Fox Engine

Version 1.0.0

Developer Documentation

Edition 1.0.0

Authors: Hikaito [github.com]

Bug Reporting

Please report any bugs you find in the program. Be sure to describe any bugs thoroughly enough that our developers can duplicate the issues; the developers can't fix bugs they can't find.

If you are using the .jar version of this program and the program freezes, this indicates a fatal error occuring. If you have compiled the program in an IDE, errors and file logging is written to System.out. A compiled version of the program also freezes in the event of a fatal error.

Introduction

Fox Engine is a program targeted at artists for guided image compositing with artist-generated layers. The software was written to support the concept of "adoptables" art that is popular to many forum game websites.

The software was written in Java with the intent of being highly portable. Since Java is run by the JRE, the software can be ported to any hardware that runs a suitable JRE.

Functionality

The software was written in Java 14, and should be compatible with this and any later version of Java.

Execute Program's main function with no arguments to launch the software.

General Structure

The program structure is divided into subunits that are linked together by a central control class [Program]. Static functions in the central control class are used to invoke various actions across the program structure.

A **project** is the file structure of files available for use as image layers. The ProjectManager object is used to store the project, the information of files available for use in a user's layer tree file.

A **layer tree** is the save file that generates a specific image from a project. The LayerManager object is used to store the user's current file and layer tree structure.

Events and Windows

Actions encapsulated as events are used in several places, such as with the warning window class, which can be used to give the user a chance to abort an action.

Persistent Data

Persistent Data describes data the program remembers, like save files and user settings.

User data is written to json files using the gson package, a json packet that allows fields to be marked as elements to serialize and restore during deserialization. Variables that are saved to files are marked with the "Expose" keyword.

Layer tree save files are not written with the actual images, but instead the registry of project images used to create the layer tree, so many projects can be saved with only limited memory space.

User Setting File

The program saves user setting information to a file called "setting.json". Certain details about the operation of the program can be changed by altering values of this document; erasing the document will prompt the program to regenerate the document.

Global constant values are stored in CoreGlobal if there is no reason for a user to need routine access to the variables.

Project File

The structure of a project is stored in "project.json" in the folder selected as the project's folder.

Layer Tree Files

By default, three output folders are generated in a project structure for storing output files. The folder "saves" is used to store user files, "templates" is used to store specialized user files from which new projects are templatized, and "renders" is the default save location for output images (png). Autosaved files are placed in "saves" with the suffix "_AUTO".

Operational Conventions

- Anything that alters computer files must report the action to Program.log.
- Anything that changes an appearance should call rerendering functions.
- Erasing a layer tree after changing the project must be done after changing the project, to use the correct UUID.
- Anything that alters a value of User Settings save file must also regenerate the save file.

Future Features

- Features that work over multiple selected items at once, or make use of primary and secondary selections.
- Project title editing.
- Undo and Redo actions.
- Warning windows prevent actions from being taken in the actual program.
- Make sure save files are actually marked with project UUID.
- Complete file validity checking for project tree.

Class Breakdown

ColorAdapter

Gson adapter class for saving Color class.

Functions:

Name	Arguments	Returns	Summary
deserialize	n/a	Color	Reads Color object from json
serialize	n/a	JsonElement	Saves Color object to readable json

Copy [interface]

Interface for copying objects.

Functions:

Name	Arguments	Returns	Summary
Copy	n/a	Type copy	Templated function to produce a deep copy of the object in question.

CoreGlobal

File for global constants.

Key Variables:

Name	Type	Purpose
LEFT_BASE_PAD	int	
LEFT_INCREMENTAL_PAD	int	
LEFT_PAD	int	
TREE_LEVEL_PAD	int	
MAX_HEIGHT_TREE_BAR	int	
MAX_WIDTH	int	
EDITOR_WINDOW_HEIGHT	int	
EDITOR_WINDOW_WIDTH	int	
EDITOR_WINDOW_IMAGE	int	
RECONCILIATION_WINDOW_HEIGHT	int	
RECONCILIATION_WINDOW_WIDTH	int	
WARNING_WINDOW_HEIGHT	int	
WARNING_WINDOW_WIDTH	int	

EventE [interface]

Defines objects as events; called EventE because Event is a keyword or something in this namespace.

Functions:

Name	Arguments	Returns	Summary
enact	n/a	n/a	Enact event

FileOperations

Static function class for file operations.

Functions:

Name	Arguments	Returns	Summary
stripExtension	String path, String extension	String	Remove extension from path if extension is present in path; return result
stripDirectory	String path	String	Isolate the filename from the rest of the path; assumes file exists
validExtension	String path, String extension	boolean	Tests if a valid extension is present in the path
validateExtension	String file, String extension	String	Enforces the path to have a given extension
trimDirectory	String directory, String path	String	Isolate a subpath from a longer path using a shorter path
selectFile	String basepath	String	Open file selection dialogue; return file selected path or null.
selectFolder	String basepath	String	Open folder selection dialogue; return path or null
loadTemplate	n/a	n/a	Select and load a file as a template

addTemplate	n/a	n/a	Select and load a template as a merge operation
saveTemplate	n/a	n/a	Select a filename and save the current layer tree as a template
loadImage	n/a	n/a	Select and load a layer tree
saveFile	n/a	n/a	Select a filename and save the current layer tree as a user file
exportDialogue	n/a	n/a	Select a filename and export the current layer tree image
newFile	Boolean showWarning	n/a	Generate a new file Boolean indicates whether or not to generate a warning (which also generates a choice)
generateDirectories	n/a	n/a	Generate corrected paths, called on project change

Folder

Object used in layer tree as a folder. Features include possessing children, clip intersection, clipping mask, alpha value, and other features of LayerCore.

