooming. Zoom out. You will see tiles containing the picture. Click on the **Pict/Movie** tile. Move the mouse over the parameter sliders and observe the **Tool Tips** area at the lower right of the screen to see the parameter names. Click on the **tiling** parameter's slider and drag it back and forth to observe the effect. Experiment with the tile's other parameters. If you set the **tiling** to 0, you will notice that only a single image appears.

> **TIP!** Whenever you find something you like, you can click on the **Add** button to save that location as a keyframe.

Image Distortion. Click on the first tile and choose the **Ripples** function (if your system has keyframes, they will all change since all keyframes share the same function assignments). Now, experiment with the parameter sliders and note how the ripples interact with the picture. If you save keyframes with different Ripple parameters, you can then play the sequence back by clicking on the **Animate Keyframes** button to have ArtMatic morph between the keyframes.

3. RGB True Color Pict/Movie Manipulations

Click on the last component in the system (it is a 1-in/1-out component) and delete it by clicking on the Delete tool  . Hold down the option key and click on the Pict/Movie component to pop up the Component Replacement popup menu. Choose **Replace with Vector (3 out)**. You will now see a color version of the picture (if not, click on the component again to pop up the component selector and choose the Pict/Movie component). By adding more components after the Pict/Movie component, you can perform sophisticated color manipulation. Color manipulation is covered in the Getting Deeper advanced tutorials.

4. RGB Mixing and the Pack Component

There are several preset structures available from the Choose Structure popup menu that provide a great starting points for using pictures and movies in your ArtMatic projects. Choose **New** from the File menu. Choose the **RGB 3 Channels** system from the Choose Structure popup menu. This structure features three RGB branches which are mixed by the system's final component. Notice that each branch terminates with a **Pack** component  . **Pack** combines three values into a single composite value (or stream) which can be interpreted by some components designed to mix RGB and 3D streams. Components with the term "packed" in them require that their inputs come from a Pack component.

In this system, the first and last branches use the Pict/Movie component and the middle branch generates an RGB texture. Click on the last component in the system. This component mixes the output of the three branches into a single image. Adjust its parameters, and notice how the image changes. Examine how the image changes if you use one of the other **Packed RGB …** components as the final component.

Press the Animate Keyframes button. ArtMatic will automatically generate a couple of keyframes.

Experiment by modifying the system's parameters and adding components to the three branches (make sure to insert them BEFORE the Pack component). Try using a second picture for the righthand branch.

Shift-click any unlocked parameters to lock all the system's parameters. Selectively unlock parameters in the middle branch and use the dice to explore new possibilities. Be sure to preview the animation that results from your experiments.

Further Exploration

This lesson only touched the surface of what can be done with these components. If you have QuickTime movies or iMovie DV clips, we encourage you to explore using them as Pict/Movie sources. To get a deeper sense of what you can do, explore the main examples library; Pict/Movie input is useful for a wide range of applications that have to be seen to be believed. Look for the example folders with 'pict' in the name and example files with the words 'logo' or 'pict in example file names to identify examples that use pictures as input sources.

Lesson 2 - QuickTour of the User Interface

This section gives a quick tour of some useful commands and shortcuts. For a complete guide to the user interface and shortcuts, see the chapters User Interface and Keyboard Shortcuts.

1. Super randomize. Control-click on the large die. This action not only randomizes the component assignments but also randomly selects a tree structure.

2. Cycle shaders. Use the **[** and **]** keys to cycle through the available color shaders.

3. Tab through the tree. Press the tab key and notice that the next component tile in the tree becomes selected.

4. Cycle components. Press the left and right arrow keys and notice that the component (function) used for the tile changes. You can go through the entire list of components using the arrow keys. (Note that for historical purposes the order used by the keyboard is not identical to the order that they components appear in the menu).

> **TIP!** Use steps 3 and 4 repeatedly to explore the possibilities found in a particular structure tree. Don't forget to zoom in and out to see what you find. A system can look very different when zoomed far in and far out. Zooming can be accomplished with the up and down arrow keys.

