

Pixel Editor Project



Group Number: 67

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Description of our Project

A multi-purpose pixel editing application, that supports many common features users would expect from a pixel editing application such as drawing, importing images and additional features consisting of layering and layer operations to give users more flexibility while using the program.

Features Summary

- Pen tool
- Eraser tool
- Air brush tool
- Blur tool
- Fill tool
- Eye Dropper
- Selection tool
- Shapes Tool
- Delete Shape Tool
- Text tool
- Cutter tool
- Quick cutter tool
- Crop Tool (do again)
- Image Filters
- Undo Tool
- Redo Tool
- Open Image
- Save As
- Open Project
- Save Project
- Color Options
- Layers Preview Panel
- Multiple Canvases
- Clear Canvas
- Help

Feature: Pen Tool

- Draws on canvas
- Shortcut: p

Selection	Pen
Eraser	Fill
Eye Dropper	Rectangle
Circle	Triangle
Air Brush	Text
Delete Shape	Redo
Undo	Crop
Blur	Quick Cutter Tool
Cutter Tool	Clear Canvas



PEN

Feature: Eraser Tool

- Erases Drawings on canvas
- Shortcut: e

Selection	Pen
Eraser	Fill
Eye Dropper	Rectangle
Circle	Triangle
Air Brush	Text
Delete Shape	Redo
Undo	Crop
Blur	Quick Cutter Tool
Cutter Tool	Clear Canvas



A large, stylized word 'PEN' drawn in blue ink on a white background. The letters are thick and slightly irregular, mimicking a hand-drawn style. The 'P' has a long vertical stem and a curved top. The 'E' has three horizontal bars. The 'N' has a vertical stem and a diagonal bar.

Feature: Airbrush Tool

- Creates an array of points around the curser in a random pattern similar to an airbrush or spray paint
- Shortcut: a

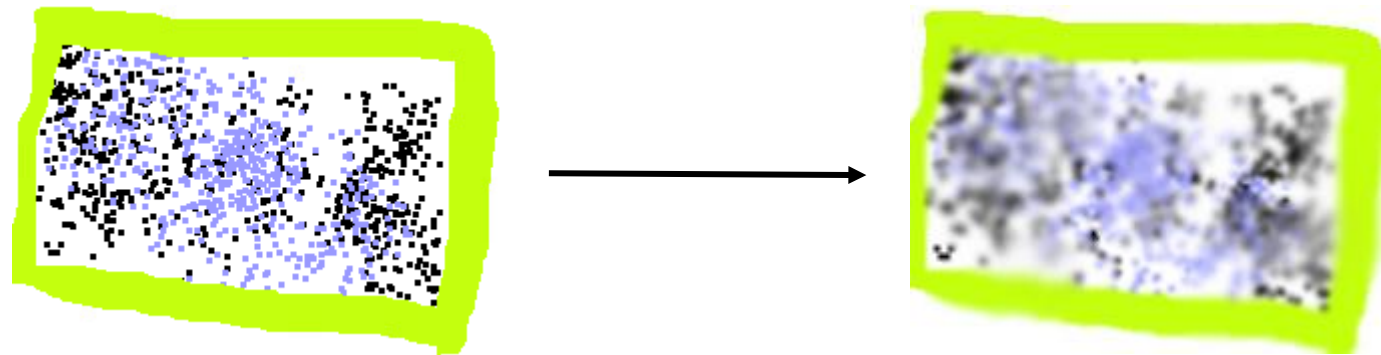
Selection	Pen
Eraser	Fill
Eye Dropper	Rectangle
Circle	Triangle
Air Brush	Text
Delete Shape	Redo
Undo	Crop
Blur	Quick Cutter Tool
Cutter Tool	Clear Canvas



Feature: Blur Tool

- Used to blur the drawing on the canvas around the curser
- Shortcut: b

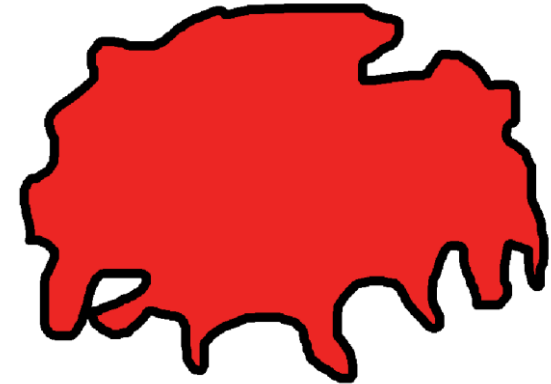
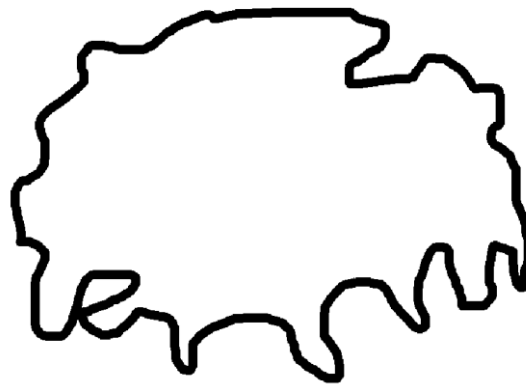
Selection	Pen
Eraser	Fill
Eye Dropper	Rectangle
Circle	Triangle
Air Brush	Text
Delete Shape	Redo
Undo	Crop
Blur	Quick Cutter Tool
Cutter Tool	Clear Canvas



Feature: Fill Tool

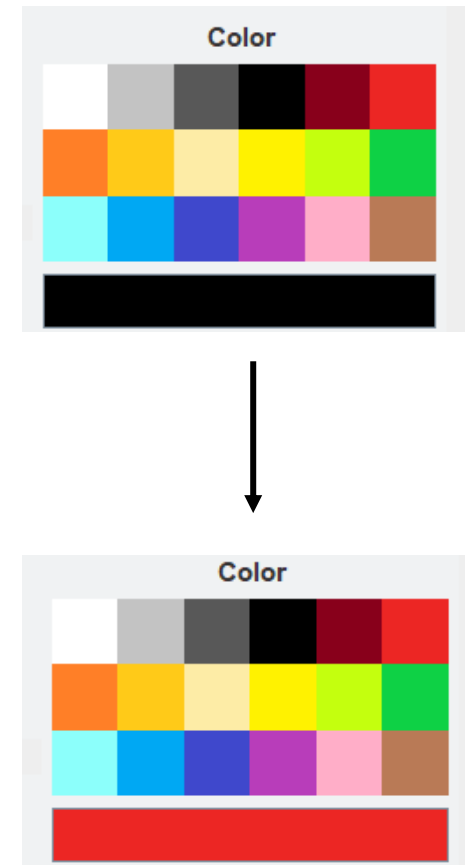
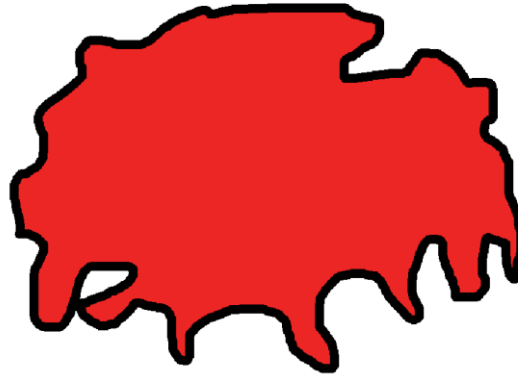
- Fills an enclosed area with the desired color
- Shortcut: f

Selection	Pen
Eraser	Fill
Eye Dropper	Rectangle
Circle	Triangle
Air Brush	Text
Delete Shape	Redo
Undo	Crop
Blur	Quick Cutter Tool
Cutter Tool	Clear Canvas



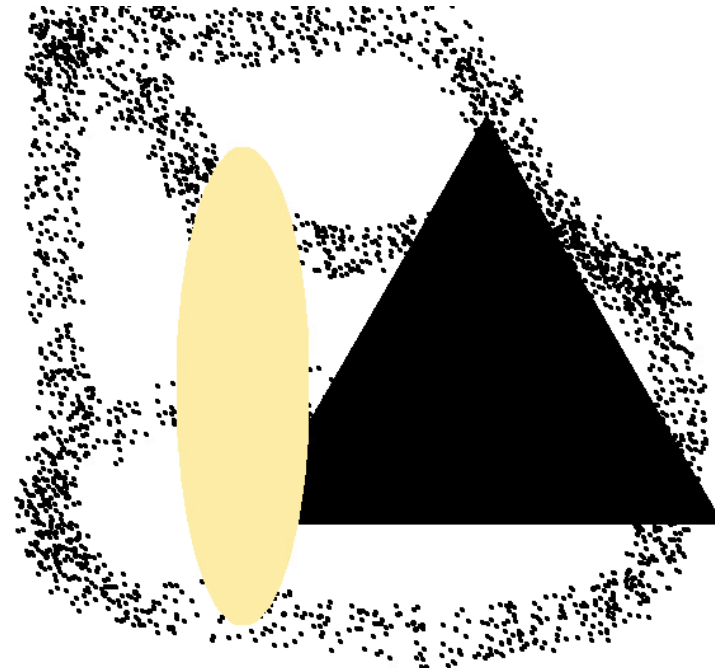
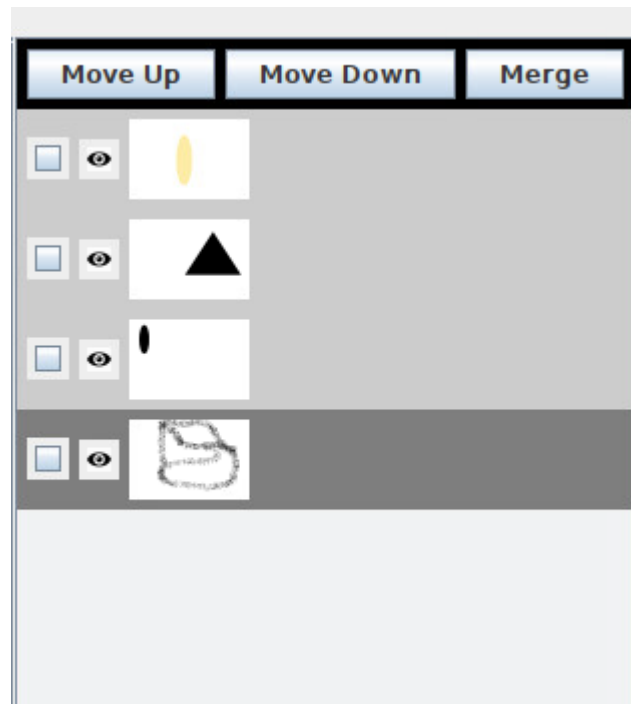
Feature: Eye Dropper Tool