Functions:

Name	Arguments	Returns	Summary
constructor	n/a	n/a	Instantiate folder with default values
copy [interface]	n/a	Folder copy	generate copy of Folder
copy	Bool label	Folder copy	Generates a copy of folder; label variable used to add "copy" to the folder's title
getIntersectClip	n/a	Boolean state	Accessor for clipIntersect
hasIntersectImage	n/a	Boolean state	Determines whether a clipping image is assigned and returns as boolean
setIntersectClip	n/a	n/a	Toggle intersect clip value, if there

			is an intersectImage. Otherwise force false.
setIntersectImage	n/a	Long filecode	Load file specified by filecode as intersect clipping image; set clipIntersect to true
revokeIntersectImage	n/a	n/a	Remove image associated with clipIntersect; set clipIntersect to false
getIntersectTitle	n/a	String title	Returns the title associated with an intersectImage, or a placeholder if there is no such image
getImage [interface]	n/a	BufferedImage image	Renders image by stacking images of member renderables in folder; applies clipping masks of members and self intersect as appropriate; buffers images
getRenderState [interface]	n/a	Boolean state	Returns the current value of "needing render"
requireRender [interface]	n/a	n/a	Marks the object to be rerendered
unrequireRender [interface]	n/a	n/a	Revokes the object's requirement to be rerendered
getChildrenVisibilitty	n/a	n/a	Toggles displayChildren
toggleChildrenVisibility	n/a	n/a	Accessor for displayChildren
getChildren [interface]	n/a	n/a	Clears list of children
clearChildren [interface]	n/a	LinkedList<Tree Unit>	Returns children as a linked list

Key Variables:

Name	Type	Purpose
clipIntersect	bool	Indicates whether or not to enable intersect clipping
intersectImage	ImageUnit	Object for image associated with clipIntersect; null when no such object
imageSource	BufferedImage	Optimization: stores raw rendered image to prevent routine rerender

imageAlpha	BufferedImage	Optimization: storesfinal [alpha and intersect clipping] rendered image to prevent routine rerender
children	LinkedList<TreeUnit>	Stores children in a linked list [used by interface]
displayChildren	bool	Used to mark user visibility of folder children in layer menu

GuiFieldControls

Static function class that generates elements for layer tree sidebar.

Functions:

Name	Arguments	Returns	Summary
makeDelete	LayerCore layer	JButton	Make button to delete element
makeDeleteAll	LayerCore layer	JButton	Make button to delete element and all subelements
makeDuplicate	LayerCore layer	JButton	Make button to clone an element and all subelements
addLocationControls	JPanel innerField, LayerCore layer	n/a	Add movement buttons to a specified JPanel
makeButtonIn	LayerCore layer	JButton	Make button for moving layer into folder
makeButtonDown	LayerCore layer	JButton	Make button for moving layer down in folder
makeButtonUp	LayerCore layer	JButton	Make button for moving layer up in folder
makeButtonOut	LayerCore layer	JButton	Make button for moving layer out of folder
makeSelectionButton	LayerCore layer	JButton	Make button for selecting layer

makeTitle	LayerCore layer	JLabel	Make label for title
makeTitleField	LayerCore layer	JTextField	Make editable field for title
makeClippingToggle	LayerCore layer	JCheckBox	Make toggle for clipping
makeClippingLabel	LayerCore layer	JLabel	Helper function makeClippingToggle; produces label
makeVisibleToggle	LayerCore layer	JCheckBox	Make toggle for visibility
makeVisibilityToggleButton	LayerCore layer	JButton	Make button to toggle visibility
makeAlpha	LayerCore layer	JPanel	Make alpha edit subpanel
makeColorToggle	Layer layer	JCheckBox	Make use color toggle
addColorChooser	JPanel innerField, Layer layer	n/a	Make color chooser with default parameters
addColorChooser	JPanel innerField, int textPosition, Color textColor, Layer layer	n/a	Make color chooser with full parameters textPosition: 0 = none, 1 = left, 2 = right textColor determines color of text
loadFileAsLayerButton	Layer layer	JButton	Make button for loading file into layer
makeChildrenExpand	Folder layer	JCheckBox	Make toggle for showing and hiding children in layer tree view
makeChildrenExpandButton	Folder layer	JButton	Make toggle button for showing and hiding children in layer tree view
loadFileAsIntersectMaskButton	Folder layer	JButton	Make button for loading intersect clipping file
revokeIntersectMaskButton	Folder layer	JButton	Make button for revoking intersect

			clipping file
makeIntersectClipToggle	Folder layer	JCheckBox	Make toggle checkbox for intersect clipping

GuiOperations

Static function helper glass for gui operations.

Functions:

Name	Arguments	Returns	Summary
treeColorAssign	LayerCore obj	Color	Selects a color based on the layer properties
levelShade [depreciated]	int level	Color	Function for determining the background shading from a level number
formatColor	Color color	String text	Formats the hex values of a color to a prettier format for human consumption
toggleMenuComplexity [depreciated]	boolean expand	String text	Generates text for a menu toggle

ImageOperations

Static function class with image operations.

Functions:

Name	Arguments	Returns	Summary
colorBackground	BufferedImage source, Color color	BufferedImage result	Draws the source image on a background of a specified color
colorAlpha	BufferedImage source, Color color	BufferedImage result	Colors the specified source image with a specified color but does not alter the alpha channels

shiftAlpha	BufferedImage source, double factor	BufferedImage result	Reduces the alpha of the source to a specified multiplication factor [0-1]
clipMerge	BufferedImage source, BufferedImage overlay	BufferedImage result	Merge the overlay image as a clipping mask to the source image
clipIntersect	BufferedImage mask, BufferedImage top	BufferedImage result	Return only the alpha intersection of mask and top, with top designated as the color source

ImagePanel

Object for rendering the actual canvas, particularly with zoom.

Functions:

Name	Arguments	Returns	Summary
constructor	n/a	n/a	Initialize elements
setImage	String filepath	n/a	loads image at path
generateIcon	n/a	n/a	Generate a new icon with the appropriate zoom applied to the source image
getZoom	n/a	n/a	Generate a zoomed image
readImage	String filepath	Bool success	Load image from filepath as BufferedImage
setImage	BufferedImage newImage	n/a	Sets image to given image and regenerates images
zoomIn	n/a	n/a	Zoom in by a fixed factor
zoomOut	n/a	n/a	Zoom out by a fixed factor
setZoom	Int factor	n/a	Set zoom by factor divided by a constant
setZoom	Double factor	n/a	Set zoom to a given value
getZoomValue	n/a	n/a	Accessor for zoom

Key Variables:

Name	Type	Purpose
zoom	double	Represents the zoom setting
image	BufferedImage	Stores the image to be zoomed
imageIcon	ImageIcon	The actual graphical representation of the image

ImageUnit

Data object for an image loaded from the project tree.

