TESTING POLICY DOCUMENT

Blix - AI Photo Editor

The Spanish Inquisition

September 28, 2023

Contents

Introduction

Introducing Blix: An Advanced AI Photo Editor

Welcome to Blix, an innovative and sophisticated AI-powered photo editing application. Blix sets itself apart by providing users with a seamless editing experience through a powerful and intuitive interface, reminiscent of a digital blender. This user manual will guide you through the features and functionalities of Blix, enabling you to harness the full potential of this cutting-edge editing tool.

Blix caters to users of all levels, from amateur photographers to seasoned professionals, by streamlining the editing process and eliminating the need for extensive knowledge of complex editing software. By presenting a visual graph-based interface, akin to a blender, Blix enables effortless mixing and matching of diverse editing effects.

As a user, you gain access to a vast array of editing possibilities. Whether you wish to apply filters, fine-tune brightness and contrast, or add artistic effects such as vignettes or vintage tones, Blix provides an extensive selection of editing options. Each editing choice is represented as a node within the graph, allowing for seamless connectivity and the creation of custom editing flows tailored to your preferences.

What truly sets Blix apart is its integration of cutting-edge AI technology. Through Blix, you can engage with an AI assistant that enhances your editing journey. By sending prompts to the AI, you unlock a world of possibilities. The AI assistant can recommend specific edits, suggest optimal adjustments, or even manipulate the graph on your behalf, all based on your unique preferences and the desired outcome.

In summary, Blix is an advanced AI photo editor that empowers users to elevate their photography with ease and finesse. Its intuitive graph-based interface, extensive editing options, and integration with an AI assistant create a harmonious environment for realizing your creative vision. This user manual will serve as your comprehensive guide, enabling you to navigate the features of Blix and unlock the full potential of your photo editing capabilities.

General Testing Characteristics

During the continued developement of Blix, we have made use of a variety of testing techniques. These techniques include unit testing, integration testing, and end to end testing. In order to facilitate the testing process, we have made use of a variety of tools. These tools include Jest, playwright, codecov and github workflows. These tools have been used to test the functionality of the application, automate the testing process, and ensure that the application is properly covered by tests.

Unit Testing

Unit testing is a software testing method by which individual units of source code are tested to determine whether they are working as intended. Blix has been extensively tested using unit testing. This has been done using the Jest framework.

Jest is a JavaScript testing framework designed to ensure correctness of any JavaScript/Typescript codebase. All of the core functionality of Blix has been unit tested. This includes the functionality of the graph, the AI assistant, the plugins, and the user interface, ensuring that each function executes correctly at an atomic level in isolation.

Integration Testing

Integration testing is the phase in software testing in which individual software modules are combined and tested as a group. In the various subsystems of Blix, integration tests have been used to ensure that the subsystems are working together as intended. This has also been done using the Jest framework. Each subsystem in their entirety as well as the subsystems communicating with each other have been tested, ensuring that all interactions between systems and the travel of data between systems is correct.

Minimal or no mocking is used for Integration testing as we want to test the actual functionality of the application such that communication and interaction between systems is tested, and not the atomic operations of each system. Mocks are mainly used for integration tests when testing a subsystem that uses an external resource such as an api request.

JEST

The reason why we chose Jest for our unit and integration testing is because it is a very popular testing framework that has TypeScript support and meshes easily with the rollup of our electron app. Jest is easy to use and has a lot of functionality that makes testing easier, such as mocking and code coverage.

Furthermore due to the popularity of Jest, there is a lot of documentation and support for it, which makes it easy to use and learn, which was essential considering our lack of experience with testing frameworks

End to End Testing

End-to-end testing is a technique used to test whether the flow of an application is performing as designed from start to finish. The purpose of carrying out end-to-end tests is to identify system dependencies and to ensure that the right information is passed between various system components and systems. Blix has multiple end to end tests that test the correct functionality of the application as a whole. These tests are done using the playwright framework. Playwright is a Node.js library to automate Chromium, Firefox and WebKit with a single API.