- Selects a color from the canvas
- Shortcut: i



Feature: Layers

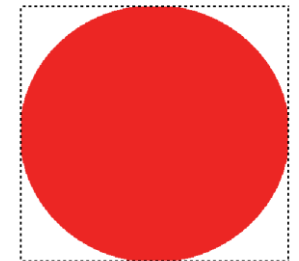
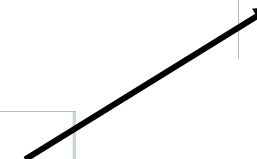
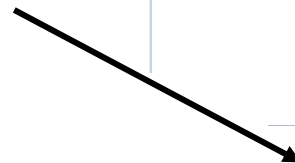
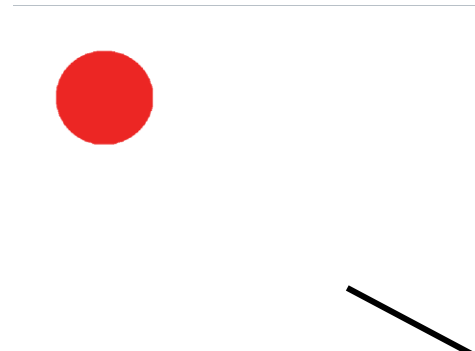
- Layers are drawing objects which are on top of each other. Drawing on one layer does not draw on another. Any layers above others in the layer menu will be shown “on top” of them in the canvas. Layers can then be hidden, merged and deleted.



Feature: Selection Tool

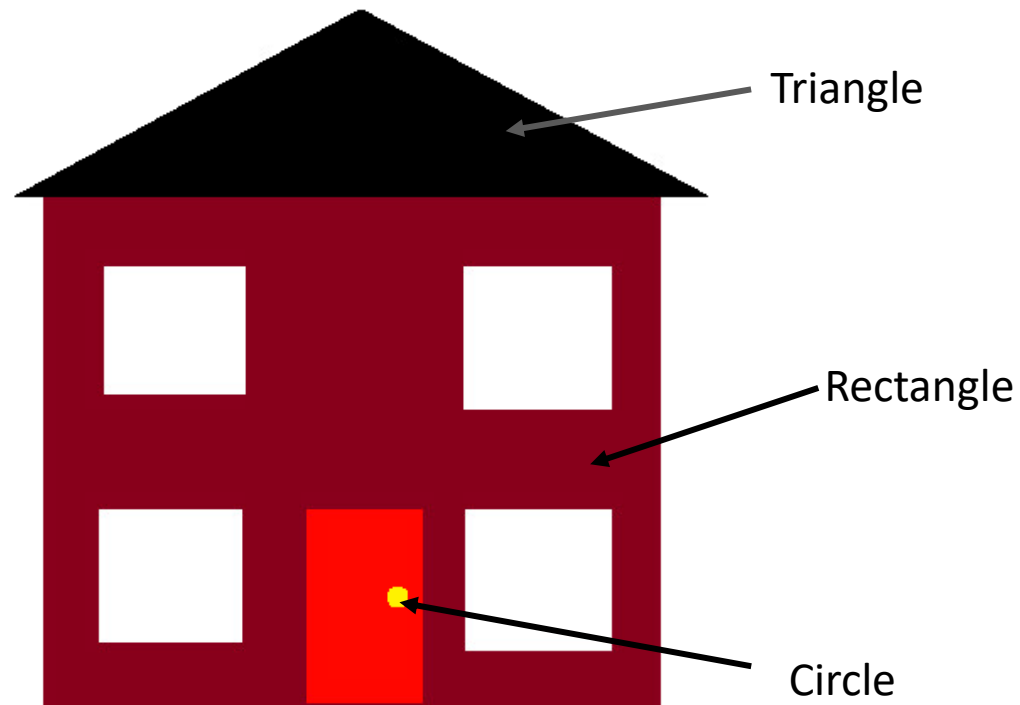
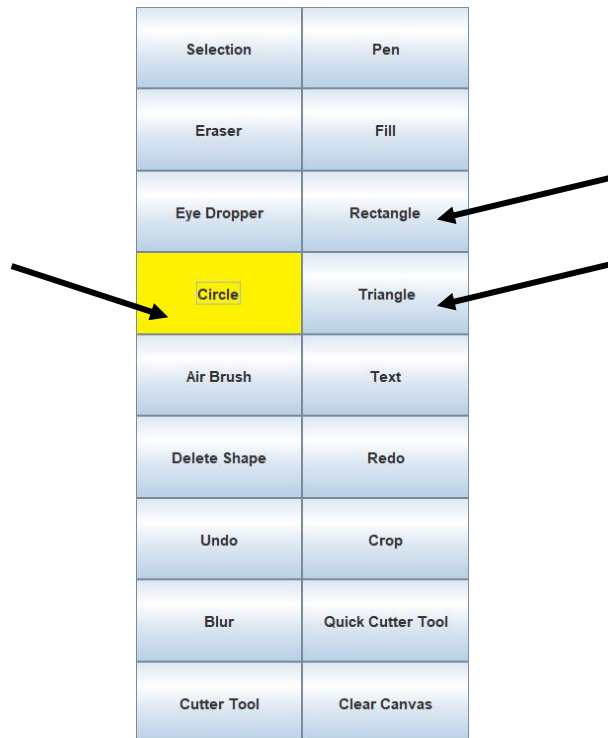
- Selects and moves layers on canvas
- Resizes Layers on Canvas
- Shortcut: v

Selection	Pen
Eraser	Fill
Eye Dropper	Rectangle
Circle	Triangle
Air Brush	Text
Delete Shape	Redo
Undo	Crop
Blur	Quick Cutter Tool
Cutter Tool	Clear Canvas



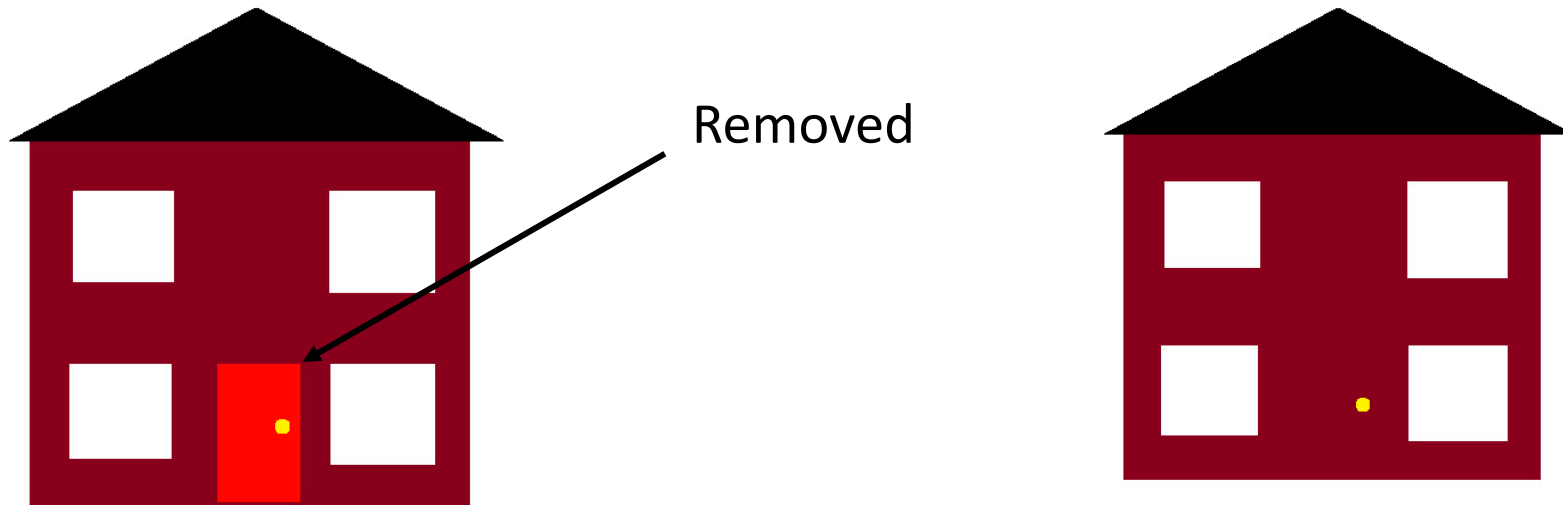
Feature: Shapes Tools

- Having the ability to add Rectangle, Circle and Triangle Layers into Canvas
- Shortcuts
 - Circle: c ---- Triangle: t ---- Rectangel: r



Feature: Delete Shape

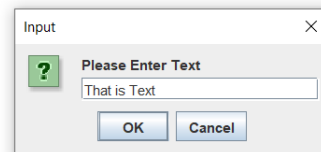
- Used to remove an individual shape, text or a group of shapes merged onto 1 layer from the canvas.
- Shortcut: d



Feature: Text Tool

- Adds Text to the Canvas
- Shortuct: s

Selection	Pen
Eraser	Fill
Eye Dropper	Rectangle
Circle	Triangle
Air Brush	Text
Delete Shape	Redo
Undo	Crop
Blur	Quick Cutter Tool
Cutter Tool	Clear Canvas