Functions:

Name	Arguments	Returns	Summary
constructor	n/a	n/a	Initialize with no file
constructor	Long filecode	n/a	Initialize with file from filecode
Copy [interface]	n/a	ImageUnit copy	Generate a deep copy
getTitle	n/a	String title	Accessor for title; reloads if firstLoad = true
get	n/a	BufferedImage image	Accessor for imageSource; reloads if firstLoad = true
getFileCode	n/a	Long filecode	Accessor for fileCode
setImage	Long filecode	n/a	Mutator for filecode; marks firstload as true
initialize	n/a	n/a	Helper function that retrieves file with filecode from project structure; changes fileCode and title

Key Variables:

Name	Type	Purpose
imageSource	BufferedImage	Image of data object
firstLoad	bool	Boolean indicator to reload image; initializes to true

fileCode	long	Filecode associated with image
title	String	Title associated with image

Layer

Layer object for LayerTree.

Functions:

Name	Arguments	Returns	Summary
constructor	n/a	n/a	Initialize default values
copy [interface]	n/a	Layer copy	generate copy of layer
copy	Bool label	Layer copy	Generates a copy of layer; label variable used to add "copy" to the title
setImage	n/a	Long fileCode	Load new file into imageSource; if the layer's title is the default title, change the layer's title to match. Mark for rerendering.
getFileCode()	n/a	Long fileCode	Get the imageSource's file code
getImage [interface]	n/a	BufferedImage image	Returns the "render" image from the renderable object
getRenderState [interface]	n/a	Boolean state	Returns the current value of "needing render"
requireRender [interface]	n/a	n/a	Marks the object to be rerendered
unrequireRender [interface]	n/a	n/a	Revokes the object's requirement to be rerendered
getUseColor	n/a	Bool state	Accessor for useColor
setUseColor	n/a	n/a	Toggles useColor state
setUseColor	Bool state	n/a	Mutator, changes useColor state to specific value

getColor	n/a	Color color	Accessor for color
setColor	Color state	n/a	Mutator for color

Key Variables:

Name	Type	Purpose
imageSource	ImageUnit	Store image that represents layer image
imageColor	BufferedImage	Optimization: stores colored version of image
imageColorAlpha	BufferedImage	Optimization: stores alpha clipped version of image
useColor	bool	Toggle indicating whether or not to use the image's original color [false = use original color]
color	Color	Color to be used if useColor is false

LayerCore

Core object for layer tree objects with common attributes.

Functions:

Name	Arguments	Returns	Summary
LayerCore	String type for super	n/a	Initialize default values for object
copy	n/a	LayerCore copy	Generates deep copy of object
getAlpha	n/a	Double alpha	Accessor for alpha
setAlpha	Double state	n/a	Mutator for alpha
getVisible	n/a	Bool visible	Accessor for visible
setVisible	n/a	n/a	Toggle visible value
setVisible	Bool state	n/a	Set visible value to specific boolean value
getClipToParent	n/a	Bool clipToParent	Accessor for clipToParent

setClipToParent	n/a	n/a	Toggle clipToParent value
setClipToParent	bool state	n/a	Set clipToParent to a specific boolean value
getTitle	n/a	String title	Accessor for title
setTitle	String title	n/a	Mutator for title

Key Variables:

Name	Type	Purpose
requiresAlphaRerender	bool	Optimization flag for indicating when alpha should be rerendered
alpha	double	Percentage ranging from 0 to 1 indicating the opacity of a layer
visible	bool	User visibility: a toggle of active or inactive; distinct from alpha
clipToParent	bool	Boolean to control clipping to layers below
title	String	Title for layer

LayerEditorPane

Static class generates editor pane views.

Functions:

Name	Arguments	Returns	Summary
corePanel	n/a	JPanel	Produces core panel object
layerEditorPane	layer	JPanel	Produces editor pane for a specified layer
folderEditorPane	Folder	JPanel	Produces editor pane for a specified folder

LayerManager

Object responsible for maintaining and rendering the layer tree.

SelectionManager message passing

Name	Type	Detail
addSelection	set	addSelection
removeSelection	get	removeSelection
clearSelection	execute	clearSelection
peekSelectionTop	get	peekTop
getSelectionStatus	get	getSelectionType
checkSelection	get	checkSelection
selectionColor	get	selectColor

Functions:

Name	Arguments	Returns	Summary
setProjectID	String id	n/a	Mutator for projectID
setProjectTitle	String title	n/a	Mutator for project_title
getProgramVersion	n/a	VersionNumber version	Accessor for programVersion
evaluateProgramNumber	Program number, test number	boolean	Tests a VersionNumber to check if it is acceptable given a specified program number. Returns true if permitted and false if denied.
constructor	n/a	n/a	Initializes gui
addManager	LayerManager obj	n/a	Adds a layer manager's layer tree as a folder to the current layer tree
replaceManager	LayerManager obj	n/a	Replaces the contents of the current layer manager with a loaded layer manager
clear	n/a	n/a	Remove all elements from root
moveLayer	TreeUnit layer, direction dir	n/a	Move specified tree unit in specified direction, but only if physically possible
addFolder	n/a	n/a	Add new empty folder to root

addLayer	n/a	n/a	Add new empty layer to root
addLayer	Long code, bool useColor, Color color	n/a	Add layer with specified attributes
addChild	Parent, child	n/a	Add child to specified parent
addChild	Parent, child, location	n/a	Add child to specified parent at specified location
addChildAtSiblingng	Sibling, child, place	n/a	Add child to parent at sibling at specified location
duplicate	layer	n/a	Create duplicate of layer at layer location
delete	Layer, boolean deep	n/a	Delete layer; if deep is true, then delete all nested elements. Otherwise delete only outer shell
generateTreeParents	n/a	n/a	Regenerate tree structure internally
generateTreeParents	parent	n/a	Regenerate subtree structure internally
markImageForRender	TreeUnit object	n/a	Mark object and all ancestors for rerender
markParentForRender	TreeUnit child	n/a	Mark object's parent and all ancestors for rerender
stackImage	n/a	BufferedImage image	Return the tree's stacked image
getLayerTreePanel	n/a	JPanel	Accessor for layerTreePanel
getLayerEditorPanel	n/a	JPanel	Accessor for layerEditPanel
initializeGui	n/a	n/a	Generate gui in layerTreePanel and layerEditPanel
rebuildLayerTree	n/a	n/a	Regenerate gui in layerTreePanel
rebuildEditorPanel	n/a	n/a	Regenerate gui in layerEditPanel