5. Add a keyframe. When you find something you like, type command-B to add a keyframe. Add a couple of them.

6. Replace a keyframe. Click on a keyframe and modify the parameter sliders for one or more tiles (components). Hold down the command key and click on any keyframe to replace it with the current settings.

7. Delete a keyframe. You can directly delete keyframes by holding down the option key and then clicking on the keyframe you want to delete.

8. Animate keyframes. Press the spacebar to start keyframe animation playback. Pressing the spacebar again will pause the playback.

9. Random path animation. Hold down the option key and press the spacebar to start random path animation. Press the spacebar again to pause. To resume random path playback, press option-spacebar again.

Lesson 3 - Tree Editing

ArtMatic Pro (unlike ArtMatic 1.2 and earlier) allows you to modify the structure of a file's structure tree. Very few restrictions are placed on the modifications you make. So, it is possible to create structures too big to be displayed in the available area. For the sake of this tutorial, we will keep things simple and show some basic modifications you can make. To get a more complete understanding of tree editing, you should read the User Interface chapter as there are extensive editing features beyond the scope of this tutorial.

1. Setting Up The Structure

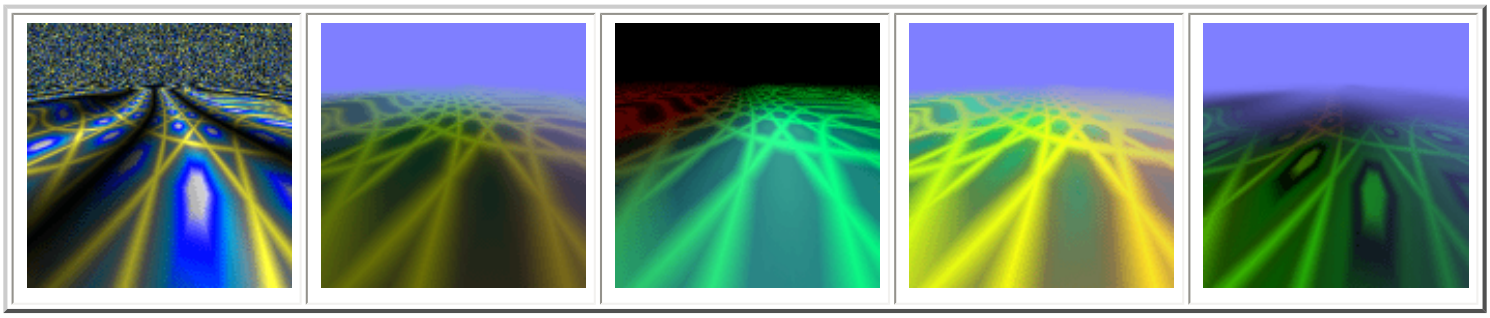
Choose a simple structure. Choose the **basic** structure from the **Structures** popup menu. The structure starts with a 2D vector (two-in/two-out) component. The second component is a 2D scalar(two-in/one-out) component. Click Randomize All (the large die) until you find a pattern you like.

2. Insert Perspective & Rotation

The **Insert** popup menu provides numerous commands for modifying the tree's structure.

Insert Perspective. Choose the **Insert Perspective** command. A group of tiles are added at the top the tree that provide a three-dimensional perspective effect. Click on the **Perspective Clipped** tile  and adjust with the parameter slider (Perspective has only one adjustable parameter) and notice how the image plane appears to tilt. You will notice 'noise' in the distance at some settings. Leave the plane tilted so that you can see the horizon. Click on the **Ax + By + C** tile  that feeds the Perspective Clipped tile and experiment with its parameters.

Change shaders. Use the **[** and **]** keys to cycle through all the shaders. You will notice that some shaders remove the distance 'noise' completely and others change its character dramatically as shown in the images below. You can remove the distance 'noise' with all color shaders by turning on depth cueing with the Shading Options popup menu.