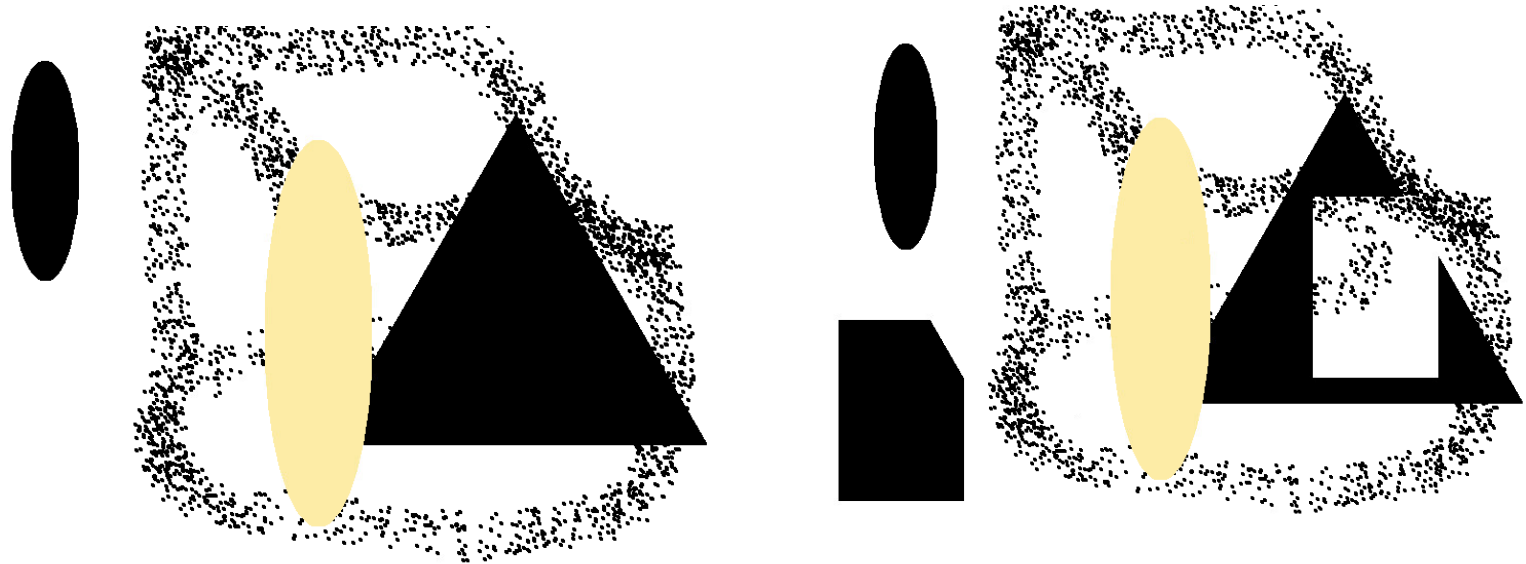


That is Text

Feature: Cutter Tool

- Cuts out a segment of a layer which is then converted to its own layer to be deleted, moved or resized
- Shortcut: I

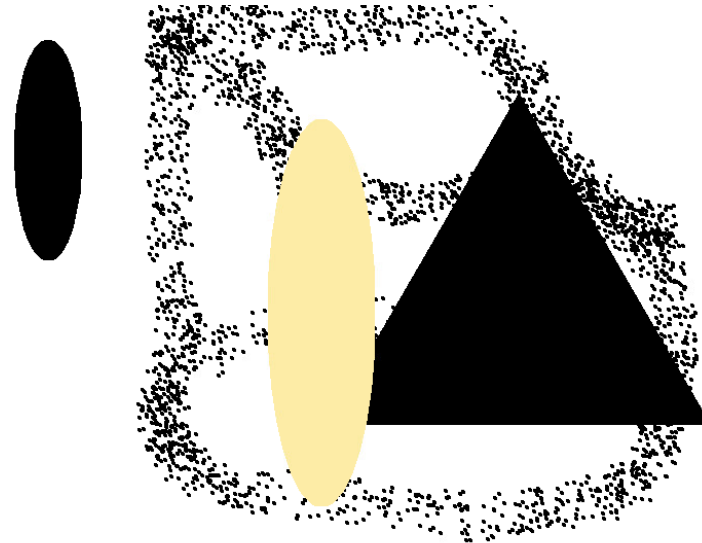
Selection	Pen
Eraser	Fill
Eye Dropper	Rectangle
Circle	Triangle
Air Brush	Text
Delete Shape	Redo
Undo	Crop
Blur	Quick Cutter Tool
Cutter Tool	Clear Canvas



Feature: Quick Cutter Tool

- Cuts out a segment of all layers which then has the same properties as the cutter tool
- Shortcut: q

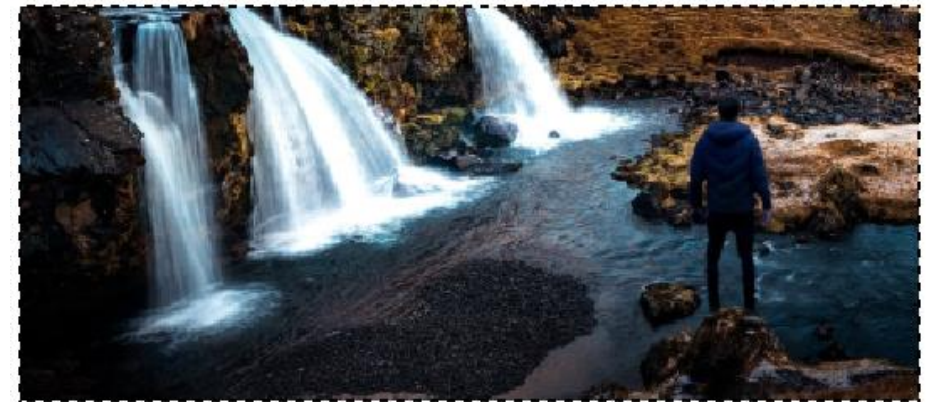
Selection	Pen
Eraser	Fill
Eye Dropper	Rectangle
Circle	Triangle
Air Brush	Text
Delete Shape	Redo
Undo	Crop
Blur	Quick Cutter Tool
Cutter Tool	Clear Canvas



Feature: Crop Tool

- Used to remove part of an image
- Shortcut: w

Selection	Pen
Eraser	Fill
Eye Dropper	Rectangle
Circle	Triangle
Air Brush	Text
Delete Shape	Redo
Undo	Crop
Blur	Quick Cutter Tool
Cutter Tool	Clear Canvas



Feature: Image Filters

- Right clicking on imported images or rasterized additional layers will enable an image filter menu in which filters can be picked from. Filters may also be overlapped so that varied looks can be applied.



Blur Filter
Greyscale Filter
Invert Filter
Sepia Filter
Sharpen Filter
Red Filter
Green Filter
Blue Filter



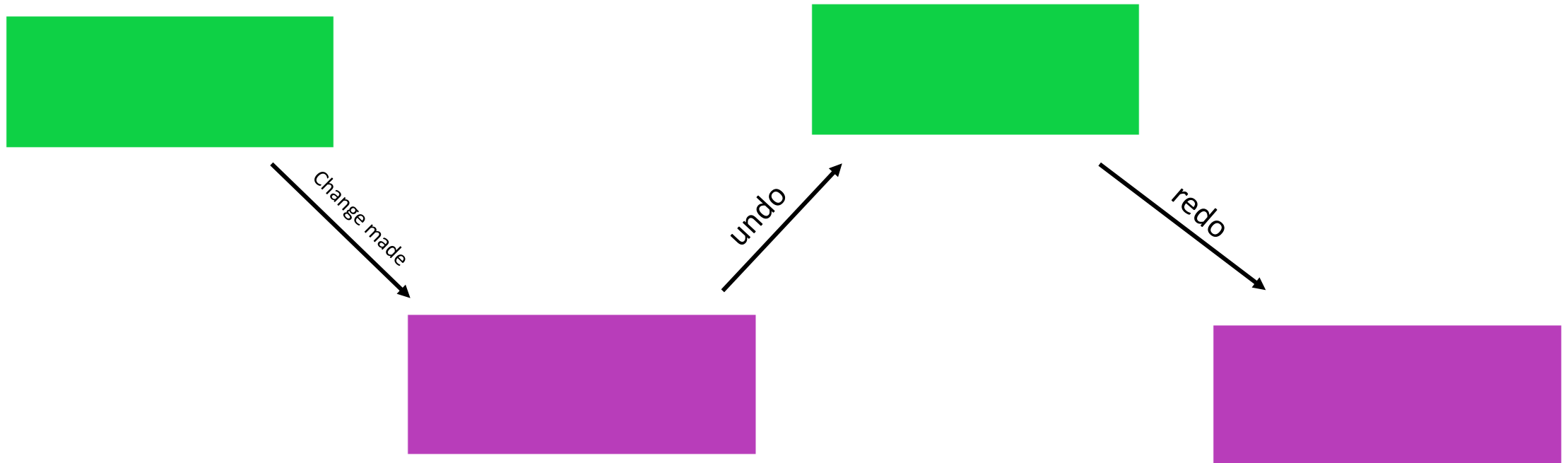
Feature: Undo Tool

- Allows you to undo your most recent action to go one step back in history
- Shortcut: ctrl + z