Key Variables:

Name	Type	Purpose
position	enum	Describes vertical position
direction	enum	Describes a direction to move a file
defaultLocation	position	Default location for insertion operations
root	Folder	Folder representing layer tree
projectID	String	Project ID associated with a project
projectTitle	String	Title associated with a project
programVersion	VersionNumber	Version of the program used to create the layer tree
selectionManager	SelectionManager	Selection object
layerTreePanel	JPanel	Panel for holding layer tree gui
layerEditPanel	JPanel	Panel for holding layer edit gui

LayerTreeFolder [interface]

Marks an object as capable of acting as a folder in the layer tree.

Functions:

Name	Arguments	Returns	Summary
clearChildren	n/a	n/a	Clears list of children
getChildren	n/a	LinkedList<Tree Unit>	Returns children as a linked list

LayerTreeGui

Static function class that generates elements for the layer tree display.

Functions:

Name	Arguments	Returns	Summary
makeFiletreeBar	Int level	JPanel	Generate base bar unit

makeFolderBar	Folder unit, int level, Color color	JPanel	Generate folder bar unit from specified folder, level, and selection color
makeLayerBar	Layer unit, int level, Color color	JPanel	Generate layer bar unit from specified folder, level, and selection color
buildPanel	JPanel box, int level, LayerTreeFolder unit	n/a	Generate layer tree gui from layer tree

MainWindow

Class to generate and maintain main gui window.

Functions:

Name	Arguments	Returns	Summary
constructor	n/a	n/a	Generates main window
dispose	n/a	n/a	Disposes of main window
redrawCanvas	n/a	n/a	Redraws main canvas image
repaintLayerEditor	n/a	n/a	Redraw editor sidebar
drawAllInitialize	n/a	n/a	Initialize all components
regenMenuBar	n/a	n/a	Regenerate upper menu bar components
zoomInCanvas	n/a	n/a	Zoom in on image
zoomOutCanvas	n/a	n/a	Zoom out image
generateMenu	JMenuBar menuBar	n/a	Initialize menu bar with elements
generateSplitFrame	n/a	n/a	Generate split frame region
generateImagePanel	n/a	n/a	Generate canvas image panel
generateControlPane	n/a	n/a	Generate control pane region

Key Variables: (many other internal variables exist)

Name	Type	Purpose
jFrame	JFrame	Window variable

MainWindowComponents

Static class for creating window components.

Functions:

Name	Arguments	Returns	Summary
makeZoomPanel	ImagePanel imageLabel	JPanel	Make zoom slider panel for sidebar
makeButtonRow	n/a	JPanel	Make top of sidebar button panel
makeLayerTreePanel	n/a	JScrollPane	Create scrolling pane for layer tree
makeZoomSlider	ImagePanel target	JSlider	Make actual slider object for zoom slider panel (creates slider object)
makeNewFolderButton	n/a	JButton	Make button for adding new folder to layer tree
makeNewLayerButton	n/a	JButton	Make button for adding new layer to layer tree
makeDeselectAllButton	n/a	JButton	Make button for deselecting all elements
makeExportButton	n/a	JButton	Make button for exporting image

MenuPane

Static class for generating topbar menu elements.

Local Classes:

Name	Implements	Task
templateLoadWarning	EventE	Carry event for loading template
loadFileWarning	EventE	Carry event for loading a layer tree file

Functions:

Name	Arguments	Returns	Summary
generateFileMenu	n/a	JMenu	Generate File Menu
generateViewMenu	n/a	JMenu	Generate View Menu
generateProjectMenu	n/a	JMenu	Generate Project Menu

Program

Primary backbone of the project; transports messages between different objects through static function calls. Central control unit for processing responsibilities.

Note: most functions require main() to be run first before they work properly.

Functions:

Name	Arguments	Returns	Summary
main	String[] args	n/a	Launches program window and etc
getProgramVersion	n/a	VersionNumber	Accessor for programVersionNumber
log	String input	n/a	Writes information to log stream
getWindowTitle	n/a	String	Generate window title

MainWindow

Name	Type	Detail
redrawAllRegions	execute	Redraw canvas and editor window regions
redrawLayerEditor	execute	Redraw editor region
redrawCanvas	execute	redrawCanvas
redrawMenuBar	execute	regenMenuBar
zoomInCanvas	execute	zoomInCanvas
zoomOutCanvas	execute	zoomOutCanvas

ProjectManager

Name	Type	Detail
getProjectID	get	getUUID
getImageFile	get	getFile
getImage	get	Returns BufferedImage associated with file code
saveProject	execute	saveFile
loadProject	set	loadProject
editProject	execute	openEditor
selectFileFromProject	execute	openSelector(layer)
selectIntersectClippingFile	execute	openSelector(folder)
getProjectMenu	get	getMenu

SelectionManager via LayerManager

Name	Type	Detail
addSelection	set	addSelection
removeSelection	get	removeSelection
clearSelection	execute	clearSelection
peekSelectionTop	get	peekSelectionTop
getSelectionStatus	get	getSelectionStatus
checkSelection	get	checkSelection
selectionColor	get	selectionColor