3. Insert Global Rotation

Choose **Insert Global Rotation** from the Insert popup menu. ArtMatic Pro adds a Rotate component at the top of the system. If the rotation tile isn't active, click on it. Adjust its Angle parameter (A) and notice how you can rotate the entire system.

Enter an angle directly. Internally, ArtMatic uses a format called radians for angles. It is possible, however, to directly enter the rotation using degrees. Click on the **A** label next to the parameter slider to display the Parameter Envelope dialog. Click on the Angle parameter's numerical display (in the dialog) and type '45' (for 45 degrees) then type 'd'. ArtMatic converts the value from degrees to its internal format.

By animating the Angle parameter, global rotation can be used to animate rotation of the entire system. To do this, add a keyframe. Adjust the Rotation component's Angle parameter, and add a new keyframe, etc.

4. Component Replacement Popup

Make Group. When you option-click the active (selected) tile, the Component Replacement popup menu appears with options for replacing the tile. The exact options that are available depend on the number of inputs and outputs of the selected component. Click on the tile below the perspective tile to make it active. Option-click the tile to pop up the Component Replacement popup menu, and chose **Make Group** which replaces the tile with a group of tiles. Option-click the tile below the perspective tile (it will be a 2-in/2-out tile). Choose the **Make 3D Group** Click on any of the new tiles and use the left/right arrow keys to see how changing components affects the image.

Changing the number of inputs or outputs. Click on any tile to make it active. Option-click the tile to pop up the Component Replacement popup menu. Note that there are commands that allow you to replace the tile with another that has a different number of inputs and/or outputs. The exact options depend on the active tile. To change both the number of inputs and outputs, you will have to access this menu twice (once to change the number of inputs and once to change the number of outputs).

5. Inserting New Tiles

Click on any tile in the system to make it active. You can add a tile before or after the selected tile by clicking on the Insert Before or Insert After tools or by choosing the Insert Before or Insert After commands from the Insert popup menu.

Moving On

Obviously, these introductory tutorials have barely scratched the surface of what you can do with ArtMatic Pro. If you want to learn more about ArtMatic, here are a few suggestions:

- **Explore the example files** - we have supplied a large number of ArtMatic files which demonstrate a wide range of possibilities. Notice that each file has a number of keyframes. We recommend that you play the keyframe animation for each file by clicking on the **Animate Keyframes** button (or typing command-h to see a high-quality mini-preview).
    - **Tip**: A quick way to peruse the examples is to choose **Open** from the File menu and navigate the dialog to a folder that contains ArtMatic files. Rather than opening each file, use the arrow keys of your keyboard to visit different files. When a file is selected, you will see a thumbnail of its first keyframe.

- **Explore the documentation** - The rest of the documentation has full descriptions of ArtMatic Pro's features and lots of useful tips. Before continuing with the intermediate level tutorials, you should read the Intro, Overview and Concepts chapters of the manual and browse the Component Reference chapters. We also recommend reading the User Interface chapter in order to familiarize yourself with all of ArtMatic's tools.
- **Perform the advanced tutorials** - the QuickStart III and Getting Deeper chapters of the manual provide valuable techniques and insights that will help you deepen your mastery and understanding of ArtMatic Pro.

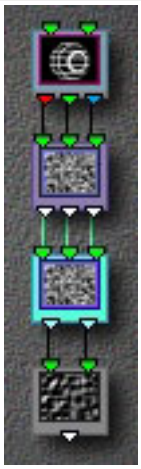
rtMatic Pro.