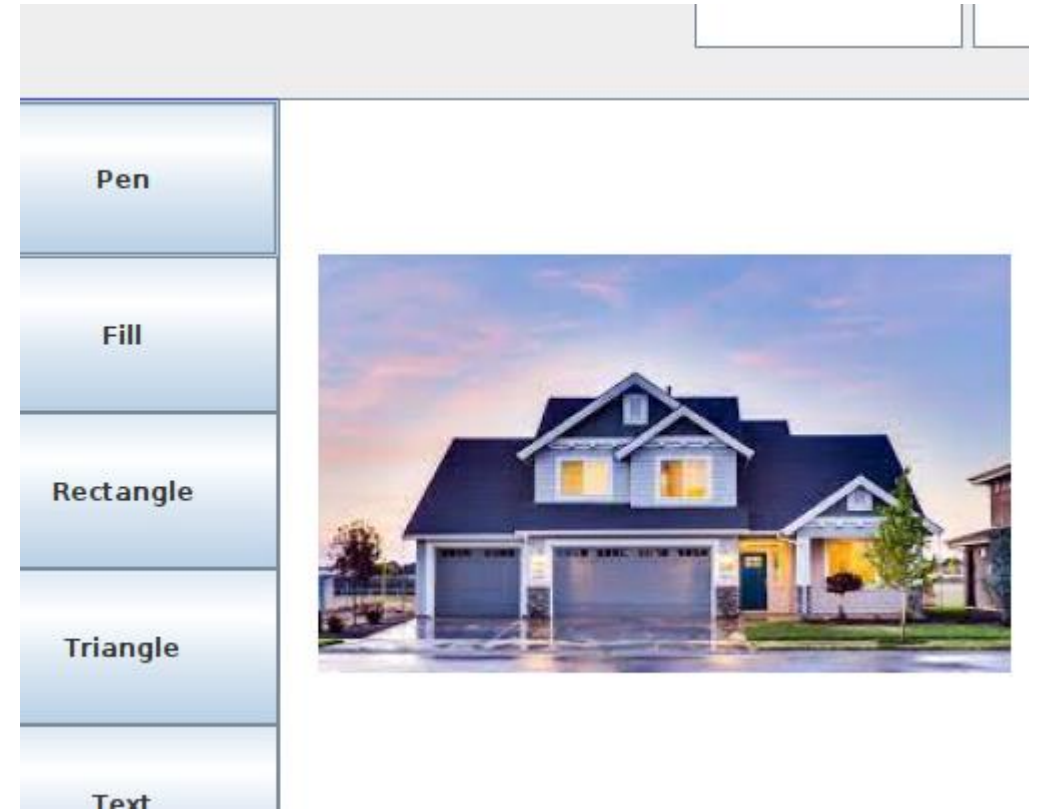
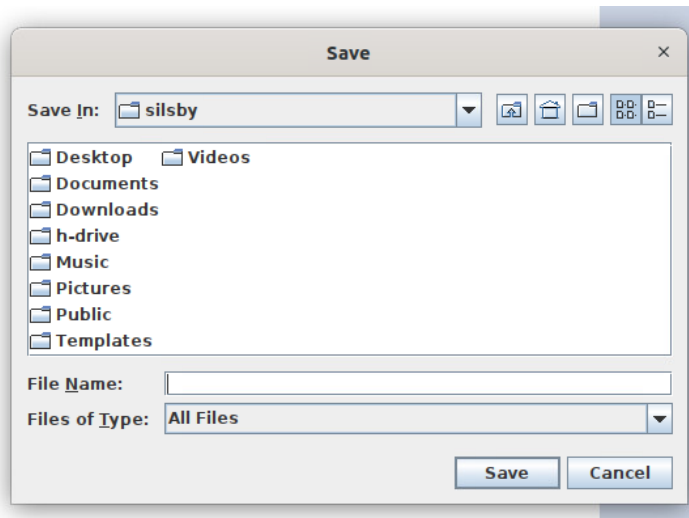
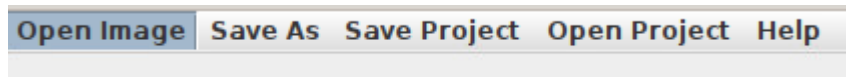
Feature: Redo Tool

- Allows you to get back to the recent undo step
- Shortcut: ctrl + y



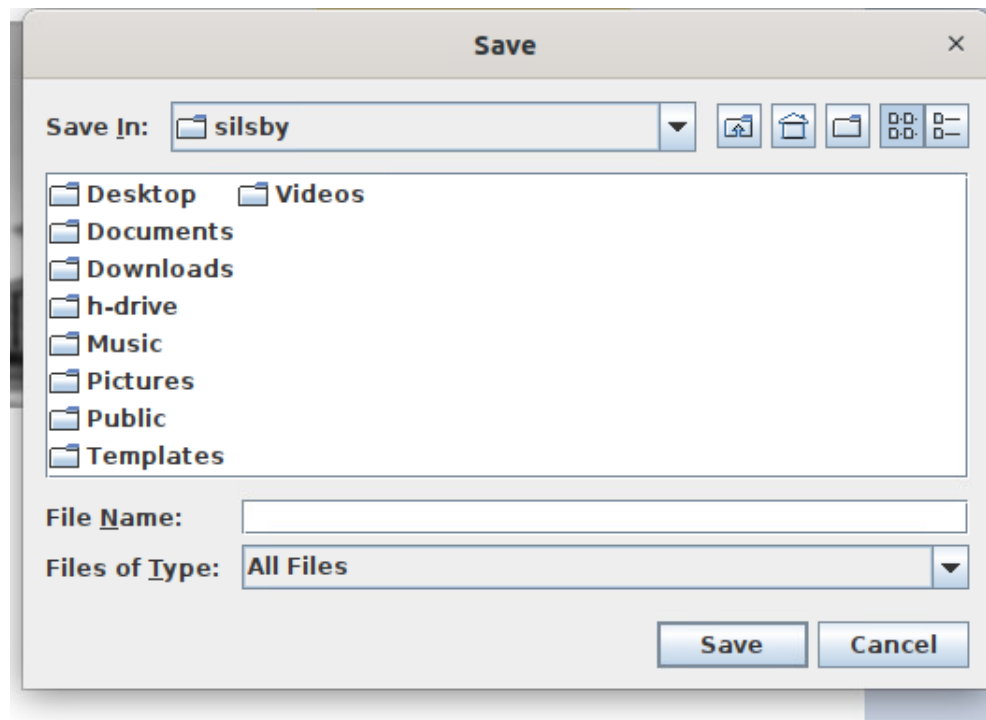
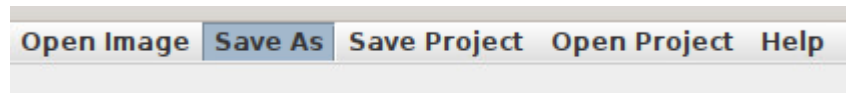
Feature: Open Image

- Imports an image from your computer into the canvas.



Feature: Save As

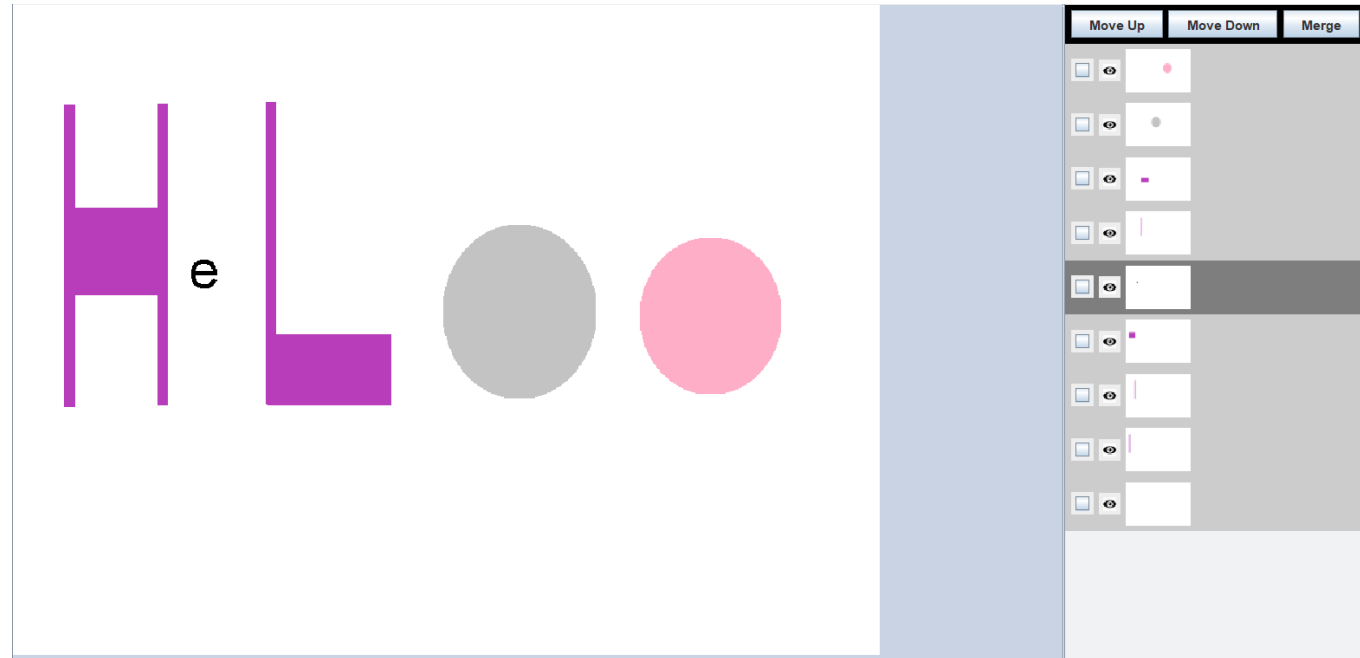
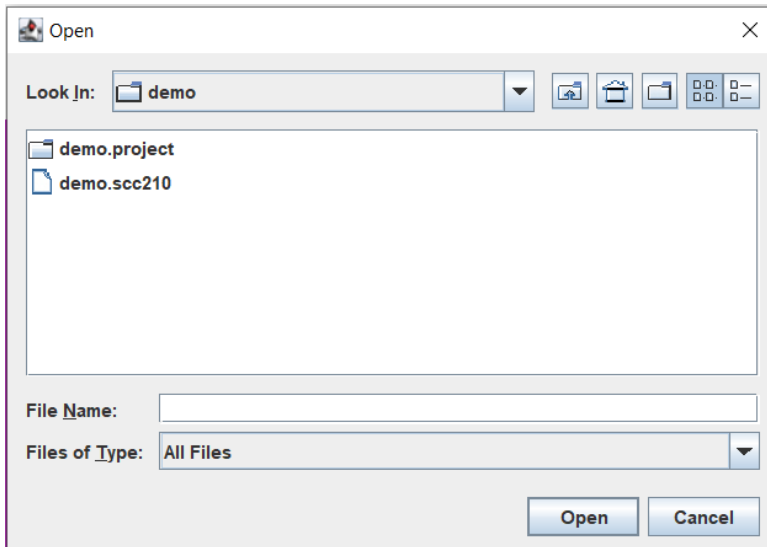
- Saves the canvas as an image file.



