

# General Plan – Drawing Program

## Personal information

Name: Filip Eller

Student number: 1004225

Degree program: Teknistieteellinen kandidaattiohjelma, Tietotekniikka

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## General description

I will be making a drawing program at demanding level.

The program provides the user with a variety of tools for drawing in different ways. The program will have at least these tools:

- Brush tool. The tool for freehand drawing. The user clicks at a point and while the mouse is pressed down a brush stroke is drawn on the canvas. The stroke follows the mouses moves. According to the English version of the assignment description the user should be able to draw straight lines, while the Finnish version says nothing about straightness. Anyway, the program will also have a tool for straight lines:
- Line tool which draws straight lines. This works as is described in the assignment description: "Drawing a straight line by pressing the mouse down on a starting point and releasing it on the ending point."
- Rectangle tool which draws rectangles. Pressing down the mouse pins the first corner and draws the rectangle with the opposing corner following the mouse. Releasing the mouse pins the opposing corner at the release point and the other corners accordingly.
- Square tool. Like the rectangle tool but draws squares.
- Oval tool. Works like the rectangle tool but draws an oval which resides within the would-have-been-rectangle.
- Circle tool. Like the oval tool but draws circles.
- Text tool. Creating a new text box is like drawing a rectangle. After that the user can type text into the box. Clicking an existing text box lets the user modify its contents.
- Selection tool, which selects an element or a group of elements.
  - o The selected element's properties can be changed. These include colour, size, rotation etc. The element can also be deleted. The properties are controlled through several text fields / sliders. Selecting multiple elements gives the option of creating a group. Some properties can be changed through another tool:
- Transform tool, which moves, scales or rotates the selected element. Moving is done by dragging the element's centre with a mouse while scaling is done by dragging the elements corners. Rotating works by dragging the mouse outside the element.

Any actions can be undone as long as the drawing is open. The action history is discarded when the program is closed or the user switches to another drawing. The user can also save drawings to files and load previous drawings to continue where they left off.

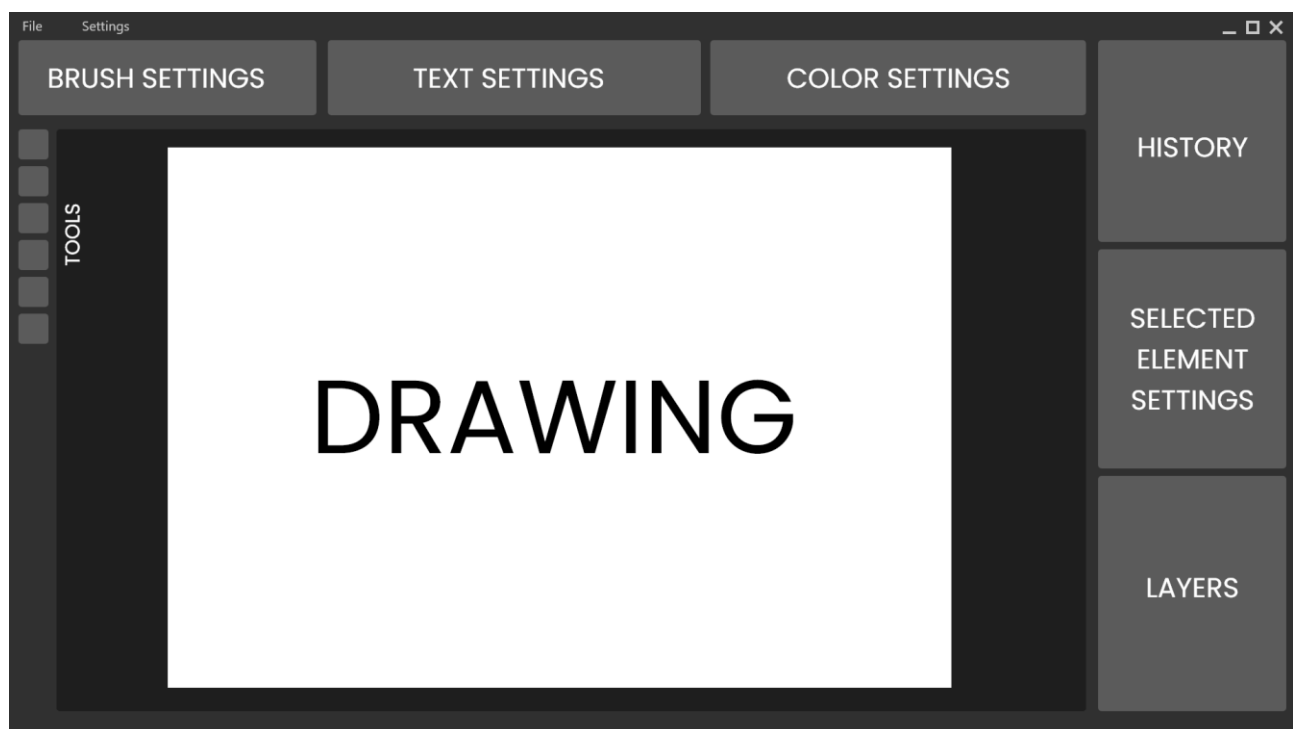
There are two ways for the user to structure their work: groups and layers. Grouped elements can be selected and modified together. Elements can be added and removed from a given group, and a group can be broken up. All elements belong to some layer. By default, there is only one layer that is completely white at first, but the user can add as many layers as they like. The new layers are created as transparent. Layers are displayed on top of each other so that elements on upper layers cover elements in lower layers. Layers are most useful for

