SOFTWARE SPECIFICATION REQUIREMENTS

FOR

Simple 2D CAD Software

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Team PIXOR

Version 1.0

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Introduction

This project aims to bring the power and precision of CAD to a wider audience, making it accessible and easy to use for everyone. Our software will be designed with simplicity and user-friendliness in mind, ensuring that even those with minimal technical knowledge can create and manipulate 2D designs with ease. It will include basic features such as drawing lines, circles, rectangles, and other shapes, as well as more advanced functionalities like layer management, dimensioning, and exporting to various file formats. We believe that this project has the potential to revolutionize the way people approach design, by breaking down the barriers of traditional CAD software and making design a more inclusive and accessible field.

Purpose

The purpose of this project is to develop a Simple 2D CAD (Computer-Aided Design) Software that is accessible and easy to use for everyone, regardless of their technical knowledge. The software aims to democratize the field of design by providing a platform where anyone can create and manipulate 2D designs with ease. It includes basic features for drawing various shapes, as well as advanced functionalities like layer management, dimensioning, and exporting to different file formats. By breaking down the barriers of traditional CAD software, we hope to make design more inclusive and accessible.
This software aims to target a wide range of audiences. It's perfect for:

- ***Students** learning about design or engineering, who need a simple tool to create and understand 2D designs.*
- ***Educators** in the field of design or engineering, who can use this tool to demonstrate concepts in a more interactive and engaging way.*
- ***Hobbyists** who can use this tool to plan and visualize their projects*

Essentially, anyone who needs a user-friendly and accessible tool for creating, viewing, and manipulating 2D designs could benefit from this project. It's all about making design more inclusive and accessible!

References

1. **LibreCAD**: This is a free 2D CAD software that is beginner-friendly and available on a variety of operating systems.
2. **QCAD**: Offers a free trial and a reduced Community Edition.
3. **FreeCAD**: A free software with no restrictions on commercial use.
4. **NanoCAD**: Offers a 30-day trial, and a free license for students/educators.
5. **Draftsight**: Another popular choice in the industry.
6. **BricsCAD Lite**: Offers optimal toolsets in a user-friendly and highly compatible format.

Each of these software are Open Source Projects and are considered to be amongst state of the art 2D CAD Softwares.

Design Constraints Specification

1. *This software needs to be compatible with various operating systems like Windows, Mac, and Linux. The operationality of our software over multiple platforms would be ensured by the usage of PyQT, WxPython, Tkinter and Kivy. PyQT would ensure seamless integrations of APIs with widgets by allowing us to create separate buttons for handling various events such as saving a file or deleting a certain point or line from the drawing, Tkinter on the other hand would act as the standard GUI for our whole app. Kivy is built on top of OpenGL ES 2.0 and uses a custom layout manager called BoxLayout which would prove useful for Cross platform support.*
2. *To ensure performance efficiency we will use optimized algorithms and data structures, efficient resource management, and parallel processing. We will also implement caching to reduce redundant computations and speed up retrieval times. Regular software profiling will help us identify and optimize any performance bottlenecks.*
3. *The user interface will be designed to remain responsive even during heavy computations by performing these tasks in separate threads. Lastly, the software will be scalable to efficiently handle a wide range of project sizes, from small personal projects to larger professional designs.*
4. *The liberty to export created designs to SVG/JPEG/PDF formats would allow user to freely export designs in his desired format. We'll also work on an option to import designs from these supported file formats for simplified project management.*
5. *To ensure that the users get familiar with the efficient and sleek UI, a simple directory containing basic usages and use cases of every button and widget will be curated upon and created in navbar.*

Performance Specifications

- *The user would be limited to have access to edit only 1 document at a time. This would reduce the system peripherals load and speed up the process of exporting designs.*
- *As this software aims to be only an offline build, The issue related to simultaneous access of data wouldn't be present, but we'll have to work on reducing the weight of widgets and take in consideration the time complexities involved for processing the computer assisted drawings within certain time periods for both normal and workload conditions, which would later be checked for performance bottlenecks.*

Scope Integration

The proposed Software is completely self-contained and independent, this means it would be designed to operate independently of other systems or software. It would have all the necessary components and functionalities built-in, and wouldn't require additional software to function. However, being self-contained might limit the software's flexibility and scalability. For instance,

users might not be able to use it alongside other tools they are familiar with, or extend its functionality through plugins or APIs. Therefore further work needs to be done to Research the need for the same.

Tech Stack

The primary Programming language that this software would be built on is going to be python. The specifications and versions of the libraries that we're going to use for building this software are specified below -

- PyQT5 v 5.15.9 LTS stable build (https://repology.org/repository/devuan_unstable
- Tkinter nixpkgs stable 22.11 version 3.10.11
- Python Version 3.9.4 (https://www.python.org/downloads/release/python-394/)
- Seaborn – as this software deals with more complex visuals, Seaborn is the most suitable library for visualizations. Version 0.11.2 (https://pypi.org/project/seaborn/0.11.2/)
- Scipy – for dealing with complex coordinate related functions to ensure smooth experience while designing.
- Pytest version 7.4.2 (https://pypi.org/project/pytest/)