Feature: Open Project

- Imports a saved project from your computer into the canvas
- The Project file extension is 'scc210'

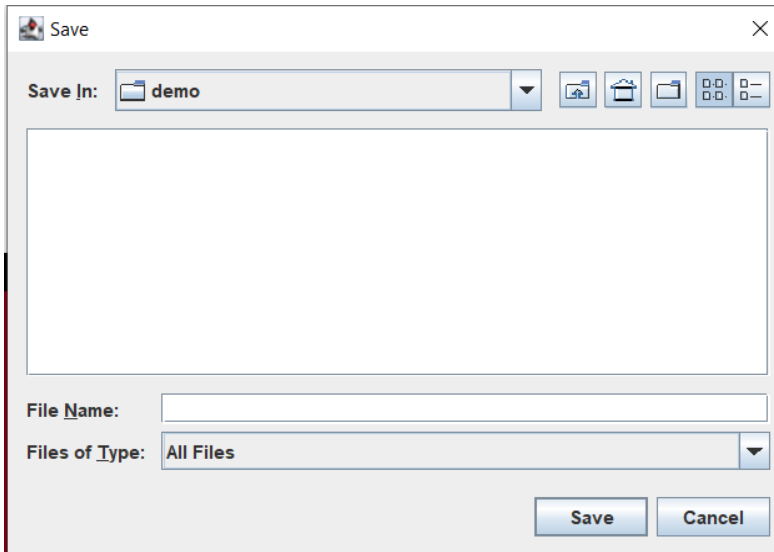
Open Image Save As Save Project **Open Project** Help



Feature: Save Project

- Exports the current state of the canvas into a project in the user's computer to enable users to continue working on their project
- The Project file extension is 'scc210'

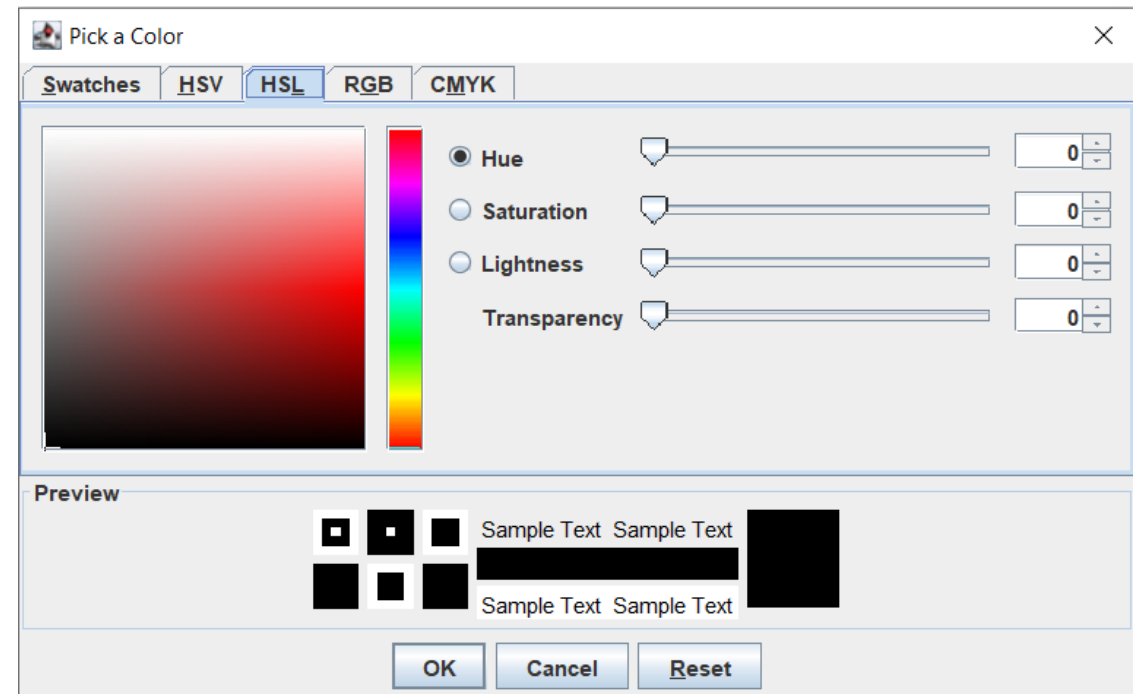
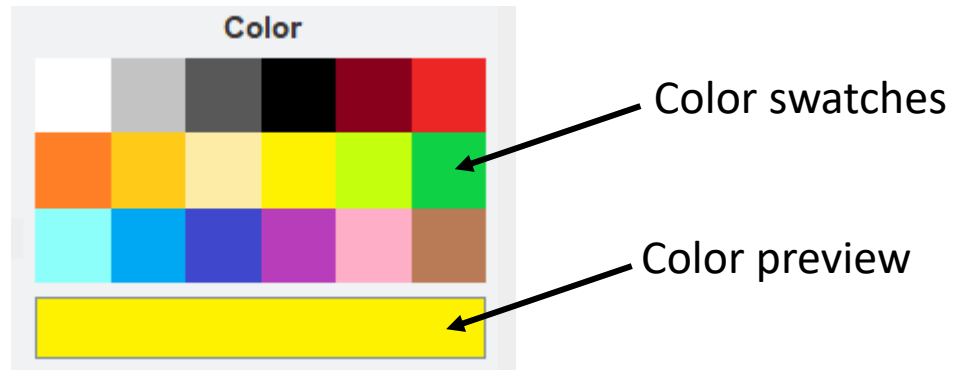
Open Image Save As **Save Project** Open Project Help



demo.project	4/1/2023 11:24 AM	File folder
demo.scc210	4/1/2023 11:24 AM	SCC210 File

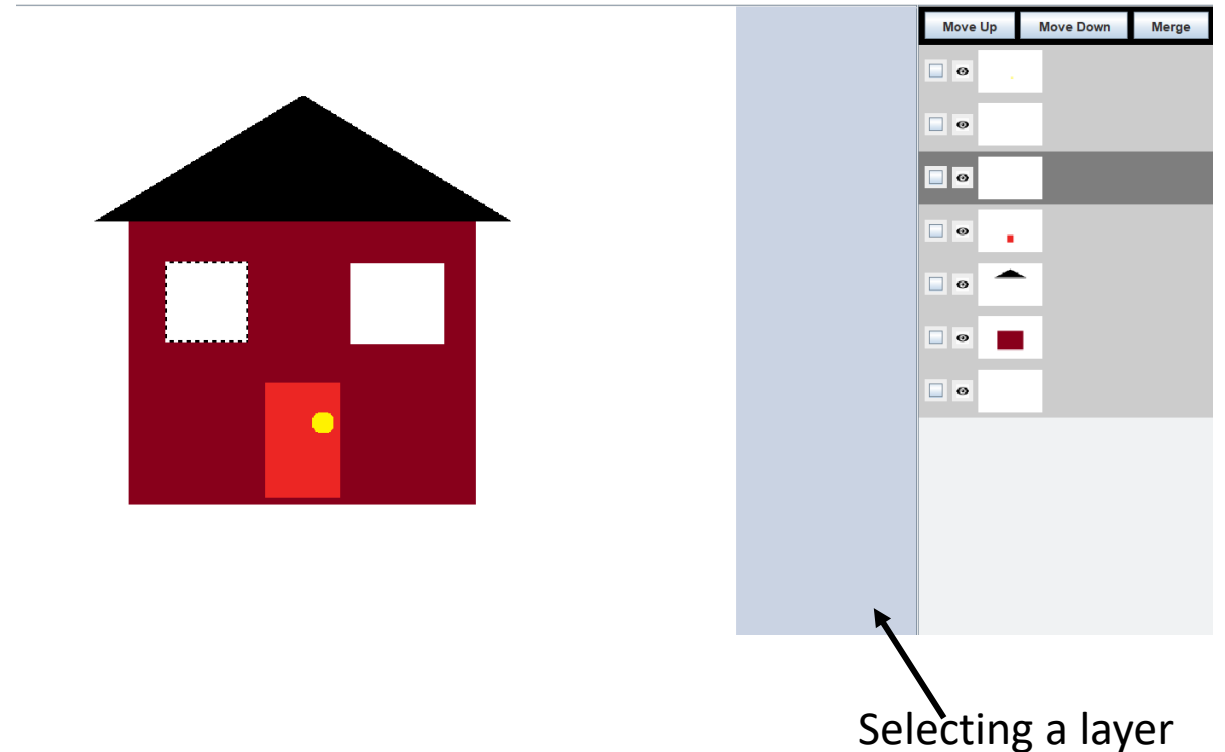
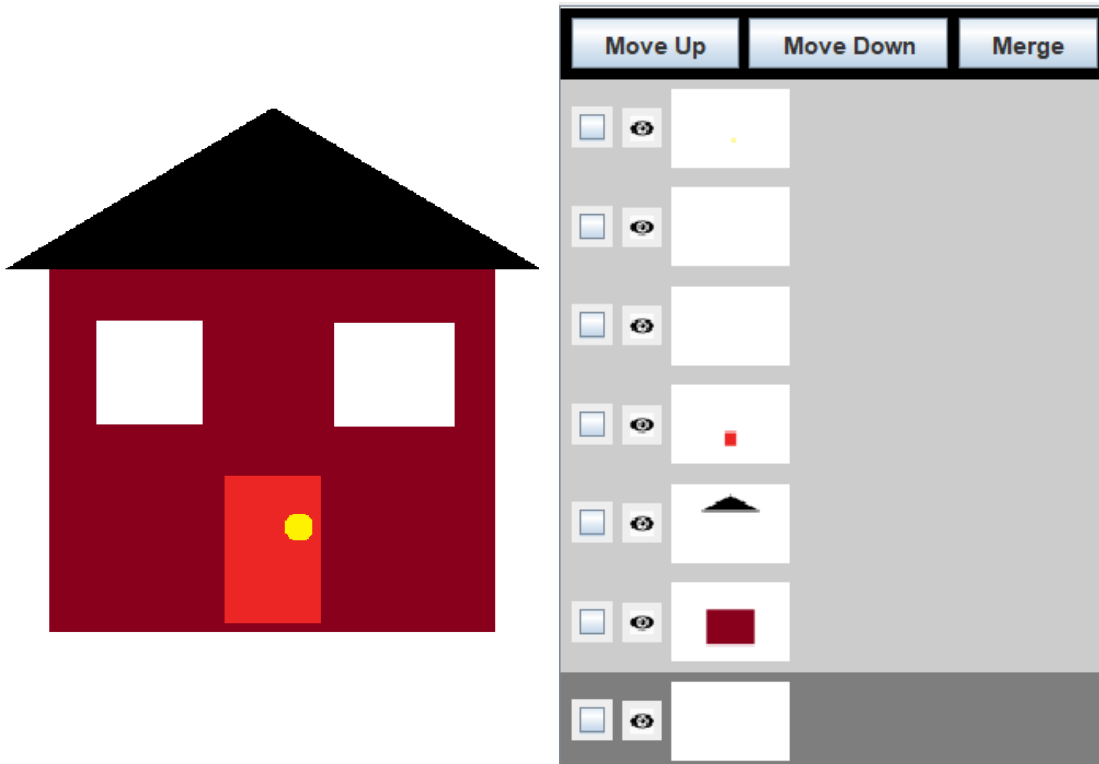
Feature: Color Options