LayerManager

Name	Type	Detail
generateManagerFile	execute	Generate save file for layer manager
loadManagerFile	get	Load layer manager object
loadFileAsManager	set	Load layer manager object as project layer manager

mergeFileAsManager	set	Merge layer manager object with project layer manager
clearFile	execute	clear
moveLayer	execute	moveLayer
addFolder	execute	addFolder
addLayer	execute	addLayer
addLayer (arguments)	set	addLayer, but with arguments
duplicateTreeUnit	execute	duplicate
deleteTreeUnit	execute	delete
markImageForRender	set	markImageForRender
markParentForRender	set	markParentForRender
getCanvasImage	get	stackImage
getLayerTreePanel	get	getLayerTreePanel
getLayerEditPanel	get	getLayerEditorPanel

FileOperations

Name	Type	Detail
loadTemplate	execute	loadTemplate
addTemplate	execute	addTemplate
saveTemplate	execute	saveTemplate
loadImage	execute	loadImage
saveFile	execute	saveFile
exportImage	execute	exportDialogue
newFile	execute	newFile (true)
newFileNoWarning	execute	newFile (false)

UndoRedoStack:

Name	Type	Detail
addUndo	set	add
undo	execute	undo
redo	execute	redo

UserSetting Functions:
All mutator functions have to invoke the export function on UserSetting.

Name	Type	Detail
getScrollMouseAcceleration	get	canvasMouseAcceleration
getCanvasScaleFactor	get	canvasScaleFactor
getCanvasSliderMin	get	canvasSliderMin
getCanvasSliderMax	get	canvasSliderMax
getCanvasSliderNeutral	get	canvasSliderNeutral
getDefaultCanvasWidth	get	defaultCanvasWidth
getDefaultCanvasHeight	get	defaultCanvasHeight
getDefaultWindowWidth	get	defaultWindowWidth
getDefaultWindowHeight	get	defaultWindowHeight
getUndoMax	get	undoMax
getPrimarySelectionColor	get	colorPrimarySelection
getSecondarySelectionColor	get	colorSecondarySelection
getManySelectionColor	get	colorManySelection
getDefaultRenderableTitle	get	defaultRenderableTitle
getDefaultFileCode	get	defaultFileCode
getSaveFileExtension	get	fileExtensionSave
getImageFileExtension	get	fileExtensionRender
getImageExportFormat	get	imageRenderFormat

getAutosavePath	get	filenameExtensionAutosave Argument: filename String Result: full path to autosave folder with autosave suffix and the save extension
getFileExtensionLoadImage	get	fileExtensionLoadImage
getProjectFile	get	projectFileName
getProjectPath	get	pathDefaultProject
setProjectPath	set	pathDefaultProject Argument: path String Result: saves path as new project path
getSaveFolder	get	pathExportImageFolder
getSaveFolderPath	get	pathExportImageFolder: full path
getTemplateFolder	get	pathSourceTemplateFolder
getTemplateFolderPath	get	pathSourceTemplateFolder: full path
getRenderFolder	get	pathExportSaveFolder
getExportFolderPath	get	pathExportSaveFolder: full path

Key Variables:

Name	Type	Purpose
userSetting	UserSetting	User settings object
window	MainWindow	Main window of program
undoRedoStack	UndoRedoStack	Set of undo and redo actions
projectManager	ProjectManager	Project manager for project of program
programVersionNumber	VersionNumber	Version of program in production; used for version number calculations
logStreamOut	PrintStream	Output stream for log actions
gson	Gson	GsonBuilder for reading files

ProjectCore

One level above project unit core, adds ID.

Functions:

Name	Arguments	Returns	Summary
constructor	String type, long id	n/a	Pass type to super, keep id
getID	n/a	long	Accessor for id
setID	long	n/a	Mutator for id
getTree [abstract]	n/a	DefaultMutableTreeNode	Get tree

Key Variables:

Name	Type	Purpose
id	long	Project ID for file

ProjectEditor

Windowed dialogue for editing the project structure.

Local Classes:

Name	Implements	Task
RegenerateEvent	EventE	Invokes regeneration of editor windows

Functions:

Name	Arguments	Returns	Summary
constructor	ProjectManager source	n/a	Generates project editor window
generateTree	n/a	JTree	Generates a JTree from the project tree
regenerateEditorPane	n/a	n/a	Regenerate editor pane [helper]

regenerateEditorPane	DefaultMutableTreeNode selection	n/a	Regenerate editor pane with selected tree node object
generateFileDetails	DefaultMutableTreeNode select	n/a	Generate editing gui for a file
generateFolderDetails	DefaultMutableTreeNode select	n/a	Generate editing gui for a folder
generateRootDetails	DefaultMutableTreeNode select	n/a	Generate editing gui for a project root
generateNullDetails	n/a	n/a	Generate gui for no selected element to edit

Key Variables:

Name	Type	Purpose
source	ProjectManager	Holds project source that invoked window
editorPane	JPanel	Panel for editing gui
imageDisplay	JPanel	Panel for image gui
splitPane	JSplitPane	Pane for splitting the different gui elements
treeRoot	DefaultMutableTreeNode	Root for gui tree structure raw data
tree	JTree	Variable to hold the project gui tree structure
color	boolean[]	This variable has only one value; it is passed as an array so it does not need to be returned from functions. This variable tracks whether or not to use the background mask color in display.
activeSelection	ProjectUnitCore	Variable that tracks the selected element in the project editor gui tree

ProjectEditorFunctions

Static class for generating project window gui elements.