QuickStart III - Intermediate Level Features

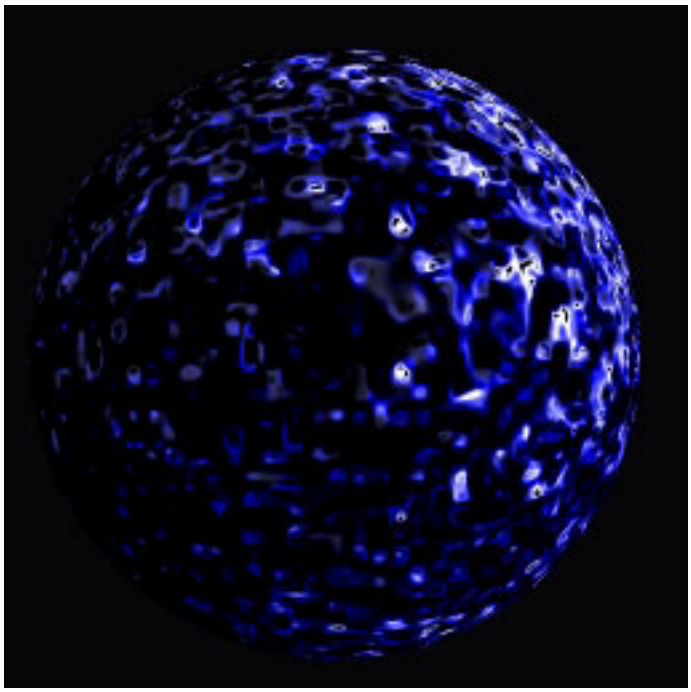
This tutorial chapter covers a number of useful techniques and tricks and provides an introduction to some advanced techniques. While not required, familiarity with the Overview, What's New, User Interface, Concepts, Shaders and Component Reference chapters will help you to get the most out of these simple lessons.

This chapter provides more background than the earlier tutorials but is still focused on giving you a tour of ArtMatic's features and giving you a sense of what ArtMatic Pro can accomplish. There is one additional tutorial chapter called Getting Deeper which provides both useful techniques and an introduction to concepts and methods that will benefit all artists seeking to get the most out of ArtMatic Pro.

Lesson 1 - 3D Object Basics



A simple structure that yields a 3D Sphere. See the file **Simple Sphere** found in the **Documentation Examples** folder.



A simple exploration of 3D surfaces

In this lesson, we will explore some of the properties of ArtMatic's 3D objects. The image shown above was produced by the file "Simple Sphere" which is found in the **Documentation Examples** folder that accompanies this manual. Open the **Simple Sphere** example file. The structure is simple: a **Sphere** component followed by several noise components which eventually reduce the three outputs to one so that ArtMatic can use the active gradient to color the surface. These noise components provide the sphere's surface.

Click on the **Sphere** component's tile. Adjust its three parameter sliders and notice how it moves in relation to the texture which covers it. When the sphere moves, it doesn't take the texture with it but moves within the texture's plane. It is as if you have a silk cloth with a textured pattern stretched on a frame before you and a small sphere in your hand. If you take the sphere, reach around the cloth and press the sphere so that its outline is visible through the cloth and slide the sphere, the sphere will be moving under the texture rather than taking it with it. Most of ArtMatic's 3D objects have this relationship to their shading/texture. There are a few 3D

objects (whose names include the word **parametric**) which behave differently and take their textures with them.

The texture can be animated to create a sense of motion. Click on either of the noise components and mouse over its parameter sliders to find the component's phase parameter. Adjust the fader and repeat for the other noise components. Click on the **Add** button to add a keyframe. Continue adjusting the phases and adding keyframes. Now watch the animation by pressing the **Animate Keyframes** button (or typing command-h to see a high-quality mini-preview). Observe how the surface moves though the sphere stays in place. With some experimentation, you will find that you can simulate planetary revolution by adjusting the noise components' phase parameters.

Infinity and backgrounds

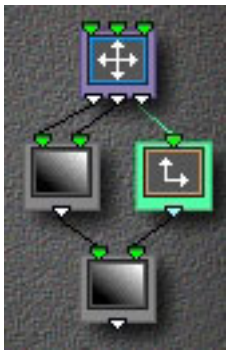
3D object components generate the value **infinity** for areas beyond object boundaries. In gradient-color systems, infinity is drawn with the rightmost color of the active gradient. In RGB (three output) systems, infinity is drawn with the first auxiliary color (the depth cueing color) and is transparent to RGB mixing components. In more complex systems with multiple branches it is possible to have the solid appear against a background provided by a picture, movie, or an ArtMatic subtree. The Documentation Examples folder provides several files for exploring these possibilities: **Cube & Pict** in which a 3D cube moves against a static background picture when animated and **Cube & Compiled** in which the background is synthesized by ArtMatic. Such systems can yield stunning animation.