These end to end tests either start in the backend or the frontend, and ensure that all the systems execute according to specification untill the request or result finally reaches the other end of the stack. End to end testing is inherently slow and all-encompasing, and therefore there are fewer tests for it. These tests are done to ensure that the application is working as a whole, and that all the systems are communicating correctly.

Playwright

Playwright was chosen for the end-to-end tests due to its support for multiple platforms such as Windows, Linux and MacOS and has built-in integrations to interact with jest, our testing framework of choice for unit and integration testing.

Furthermore playwright is relatively easy to use and has a lot of documentation and support, due to its popularity, which makes it easy to learn and use.

CICD

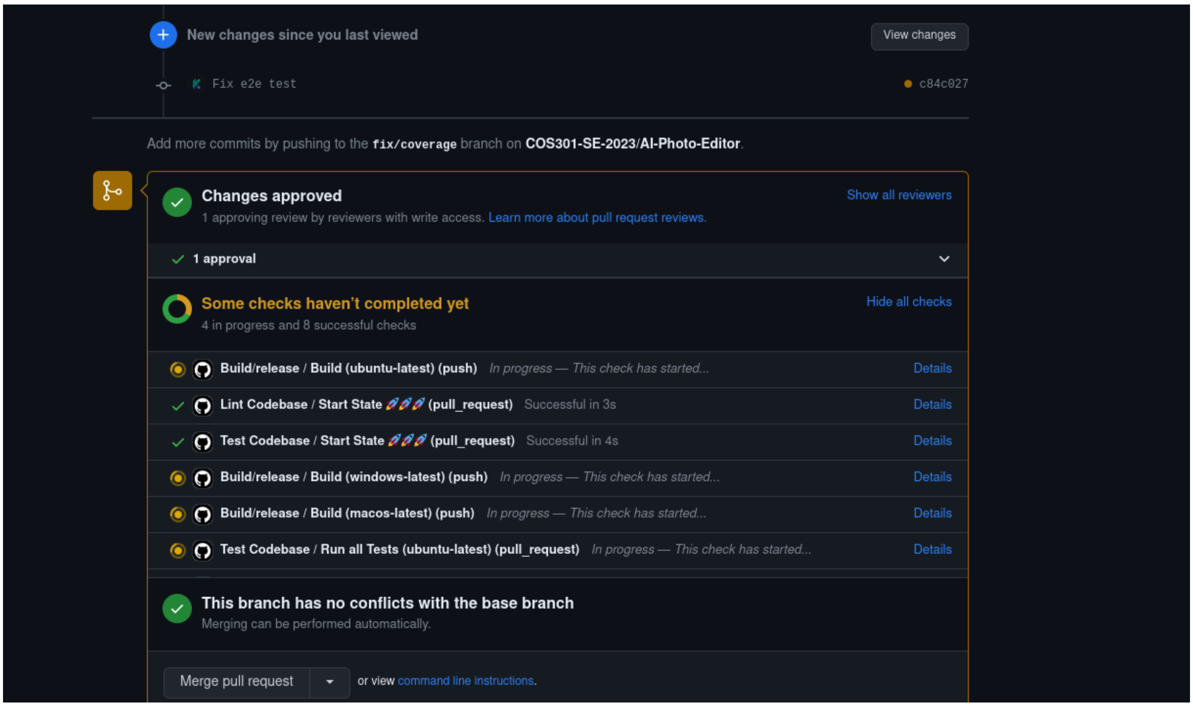
For the purposes of testing, we have made use of github workflows. Github workflows are a feature of github that allow for the automation of tasks. We have made use of github workflows to automate the testing process.

This is done by running the tests on every pull request, and on every push to the main branch. This ensures that the application is always tested before any changes are merged into the main branch.