Local Classes:

Name	Implements	Task
DeleteEvent	EventE	Delete an element from a tree
FileSelectionEvent	n/a	Base class for making a selection

Functions:

Name	Arguments	Returns	Summary
makeTitle	ProjectUnitCore unit	JLabel	Generates a title label from a ProjectUnitCore object
makeTitleField	DefaultMutableTreeNode unit, JTree tree	JTextField	Generate a title text field and add it to the specified tree
makeMoveIn	DefaultMutableTreeNode select, JTree tree, ProjectEditor caller	JButton	Generate a button for moving a selected element into a folder of another element in a tree
makeMoveOut	DefaultMutableTreeNode select, JTree tree, ProjectEditor caller	JButton	Generate a button for moving a selected element into a folder of another element in a tree
makeMoveUp	DefaultMutableTreeNode select, JTree tree, ProjectEditor caller	JButton	Generate a button for moving a selected element into a folder of another element in a tree
makeMoveDown	DefaultMutableTreeNode select, JTree tree, ProjectEditor caller	JButton	Generate a button for moving a selected element into a folder of another element in a tree
makeRemove	DefaultMutableTreeNode select, JTree tree, ProjectEditor caller	JButton	Make button for removing an element from a tree
makeFileSelectionField	DefaultMutableTreeNode unit	JPanel	Generate title text for a selected element
makeColorToggle	ProjectFile unit, EventE event	JCheckBox	Generate a toggle option for "use color"
makeBackgroundTo	EventE editor,	JCheckBox	Generate a toggle option for

ggle	boolean[] toggle		background viewing color
addColorChooser	JPanel innerField, ProjectFile unit, EventE redraw	n/a	Helper with default values
addColorChooser	JPanel innerField, int textPosition, Color textColor, ProjectFile unit, EventE redraw	n/a	Generate color chooser button for color selection of unit; place button in innerField. Text positions: 0 = none, 1 = left, 2 = right Color: color for text
loadImage	ProjectFile file, String filepath, JPanel destination, Boolean colorBackground	n/a	Load image specified by filepath and place in the destination panel. colorBackground is a boolean that indicates whether or not to add a background color. The file is marked as valid if it could be loaded.
makeAddFolder	DefaultMutableTreeNode select, JTree tree, ProjectRoot root	JButton	Make button for adding a folder to the project tree
makeAddFile	DefaultMutableTreeNode select, JTree tree, ProjectRoot root	JButton	Make a button for adding a file to the project tree
makeSave	ProjectManager source	JButton	Make a button for saving the project
makeSelection	ProjectFile unit, FileSelectionEvent select, EventE event	JButton	Make a button for selecting a file in the file selection window

ProjectFile

Element representing a file in the project tree.

Functions:

Name	Arguments	Returns	Summary
constructor	String title, long id	n/a	Initialize with path
constructor	String path, String title, long id	n/a	Initialize with title and path
getPath	n/a	string	Accessor for path
setPath	String	n/a	Mutator for path
isValid	n/a	bool	Accessor for fileValid
setValid	bool	n/a	Mutator for fileValind
setUseColor	bool	n/a	Mutator for useColor
getUseColor	n/a	bool	Accessor for useColor
setColor	Color	n/a	Mutator for color
getColor	n/a	Color	Accessor for color
getTree	DefaultMutable TreeNode top	n/a	Adds self to tree
compareTo	ProjectFile o	Comparison number	Compares by paths
generateMenu	JMenu root	n/a	Generate menu element; add self to menu

Key Variables:

Name	Type	Purpose
path	String	Path of file
fileValid	bool	Optimization: marker of file validity during file reading operations. If file read fails, it does not attempt again.
use_color	bool	Metric of whether the saved color should be used
color	Color	Color paired with use_color

ProjectFileSelection

Window for selecting object to assign to a layer tree element.

Local Classes:

Name	Implements	Task
CloseWindow	EventE	Invokes window close by simulating an x press event to the window
RegenerateEvent	EventE	Invokes regeneration of editor windows
SelectFileLayer	ProjectEditorFunctions. FileSelectionEvent	Performs action of selecting a file for a layer
SelectFileFolder	ProjectEditorFunctions. FileSelectionEvent	Performs action of selecting a file for a folder

Functions:

Name	Arguments	Returns	Summary
constructor	ProjectManager source, Layer layer	n/a	Generates file selection window for layer
constructor	ProjectManager source, Folder folder	n/a	Generates file selection window for folder
generateTree	n/a	JTree	Generates a JTree from the project tree
regenerateEditorPane	n/a	n/a	Regenerate editor pane [helper]
regenerateEditorPane	DefaultMutableTreeNode selection	n/a	Regenerate editor pane with selected tree node object
generateFileDetails	DefaultMutableTreeNode select	n/a	Generate selection gui for a file; uses different objects for a folder and a layer
generateFolderDetails	DefaultMutableTreeNode select	n/a	Generate editing gui for a folder
generateRootDetails	DefaultMutableTreeNode select	n/a	Generate editing gui for a project root
generateNullDeta	n/a	n/a	Generate gui for no selected element to

ils			edit

Key Variables:

Name	Type	Purpose
jFrame	JFrame	Window object
source	ProjectManager	Holds project source that invoked window
editorPane	JPanel	Panel for editing gui
imageDisplay	JPanel	Panel for image gui
splitPane	JSplitPane	Pane for splitting the different gui elements
treeRoot	DefaultMutableTreeNode	Root for gui tree structure raw data
tree	JTree	Variable to hold the project gui tree structure
color	boolean[]	This variable has only one value; it is passed as an array so it does not need to be returned from functions. This variable tracks whether or not to use the background mask color in display.
layer	Layer	Stores calling layer, if caller is layer
folder	Folder	Stores calling folder, if caller is folder
isLayer	bool	Stores whether the caller is a layer or a folder. A layer is true, a folder is false.
activeSelection	ProjectUnitCore	Variable that tracks the selected element in the project editor gui tree

ProjectFolder

Folder object of project tree.

Functions:

Name	Arguments	Returns	Summary
constructor	String title, long id	n/a	Initialize with title and file code
getChildren	n/a	LinkedList<Proje	Accessor for children set

[interface]		ctUnitCore>	
generateParents	n/a	n/a	Generate parent links to tree
getTree	DefaultMutableTree Node top	n/a	Adds self to tree
generateMenu	JMenu root	n/a	Generate menu element; add self to menu

Key Variables:

Name	Type	Purpose
subitems	LinkedList<Project UnitCore>	Hold children

ProjectFolderInterface [interface]

Interface marking a class as a parent for a project tree.

Functions:

Name	Arguments	Returns	Summary
getChildren	n/a	LinkedList<ProjectUnitCore>	Get child list

ProjectManager

Project Tree management unit, responsible for maintaining and operating on the project tree.