- Having the ability to choose from a range of colors using the color swatches or the color wheel
- Previewing the current chosen color
- The Color Wheel is accessed by clicking on the Color Preview Button



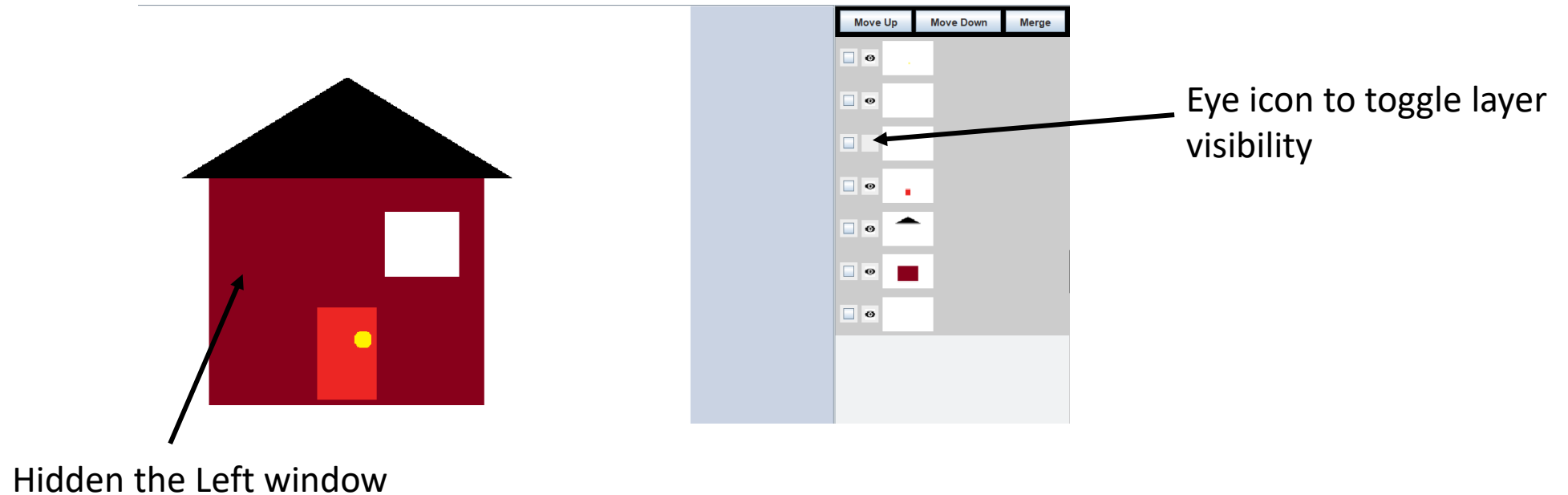
Feature: Layers Preview Panel

- Displays all the Layers that currently exist on Canvas
- Allows the user to select, hide/show, copy, delete, move up and move down layers
- Allows the user to merge layers together



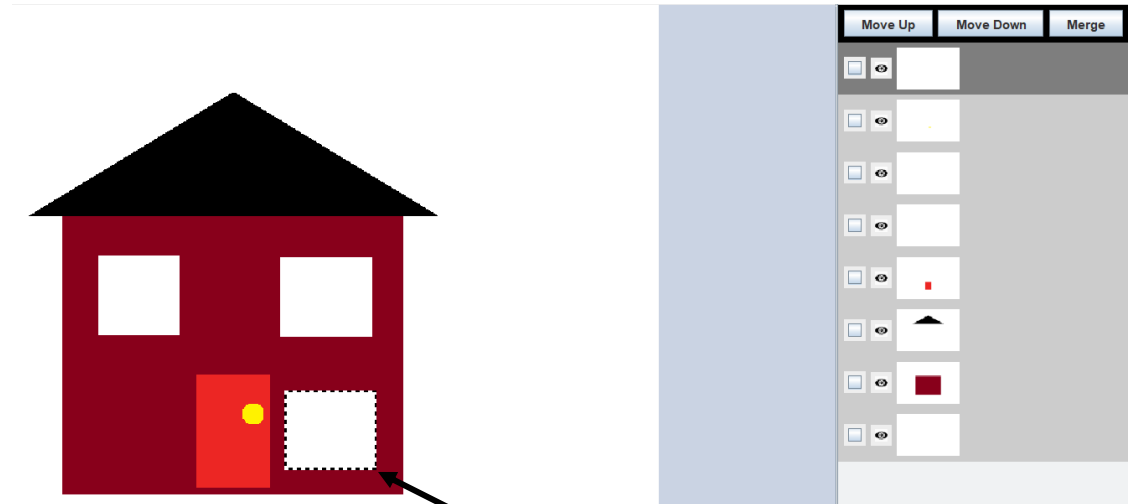
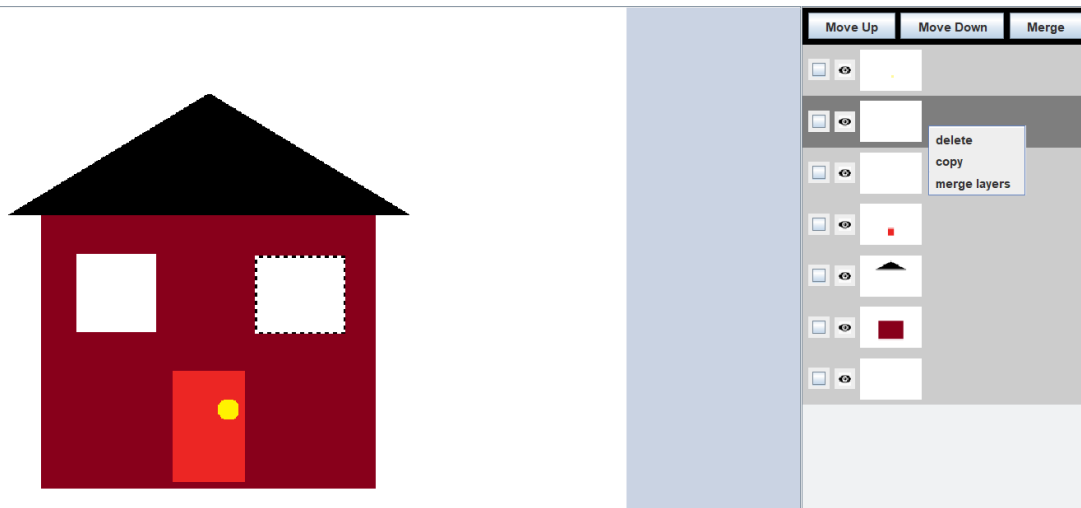
Feature: Layers Preview Panel (Hiding Layers)

- Displays all the Layers that currently exist on Canvas
- Allows the user to select, hide/show, copy, delete, move up and move down layers
- Allows the user to merge layers together



Feature: Layers Preview Panel (Copying Layers)

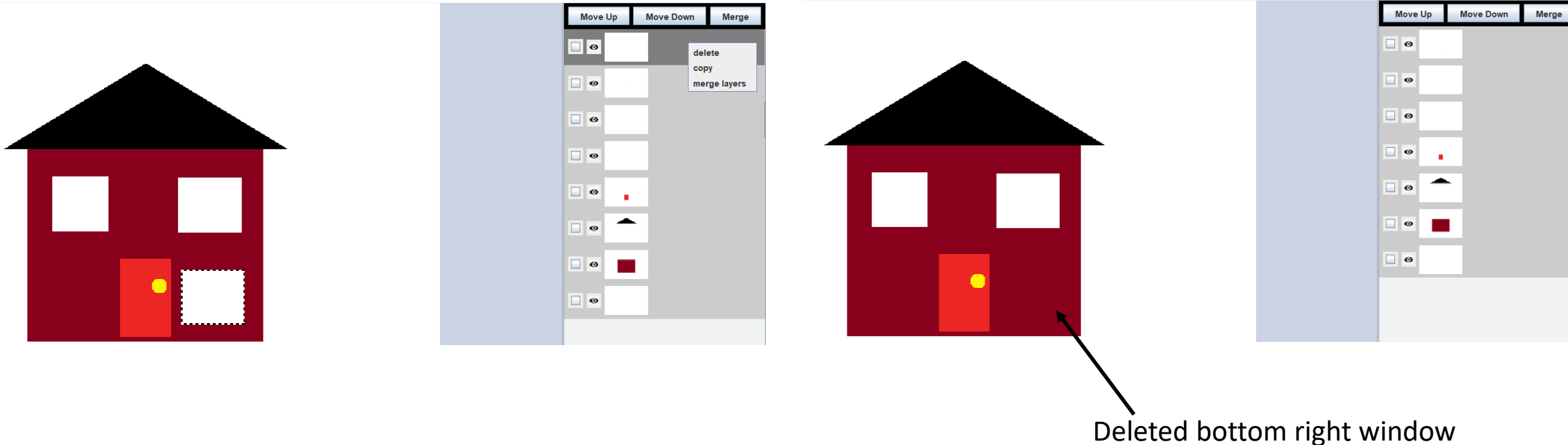
- Displays all the Layers that currently exist on Canvas
- Allows the user to select, hide/show, copy, delete, move up and move down layers
- Allows the user to merge layers together