There are a couple of features to note in these more complex examples. Both files make use of a particular 2-in/3-out component whose purpose is to take a non-RGB ArtMatic subtree and generate an RGB representation so that the branch can be mixed with a color picture or another subtree that generates RGB true color. There are a couple of 2-in/3-out components that perform this function. For more details see the **Component Reference** chapters of this manual. The other key feature that both files have in common is that they use the **Packed RGB Crossfade** component to mix the background and foreground. This component can be used to mix the output of two branches into a single image. This component has just one parameter **Interpolate** which mixes the two images that feed it. This component however treats **infinity** specially. Wherever it sees infinity, the image is treated as transparent. In our example files, the left-hand image in the mix is the background and the right-hand image is the sphere or cube in the foreground. With interpolate set to its maximum value, the sphere or cube is opaque **except** for the areas of infinity which surround it.

Lesson 2 - Time

When a system has three inputs at the top OR has an unconnected third input in its interior, the third input is a counter or time value. Time can be used to manipulate a system even if all its parameters stay constant.

A simple example. In the folder "Doc. Example Files" is a file called "Simple Time Explorer" which contains a simple system with 3-inputs at the top.



The topmost component simply scales the three incoming values (x co-ordinate, y co-ordinate, and time). The amount of scaling is provided by the A, B and C parameter sliders. For this example, no scaling is done. The x and y co-ordinates are passed unchanged to the **Ax+By+C** component which simply generates a tilted plane. In this case, the parameters have been sent to send out 0 for all points (essentially a plane with no tilt). The last component is another **Ax+By+C** component. There is one other component in the tree. It is the scale component which is connected to the rightmost (the z/time output) of the topmost component and whose output feeds the 'y input' of the final component in the system.

Click on the file's keyframe and click the **Add** button which creates a second identical keyframe. Now click the **Animate Keyframes** button. Note that the result is a gradual color change over time. In previous, versions of ArtMatic, animating between identical keyframes would also yield a static result. You can simulate ArtMatic's old behavior, by clicking on the scale component's tile and clicking Parameter A's lock icon then dragging the slider to 0. This causes the z-value to be a constant 0. If you now animate the keyframes, nothing will appear to happen. Notice that you can change the response to time by changing the 1-in/1-out component. For example, you can use the **Random** component to randomize the color change.

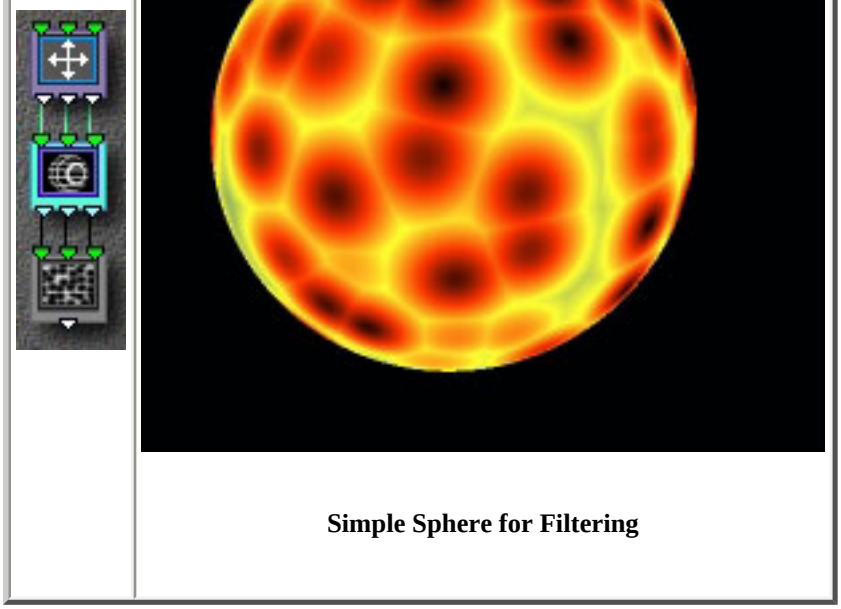
Important notes about 'time'. This input has a few side effects which may seem surprising. **First**, it is important to keep in mind that the third global input is fed into open inputs that are in the middle of the tree (as in the picture at left); hence, time can influence trees that have only two inputs at the top. **Second**, the counter's value increments with the passage of time **even if it flows through locked tiles**. (Parameter locking only prevents a tile's parameters from changing. It has no influence on the values that flow through the component.) **Third**, when you add a keyframe in a system that makes use of the third global input, the image may change when the keyframe is added. This happens because, while you are editing, the third input has the time value of the most recently viewed keyframe (or the value it had when animation was stopped). ArtMatic is only able to calculate the correct time value when the keyframe is actually added.