Functions:

Name	Arguments	Returns	Summary
getUUID	n/a	String	Retrieve UUID from project root
matchesUUID	String other	Boolean matches	Boolean of whether the UUID of the project root matches another UUID supplied
getTitle	n/a	String title	Retrieve title from root

evaluateProject Number	VersionNumber program, VersionNumber project	boolean	Assesses whether or not the supplied version number is approved for loading in the supplied version of the program.
getRoot	n/a	ProjectRoot	Retrieve the project root object [accessor for root]
getTree	n/a	DefaultMutableTreeNode	Generate the gui tree for the project tree
updateDependencies	n/a	n/a	Rebuilds dependencies when a tree is changed
buildDictionary	n/a	n/a	Generate a dictionary from the project tree
addDict	ProjectUnitCore root	n/a	Add elements of a project tree rooted at root to the current project dictionary
getFile	long code	ProjectFile	Retrieve project file from file code
saveFile	n/a	boolean	Function to write save file for project; boolean indicates success
initializeEmpty	n/a	n/a	Initialize a null project
initializeProject	String fullpath	n/a	Initialize a project from a folder path
readTree	String fullpath	ProjectRoot	Generate a project root from a folder path
initializeTree	LinkedList<ProjectUnitCore> folder, File file, ProjectRoot temproot	n/a	Generate a project tree in a specified root; adds found files to the specified folder list
loadProject	n/a	n/a	Load project file after offering the user the choice to select a folder as the project root
loadProject	String path	n/a	Load project file specified by project path; opens reconciliation dialogue as appropriate
fillFileList	ProjectUnitCore root, SortedSet<ProjectFile> files	n/a	Recursively fill the files list with all projectfile instances in the specified file tree

getAbsolutePath	ProjectFile file	String	Returns the absolute path to a project file specified by file
mergeFile	ProjectFile keep, ProjectFile flake	n/a	Copy the path and image load information of the flake to the keep file; used in project reconciliaton
addFile	ProjectFile file	n/a	Add specified file to project root
openEditor	n/a	n/a	Open project editor window
openSelector	Layer layer	n/a	Open file selector for specified layer object
openSelector	Folder folder	n/a	Open file selector for specified folder object
getMenu	n/a	JMenu	Retrieve menubar menu construct for the project tree

Key Variables:

Name	Type	Purpose
root	ProjectRoot	Data tree of the project tree
dictionary	HashMap<Long, ProjectFile>	Indexes objects in the project tree by their file code for quick access
gson	Gson	GsonBuilder for writing projects to a save file

ProjectReconciliation

Window for addressing changes to project file structure that are not represented in the project tree file.

Local Classes:

Name	Implements	Task
RegenerateEvent	EventE	Invokes regeneration of window

Functions:

Name	Arguments	Returns	Summary

constructor	ProjectManager source, SortedSet<ProjectFile> existingSet, SortedSet<ProjectFile> newSet	n/a	Generates project reconciliation window
generateTreeRoot	SortedSet<ProjectFile> set, String rootText	DefaultMutableTreeNode	Generates a tree gui structure for a specified set with the specified title
regeneratePanes	n/a	n/a	Regenerates window elements
drawEditor	n/a	n/a	Draw editor area

Key Variables:

Name	Type	Purpose
source	ProjectManager	Holds project source that invoked window
existingSet	SortedSet<ProjectFile>	List for existing files without file paths
discoveredSet	SortedSet<ProjectFile>	List for discovered file paths without associated file object
existingTree	JTree	Tree for existingSet
discoveredTree	JTree	Tree for discoveredSet
existingRoot	DefaultMutableTreeNode	Root for existingSet
discoveredRoot	DefaultMutableTreeNode	Root for discoveredSet
existingSelect	DefaultMutableTreeNode	Selected element in existingSet
discoveredSelect	DefaultMutableTreeNode	Selected element in discoveredSet
imagePanel	JPanel	Image panel
editorPanel	JPanel	Editor panel
jFrame	JFrame	Window variable
color	boolean[]	This variable has only one value; it is passed as an array so it does not need to be returned from functions. This variable tracks whether or not to use the background mask color in display.

ProjectRoot

Top level folder for project tree.

Functions:

Name	Arguments	Returns	Summary
constructor	n/a	n/a	Default title
constructor	String title	n/a	Generates with given title
getUUID	n/a	string	Accessor for uuid
getNextID	n/a	long	Returns the value of layerIDIterate and increments
checkID	n/a	long	Accessor for layerIDIterate
getPath	na/	String	Accessor for path
setPath	String	n/a	Mutator for path
getProgramVersion	n/a	VersionNumber	Accessor for programVersion
getChildren [interface]	n/a	LinkedList<ProjectUnitCore>	Accessor for children set
generateParents	n/a	n/a	Generate parent links to tree
getTree	n/a	DefaultMutableTreeNode	Generate gui tree from subtree
generateMenu	n/a	JMenu	Generate menu option from subtree

Key Variables:

Name	Type	Purpose
uuid	String	Unique project identifier for marking save files
layerIDIterate	long	Used to give layers unique numbers
path	String	Path of file location
programVersion	VersionNumber	Used to store version number of program that

		created the save file
subitems	LinkedList<Project UnitCore>	Linked list of all subitems contained within

ProjectTypeAdapter

Gson adapter class for differentiating ProjectUnit inherited classes.

Functions:

Name	Arguments	Returns	Summary
deserialize	n/a	Subclass	Reads object from json

ProjectUnitCore

Most basic unit of project tree.

Functions:

Name	Arguments	Returns	Summary
constructor	String type	n/a	Type used for deserialization
getType	n/a	String	Accessor for type
setTitle	String title	n/a	Mutator for title
getTitle	n/a	String	Accessor for title
toString	n/a	String	To-string, required for tree display
getParent	n/a	ProjectUnitCore	Accessor for parent
setParent	ProjectUnitCore	n/a	Mutator for parent

Key Variables:

Name	Type	Purpose

type	String	Differentiate deserialization
title	String	Title or alternative name for file
parent	ProjectUnitCore	Parent in tree

Receipt [interface]

Object for use with UndoRedoStack; implemented with actions.