The tests that are automated for this purpose consist of :

- Unit tests
- Integration tests
- End to end tests

- Building the application
- Linting the application
- Secret protection
- Code coverage


New changes since you last viewed

Fix e2e test c84c027

Add more commits by pushing to the fix/coverage branch on COS301-SE-2023/AI-Photo-Editor.

Changes approved

1 approving review by reviewers with write access. Learn more about pull request reviews.

✓ 1 approval

Some checks haven't completed yet

4 in progress and 8 successful checks

● Build/release / Build (ubuntu-latest) (push) *In progress — This check has started...* Details

✓ Lint Codebase / Start State 🚀🚀🚀 (pull_request) Successful in 3s Details

✓ Test Codebase / Start State 🚀🚀🚀 (pull_request) Successful in 4s Details

● Build/release / Build (windows-latest) (push) *In progress — This check has started...* Details

● Build/release / Build (macos-latest) (push) *In progress — This check has started...* Details

● Test Codebase / Run all Tests (ubuntu-latest) (pull_request) *In progress — This check has started...* Details

This branch has no conflicts with the base branch

Merging can be performed automatically.

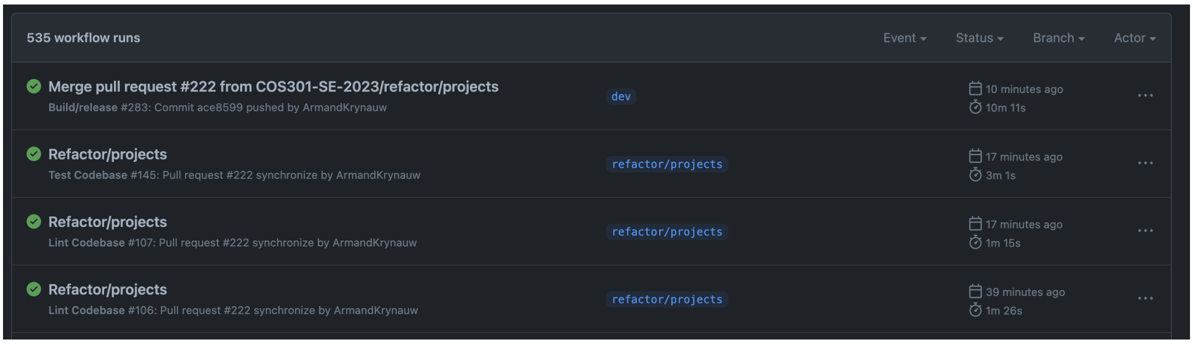
or view command line instructions.

Figure 1: Continuous Integration and Continuous Deployment (CI/CD) Pipeline

The reason why we chose github workflows for our cicd pipeline is because it enables us to build and test our app for Windows,Linux and MacOS without having to set up a local environment for each of these operating systems. This is done by using the github hosted runners. These runners are virtual machines that run the github workflows.

The github hosted runners are free to use for open source projects, and therefore we can use them for our project, allowing us to cut costs and save time. Furthermore github workflows are easy to set up and use, and are integrated with github, allowing us to easily automate our testing process.

For a more in depth view of our cicd pipeline, please refer to the following link : https://github.com/COS301-SE-2023/AI-Photo-Editor/actions



535 workflow runs

✓ **Merge pull request #222 from COS301-SE-2023/refactor/projects** **Build/release** #283: Commit ace8599 pushed by ArmandKrynauw	`dev`	10 minutes ago 10m 11s
✓ **Refactor/projects** **Test Codebase** #145: Pull request #222 synchronize by ArmandKrynauw	`refactor/projects`	17 minutes ago 3m 1s
✓ **Refactor/projects** **Lint Codebase** #107: Pull request #222 synchronize by ArmandKrynauw	`refactor/projects`	17 minutes ago 1m 15s
✓ **Refactor/projects** **Lint Codebase** #106: Pull request #222 synchronize by ArmandKrynauw	`refactor/projects`	39 minutes ago 1m 26s

Figure 2: Github Actions

Software Quality Assurance

The software requirements specification outlines quality criteria that must be assessed, measured, and validated for compliance within the project. These criteria are summarized briefly here and elaborated upon in dedicated sections.

