

Drawing Canvas App – Project Report

Project Design

We designed a simple Drawing Canvas App using Python and Tkinter.

The application opens with a toolbar at the top, a drawing canvas in the middle, and a status bar at the bottom.

The toolbar provides tools such as Freehand, Line, Rectangle, and Paint, along with a color picker, undo/redo, clear, and save buttons.

The user can interactively draw shapes on the canvas and customize them with colors and brush sizes.

The core of our design follows the Model-View-Controller principle:

- **tools.py** defines the drawing commands (shapes and paint actions), each with methods to render on screen and save to image files.
- **model.py** manages the drawing history, applies undo and redo operations, and re-renders all shapes onto the canvas. It also handles saving to PNG with the Pillow library.
- **app.py / main.py** build the user interface and connect button clicks and mouse events to the model.
- **history.py** manages the stacks of commands so that user actions can be undone or redone in sequence.
- **tests.py** includes unit tests for history tracking and saving drawings, helping us validate our code automatically.

Challenges Faced

Developing the Paint tool was challenging because it had to modify existing shapes instead of creating new ones.

This required tagging each shape on the canvas and finding the correct target for recoloring.

Undo and redo also required careful design, as we had to maintain separate lists of performed and undone actions.

Another challenge was saving images reliably. We added custom error handling to catch issues when writing PNG files.

Finally, coordinating as a team using GitHub introduced version control conflicts that we had to resolve through communication and careful merging.

Ideas for Future Work

We see opportunities to expand our project further:

- Add new shape tools such as circles, polygons, and text insertion.
- Support layer management, allowing users to arrange shapes in front or behind others.
- Enhance the Paint tool with bucket-fill and gradient options for more advanced editing.
- Provide multiple export formats beyond PNG, such as JPEG, SVG, or PDF.
- Implement multi-user collaboration features, where several people can draw on the same canvas over a network.
- Improve the user interface with icons, tooltips, and keyboard shortcuts for a smoother user experience.