Examples. Many of the example files we have provided make use of this time input. Several examples are found in the folder **Doc. Example Files:Time Examples**. You can also search the main example library for "time" to find more examples.

Lesson 3 - Inserting Filters

When building complex trees or experimenting with mutations or random path animation, you may find it helpful to insert filter components to restrict the range or modify the values being fed into some but not all of a component's inputs (or outputs). This technique has many applications and is especially powerful when used in combination with the mutation dialog or the randomizing dice.

The system shown below is a 3D sphere system with three inputs at the top. As noted elsewhere, the third global input is a counter (or time value, if you will) which increments with each frame of an animation. Even if no parameters are changed, the passage of time during the animation will cause the sphere's size and texture to change.

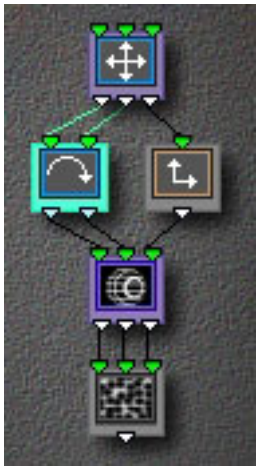


Simple Sphere for Filtering

In this structure, we can modify the counter values by inserting a 1D filter on the thread through which they flow. This structure is

found in a file called **Simple Sphere for Filtering** in the **Documentation Examples:QuickStart Files** folder. Add a few identical keyframes by clicking the **Add** button a few times in succession. Click the **Animate Keyframes** button and notice that the sphere continually recedes. The rate at which it recedes is influenced by the **Scale Z** parameter (the third) of the **Scale** component at the top of the system.

To add a filter, click on the Sphere component then click the **Insert Before** tool in the Structures area. A 3-in/3out component is inserted. Click on the inserted tile to select it. Option-click the tile and choose **Split Component** in the menu which pops up (this command is also found in the **Insert** menu which is found above the structure tree). Two components take the place of the component that was split: a 2-in/2-out tile on the left and a 1D filter on the right. Now, click on the leftmost of the new tiles and click the **Delete** tool in the Structures area to delete it.



The structure after splitting the inserted 3-in/3-out component.

The structure after deleting the unneeded component. While it may be hard to see, only the third output of the upper component passes through the 1D filter that was added.

There is now a filter on the z-output passed from the top of the system into the sphere component. Click on the 1D filter select it and click again to pop up the component selector. Choose **Sin x** from the menu. Animate the keyframes and notice that the sphere's distance now oscillates rather than continually recedes because the constantly increasing z-value output by the system is being fed through a sine function. Now, choose the **Random** function for the 1D filter and animate the keyframes. When exploring using the **mutations dialog** or **random path animation**, it is often useful to insert filters and to lock their parameters to restrict the values that flow through the tree.

Lesson 4 - Compiled Trees

This is very simple introduction to compiled trees, a very powerful feature introduced in ArtMatic Pro 2.5. The Compiled Trees & Iteration chapter provides additional information and exercises that we recommend performing.