Copied top right window

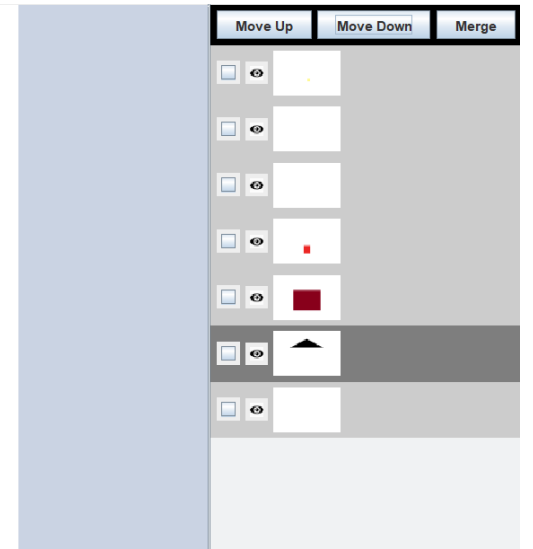
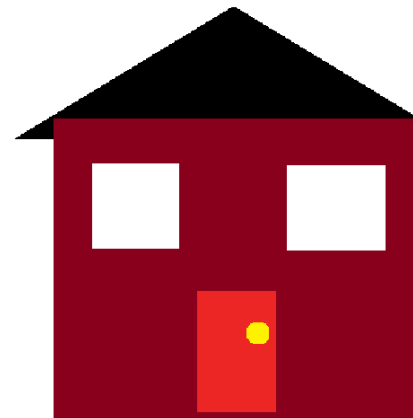
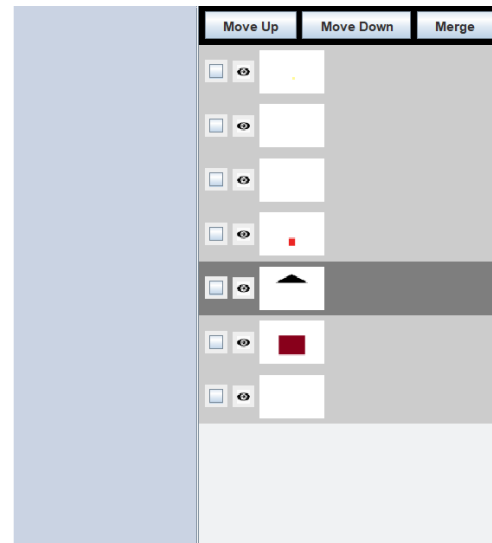
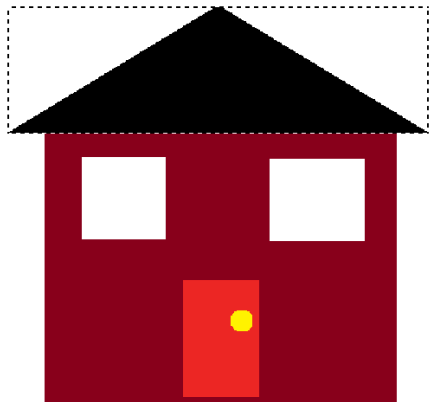
Feature: Layers Preview Panel (Deleting Layers)

- Displays all the Layers that currently exist on Canvas
- Allows the user to select, hide/show, copy, delete, move up and move down layers
- Allows the user to merge layers together



Feature: Layers Preview Panel (Moving Layers)

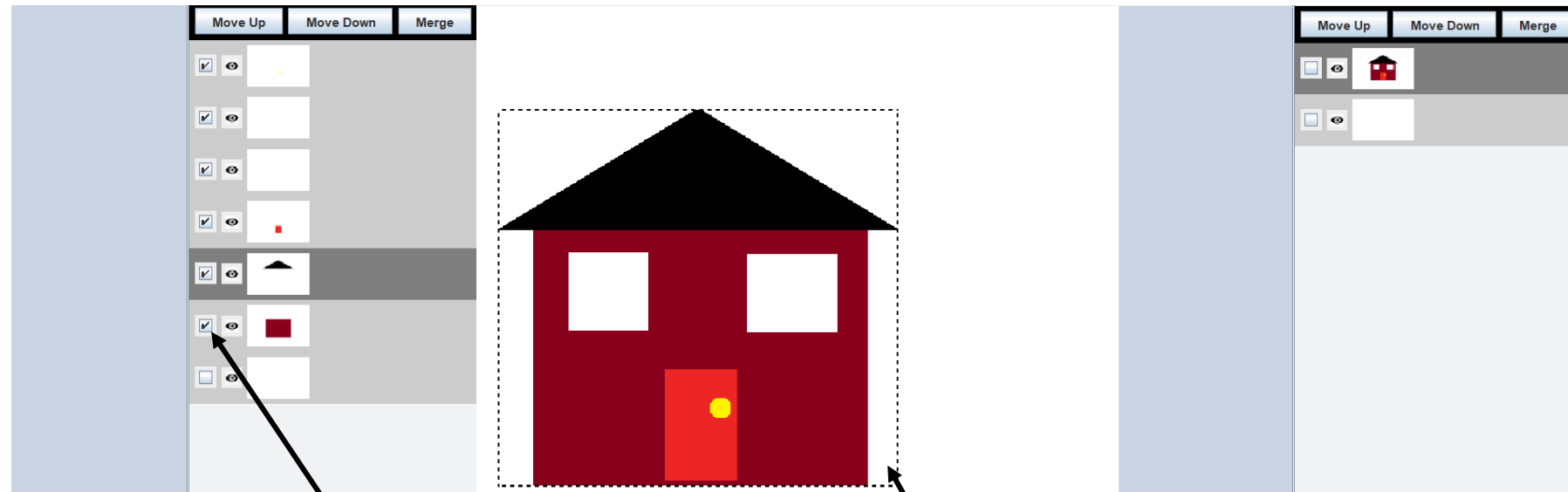
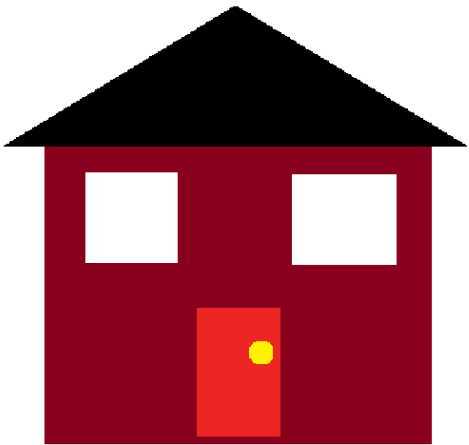
- Displays all the Layers that currently exist on Canvas
- Allows the user to select, hide/show, copy, delete, move up and move down layers
- Allows the user to merge layers together



Moved the house roof down

Feature: Layers Preview Panel (Merging Layers 1)

- Displays all the Layers that currently exist on Canvas
- Allows the user to select, hide/show, copy, delete, move up and move down layers
- Allows the user to merge layers together

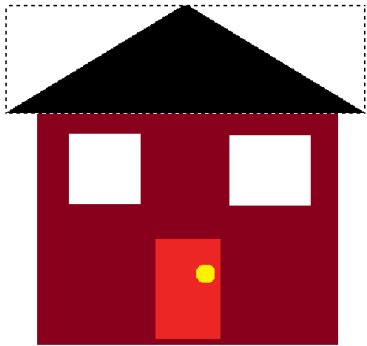


Selecting all layers we want to merge

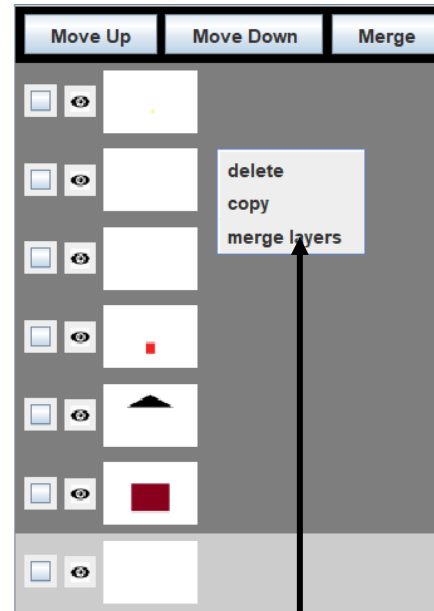
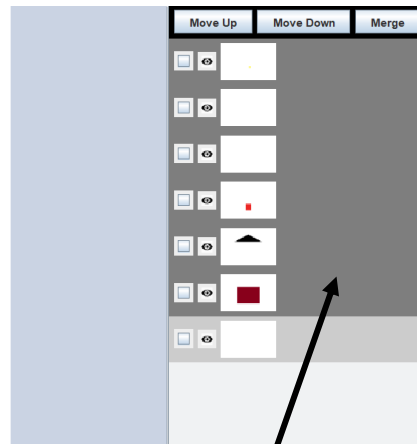
(Click Merge Button) Merged all house components into a single layer

Feature: Layers Preview Panel (Merging Layers 2)

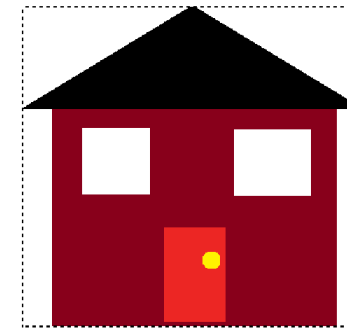
- Displays all the Layers that currently exist on Canvas
- Allows the user to select, hide/show, copy, delete, move up and move down layers
- Allows the user to merge layers together



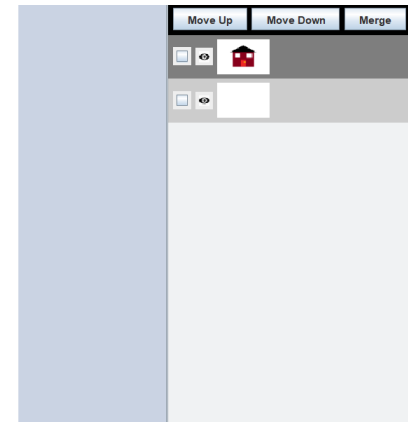
Hold ctrl and click all layers you want to merge together