1. structuring the drawing. For example, a simple drawing might have different layers for foreground, middle ground, and background.
2. controlling the visibility of multiple elements together.
3. drawing complicated subjects iteratively. For example, the user might want to use different layers for blocking out, sketching, adding details, colouring, and lighting.

### Draft user interface

Mouse clicks will control most actions a user can take, e.g. selecting a tool, configuring a brush and drawing. Some actions also use the keyboard, most notably writing text onto a drawing. If time allows, the keyboard might also be used for shortcuts for switching tools.

The GUI draws heavily from the GUIs of other drawing / photo editing applications, namely Photoshop, Clip Studio Paint and GIMP, which all look rather similar and work in similar ways. The dark and colourless design ensures minimal distraction from the drawing at hand.



The panels shown above will have different kinds of subcomponents such as small text fields, dropdown menus, sliders and buttons. Most of them directly manipulate the state of the program through causing the connected event handlers to call the relevant functions.

## Files and file formats

The user can save a drawing to a file and load a drawing from an existing file. The files will be in JSON format. The picture on the right shows what a simple drawing file might look like. At the root of the file is a list of chunks each of which have their own tags. The “drawing” chunk contains all the information about the actual artwork, while other chunks can be used to provide additional information about it. In the example the metadata is used to save the Unix timestamp of the creation date.

Let’s go over the contents of the drawing chunk. “width” and “height” refer to the size of the canvas in pixels. “layers” is a list of the layers the user has created to structure their artwork. Each layer has a list (“elements”) of the visual components that make up the artwork. Different kinds of elements are recognized through their “type”. Possible types “stroke”, “circle”, and “rectangle”, for instance. The most complicated element type is the stroke, an instance of which is created when the user draws freely using the brush tool. A stroke has an RGBA colour, a rotation value, an origin point, information about the brush in use and the coordinate pairs of the stroke’s pixels. The type can also be “group” in which case the element has a list of sub-elements.

```
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    "date": 1644748172
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    "tag": "drawing",
    "width": 1920,
    "height": 1080,
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        "name": "line and an orange",
        "opacity": 100,
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            "type": "stroke",
            "colour": [
              211,
              255,
              122,
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            "hidden": false,
            "brush": {
              "size": 40,
              "hardness": 15,
              "opacity": 100
            },
            "rotation": 90,
            "origin": [
              10,
              51
            ],
            "points": [
              [
                10,
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              ],
              [
                10,
                52
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                10,
                53
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              [
                10,
                54
              ]
            ]
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            "type": "circle",
            "colour": [
              232,
              164,
              53,
              100
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              0,
              0,
              100
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            "border": 3,
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              74
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        "name": "blue sky :)",
        "elements": [
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            "type": "rectangle",
            "colour": [
              61,
              106,
              173,
              100
            ],
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              0,
              0,
              0,
              100
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            "border": 3,
            "rotation": 170,
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  }
]
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