In the documentation examples folder, find the file called **Compiled Source**. (It is in a folder called **Compiled Examples**.) Open the file. Play its keyframes to become familiar with them, and choose the **Export Compiled** command with a name such as **compiled**

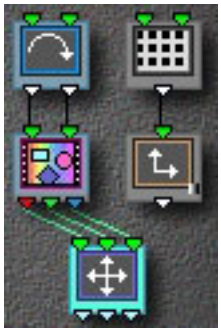
source.cp. Open the file **simple compiled example**. Click on the upper-left tile and choose the **Open Compiled Tree** component and choose the exported tree created in the previous step. Observe the complex animation that now results from a tree with just three tiles.

Now, create a new tree structure by choosing one from the Choose Structure popup menu or by control-clicking the large die. When you find a tree with a 2-in/1-out tile in it, explore what happens when you use Open Compiled Tree to replace it with the compiled tree we just created.

This is a great way to save favorite textures and shapes and incorporate them into new files. The ArtMatic examples library contains a large number of examples that demonstrate the power of this new feature. In the **Documentation Examples** folder, the file **planet with compiled bg** is one example of how compiled trees can be used to make complex textures easily available to your projects.

> **WARNING!** Compiled trees have an Iteration or Recursion parameter which is locked by default. This parameter causes the tile to be 'looped' and, thus, can tie up even a fast processor. We recommend not adjusting this parameter until you have read the Compiled Trees & Iteration chapter which covers recursion and iteration in some detail.

Lesson 5 - Shading



To facilitate exploration of the new shading options, we have provide a simple system, **New Shader Explorer**, whose structure is shown at left. It is located in the **Doc. Examples Files:QuickStart Files** folder and is a convenient system for exploring the new shading options.

Open the file. Notice that the structure has a branch that is not connected to the final output. Components that are not connected to the final output allow you to provide shading and depth that is computed independently of the main image.

Notice that the righthand columns last component has a little shading glyph in the lower-right corner. This indicates that the component provides shading (shadow and lighting information) for the system.

Explore Global Shading. Pop up the Shading Options menu by clicking on its icon 

. Turn Global Shading Off and notice the change. Now, choose **Fog and Shade Automatic** from the Shading Options popup and turn Global Shading On. The image looks different than when you first opened it because ArtMatic is no longer using the Grid component's branch to provide the shadows. Click on the last component in the righthand column to select it. Type 's' (a shortcut for choosing Component Sets Shade from the Shading Options popup). The Grid branch is now providing global shading for the system. Adjust the parameters of the branch's components and note their effect. Where the branch generates low values, the image is dark. Where the branch generates large values, the image is bright.

Explore Depth Cueing. Turn Global Shading Off. Click on the last component in the righthand column to select it. Type 'd' (a shortcut for choosing Component Sets Depth from the Shading Options popup). Pop up the Shading Options popup and notice that **Depth Cueing Small** is on. The component you selected is now responsible for creating a depth fog effect. Change the depth cueing amount using the Shading Options Popup. The first auxiliary color is used to provide the fog. Change the color and see what happens. Explore different parameter settings on the depth cueing branch and explore what happens when you change the actual components used in the branch. Explore what happens when you also assign this branch to set the global shading (by clicking on a tile and typing 's').

To let ArtMatic choose the components that control global shading and depth, choose **Fog and Shade Automatic** from the Shading Options popup.

Another example: The **Planet and Stars** example file makes excellent use of a disconnected component. See Getting Deeper chapter for more information.

For detailed information about ArtMatic's shading functions, see the Shaders chapter of this manual.

Further Exploration

Hopefully, these tutorials have provided material that you can use to start exploring on your own. To get the most out of ArtMatic (though certainly not required), we highly recommend reading the Getting Deeper chapter of this manual which provides both useful techniques and a methodology that many users have found invaluable for learning to control ArtMatic.

We also can't emphasize enough the value of both exploring on your own **and** examining the files provided in the main examples library.