Functions:

Name	Arguments	Returns	Summary
revoke	n/a	Receipt result	Applied to a vessel object with the relevant details to undo an action and produce a receipt of the inverse [a redo action]

Renderable [interface]

Marks an object as capable of being rendered as part of a layer tree.

Functions:

Name	Arguments	Returns	Summary
getImage	n/a	BufferedImage image	Returns the "render" image from the renderable object
getRenderState	n/a	Boolean state	Returns the current value of "needing render"
requireRender	n/a	n/a	Marks the object to be rerendered
unrequireRender	n/a	n/a	Revokes the object's requirement to be rerendered

RendererTypeAdapter

Gson adapter class for differentiating renderer inherited classes.

Functions:

Name	Arguments	Returns	Summary
deserialize	n/a	Subclass of Renderable	Reads Renderable object from json

---

SelectionManager

Object for controlling selection of objects in LayerTree.

Functions:

Name	Arguments	Returns	Summary
addSelection	TreeUnit obj	n/a	Add object to selection set
removeSelection	TreeUnit obj	n/a	Remove specific object from selection set
clearSelection	n/a	n/a	Remove all selected objects from selection set
getSelectionStatus	n/a	selectionPriority status	Accessor for currentSelectType
peekTop	n/a	TreeObject top	Check the top object selected
getSelectionType	n/a	selectionPriority status	Generates a value for currentSelectType based on state of selection list
checkSelection	n/a	selectionPriority status	Checks the selection status of a given object
selectColor	n/a	TreeObject obj	Generates a selection color for a given tree object

Key Variables:

Name	Type	Purpose
selectionPriority	enum	Enumerator for types of selections
selection	LinkedList<TreeUnit>	List of selected objects; order is significant to selection
currentSelectType	selectionPriority	State of current selection

TreeUnit

Object that can be assembled into a layer tree as a tree element.

Functions:

Name	Arguments	Returns	Summary
constructor	String type	n/a	Sets deserialization switch tag
getParent	n/a	FiletreeFolder	Gets parent folder object
setParent	FiletreeFolder parent	n/a	Sets new parent folder object

UndoRedoStack

Control object for managing undo and redo actions from receipt objects generated by events.

Functions:

Name	Arguments	Returns	Summary
getMaxStackSize	n/a	Int max	Accessor for maxStackSize
hasUndo	n/a	bool	Returns true if undo actions exist to be taken
hasRedo	n/a	bool	Returns true if redo actions exist to be taken
constructor	Int maxSize	n/a	Initialize stack with maximum size

add	Receipt action	n/a	Add action to undo queue; delete redo queue if extant
undo	n/a	n/a	Perform undo action
redo	n/a	n/a	Perform redo action

Key Variables:

Name	Type	Purpose
maxStackSize	int	Maximum size of the undo/redo stack [limited for memory conservation]
undoList	LinkedList<Receipt>	List of undo actions that can be taken
redoList	LinkedList<Receipt>	List of redo actions that can be taken

---

UserSetting

Storage object for user program settings.

Note: alterations to variables here must also call exportJSON() to regenerate the json file. If file variables are manipulated, generateDirectories() must also be called.

Functions:

Name	Arguments	Returns	Summary
get	n/a	UserSetting object	Factory for generating user setting object; loads object if not loaded and returns object if loaded.
importJson	n/a	UserSetting object, null on failure	loads class from json file
exportJson	n/a	Boolean of success	writes class to json file

Key Variables:

Name	Type	Purpose
fileName	String	Default file name for the written file of the user settings

gson	Gson	GsonBuilder for writing and reading classes; includes relevant adapters
canvasMouseAcceleration	int	Canvas zoom acceleration
canvasScaleFactor	double	Canvas zoom acceleration
canvasSliderMin	int	Minimum zoom for canvas zoom slider
canvasSliderMax	int	Maximum zoom for canvas zoom slider
canvasSliderNeutral	int	Neutral position of canvas zoom slider
defaultCanvasWidth	int	Default number of pixels for empty objects to use as image size
defaultCanvasHeight	int	Default number of pixels for empty objects to use as image size
defaultWindowWidth	int	Default size of the program window at launch
defaultWindowHeight	int	Default size of the program window at launch
undoMax	int	Maximum number of elements to populate the undo-redo stack size
colorPrimarySelection	Color	Color for primary selection
colorSecondarySelection	Color	Color for secondary selection
colorManySelection	Color	Color for tertiary selection
defaultRenderableTitle	String	Default name for renderable objects
defaultFileCode	String	Default code for files without a filecode
fileExtensionSave	String	Extension for save files
fileExtensionRender	String	Extension for rendered files
imageRenderFormat	String	Format for rendering files
filenameExtensionAutosave	String	Extension to title for autosaves
fileExtensionLoadImage	String	Format required on loaded images
projectFileName	String	Default name for project files to be saved as
pathDefaultProject	String	Default project to load
pathExportImageFolder	String	Default folder name for renders

| pathSourceTemplateFolder | String | Default folder name for templates |
| pathExportSaveFolder | String | Default folder name for saves |

VersionNumber

Data structure object representing a version number. Designed to be immutable.

Functions:

Name	Arguments	Returns	Summary
constructor	n/a	n/a	Initializes version to 0
constructor	String representing version number	n/a	Initializes version number from string
toString	n/a	String of version number	Builds string from version number
compareTo	VersionNumber other	Int of comparison	Compares two version numbers; a shorter number is considered to have zeroes in the missing indices. Version numbers are read from left to right. This is less than object = -1 This is same as object = 0 This is more than object = 1

Key Variables:

Name	Type	Purpose
versionNumber	int[]	Stores version number as an array

WarningWindow

Static factory for pop-up warning windows that prevent actions from taking place

Functions:

Name	Arguments	Returns	Summary
warningWindow	String text, EventE event	n/a	Generates a warning notification with the given text; on acceptance, the event contained in the event object will be enacted
warningWindow	String text	n/a	Generates a warning notification with the given text