Click merge layers option

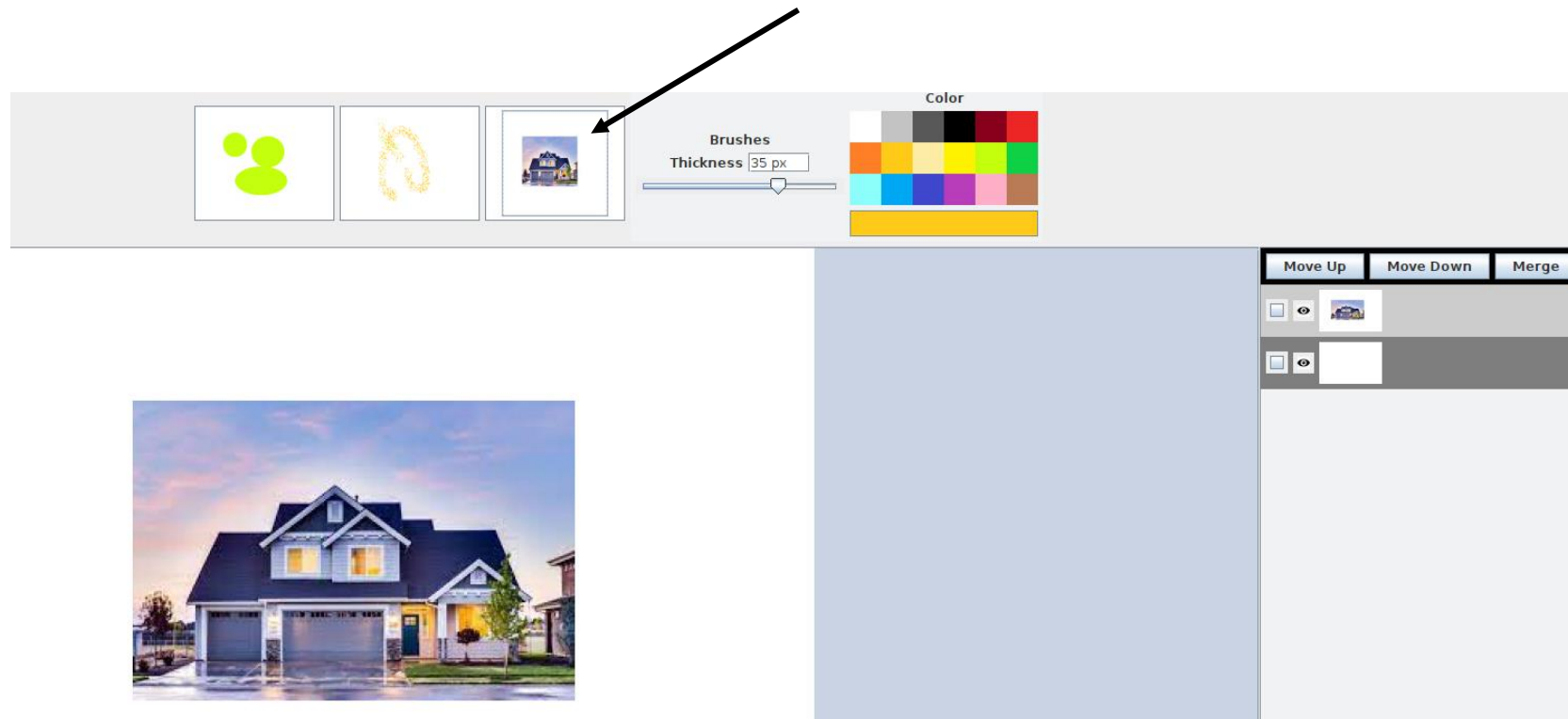


Merged all house components into a single layer

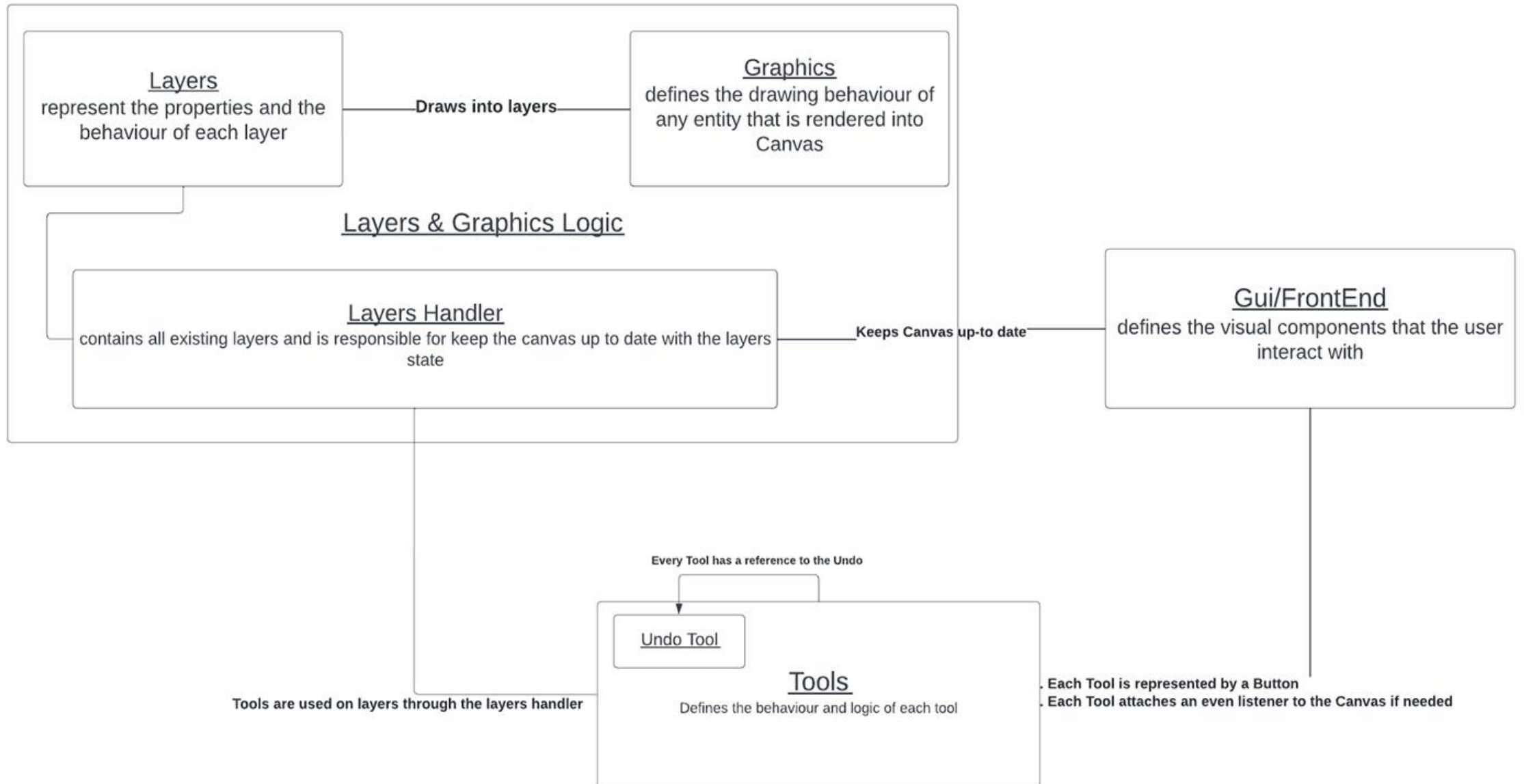


Feature: Multiple Canvases

- Allows the user to work on up to three independent projects with different layers without having to open multiple instances of the app or close one and open another.



Code Architecture: Big Picture



Code Architecture: Key Implementations

- Most of the interaction between the tools and GUI Components happen using the Observer Pattern
 - example: All the shapes, Pen, Airbrush, and the fill tools **observe** changes that happen from the colour swatches or the colour chooser
- The ToolsManager sort of acts like a **Façade** between the GUI Components and the Tools
 - some of the roles of the ToolsManager include:
 - creating instances of some of the GUI Components
 - linking the observers to the observables
- Each Tool contains a Clickable Instance.
- Changing the behaviour or appearance of the tools can be done through clickable.

Code Architecture: Key Implementations contd.

- The ClickableTool Class is used to represent common properties and behaviour of all the tools
 - Such as:
 - Specifying if the tool needs to update the Undo History
 - Specifying when a shape layer should be rasterised (for example drawing using a pen on a rectangle layer)
 - Specifying if the Tool needs to update the Layers Preview Panel when used
- Every entity in the application that is rendered into the canvas through some sort of drawing defines its drawing behaviour using a **Graphic Class**
 - example of such entities are lines, circles, text, etc..
 - an example of such class is the **CircleGraphics** Class that has a method that defines the drawing behaviour of a circle in a Graphics Context
 - **Pros of this Design:**
 - can have multiple types of entities that can be drawn easily into a single type of layer (for example can draw a rectangle entity and a circle entity into a single layer)
 - **Cons of this Design:**
 - this design over complicates the code and makes the code not DRY
 - could have specified the drawing behaviour of each layer inside the layer itself
 - When a layer requires a composition of some of the drawing entities could simply created a new Layer Type

Code Architecture: Key Implementation Mistakes

- Every Tool that needs to update the Undo History when used has a reference of the undo tool itself
 - creates unnecessary code duplication
 - needing to pass the undo tool to other tools through the constructor
 - **Solution:** the undo history mainly stores the current state of the layers from the Layers Handler, therefore the Layers Handler and the undo could have simply communicated together instead
- Every Tool that needs to update the Layers Preview Panel when used has a reference of the LayersOptions Panel
 - same problems as the first bullet point
 - **Solution:** the Layers Preview Panel needs to be up-to date with the layers state from the Layers Handler, so the Layers Handler and the Layers Preview Panel could have simply communicated together instead
- Every Tool that needs to refresh the Canvas when used, needs to explicitly inform the LayersHandler through a function call
 - creates unnecessary code duplication
 - source of bugs if a tool forgets to refresh the canvas when finishing its operation
 - **Solution:** LayersHandler should refresh the Canvas by itself internally whenever a change in the layers happen and if a tool affects a layer directly then the layer and the Layers Handler can observe the layer when its state changes

Classes

Number of classes: ~67

Tools Classes

- Airbrush
- BlurTool
- CircleTool
- CropTool
- Clear
- CutterTool
- Delete
- DrawingTool
- EyeDropperTool
- FillTool
- SelectionTool
- TextTool
- PenTool
- UndoTool
- EraserTool
- TriangleTool
- RectangleTool
- ToolsManager
- ShapeTool
- ClickableTool

Layers & Graphics Classes

- LayersHandler
- LayerData
- ShapeLayer
- TextLayer
- CircleLayer
- ImageLayer
- DrawingLayer
- RectangleLayer
- TriangleLayer
- LayerGraphics
- RectangleGraphics
- TriangleGraphics
- LineGraphics
- CircleGraphics
- SpecificGraphic
- TextGraphics
- ShapeLayerGraphics

Gui/Frontend Classes

- Clickable
- Display
- LayerOption
- LayersOptions
- OurCanvas
- ToolsPanel
- OptionsPanel
- CanvasHandler
- ColorGui
- ColorsPanel
- PenOptionsPanel
- MenuPanel

Classes

Number of classes: ~67

Menu Tools Classes

- ImageLoader
- SaveAs
- Help
- ProjectLoader
- ProjectSaver

Observer Pattern Classes

- Observer
- Observable
- CanvasObserver
- CanvasObservable
- LayerObserver

Miscellaneous

- Pen
- Brush
- Resize
- Constants
- Footer
- ImageFilters