1. Customizability & Extensibility
2. Compatibility
3. Performance
4. Security

Customizability & Extensibility

Customizability and extensibility refer to the ability of an application to be modified to meet different user needs and accommodate future enhancements. These requirements are important to ensure the longevity and relevance of the software in a rapidly changing technological environment.

Customizability enables users to adjust the software's functionalities based on their individual preferences and requirements, improving user satisfaction and productivity. Extensibility, on the other hand, ensures that our software is ready for future expansion, allowing us to add new features and functionalities without making major changes to the existing system structure.

The entirety of Blix was built from the ground-up to be as extensible as possible. Blix has an extensive plugin system that allows for the easy addition of new plugins that can enable a wide range of new features and workflows for users.

Quantification - Extensibility

The system's extensibility has been designed specifically to support the integration of both developer and user-generated plugins. The modular architecture of the system minimizes the potential impact on the existing system during the integration of new plugins.

To quantify extensibility, the system's performance was evaluated by integrating several new plugins and modules. The test result was successful, with no disruption to the existing functionalities. Currently, Blix accommodates a single built-in plugin that showcases the capacity to present any form of media or data flowing within the system. The primary functionality of the system is augmented with six specific plugins designed to meet the system's requirements, which include:

1. A Mathematical Plugin enabling fundamental mathematical operations.
2. A Logic Plugin facilitating basic logical operations.

3. A Basic Image Editing Plugin with one-way data binding from the graph to the media.
4. An Advanced Image Editing Plugin facilitating two-way data binding from the graph to the media and vice-versa.

It is noteworthy that the plugins were integrated seamlessly, and no functionality was disrupted during their addition. This demonstrates the system's high level of extensibility. The system's ability to readily adapt and incorporate new plugins will continue to be a critical metric for measuring extensibility in future developments.

Quantification - Customizability

The system offers a high degree of customizability to users, providing an adaptable interface that users can modify to suit their preferences. This includes a fully customizable layout, allowing users to add, remove, and rearrange the tiles integrated within the system. Additionally, plugin developers have the freedom to customize and create their own unique tiles.

To further enhance customizability, the system allows users to create and save custom graphs and workflows, providing flexibility to operate as per their unique needs. Another essential feature is the ability to customize preferred settings such as hotkeys, which are uniformly integrated throughout the system, enhancing ease of use and efficiency.

Customizability has been quantitatively assessed through a combination of user feedback and usability testing conducted throughout the development process. The metrics derived from these assessments served as a benchmark for the system's customizability and enabled continuous improvements to better cater to user preferences and enhance overall user experience.

Compatibility

Compatibility assesses the ability the application to operate effectively across various platforms and systems. In today's diverse and interconnected digital world, compatibility is an essential attribute that ensures our software can reach and serve a broader user base, regardless of their chosen operating system or device.

Our application is designed as a cross-platform desktop solution, capable of running seamlessly on multiple operating systems such as Windows, macOS, and Linux. This cross-platform compatibility enables us to provide a consistent user experience and maintain the full functionality of our software across all supported platforms.

Quantification

Our application is designed with cross-platform compatibility in mind, offering a unified user experience across all supported platforms. This compatibility guarantees that updates or enhancements made to the system are simultaneously available to all users, regardless of the platform they are using.

Market share analysis reveals that:

1. Windows holds a 70% market share
2. MacOS comprises 20% of the market
3. Linux contributes to a 3% market share

Therefore, our focus on compatibility ensures we cater to a significant proportion of the user market, particularly those utilizing Windows 10 and Ubuntu. In addition, our application supports both ARM and x86 architectures, thus facilitating its reach to a wider user base. This includes supporting users of the new Apple Silicon machines.

The minimum system requirements for our application to function optimally across these platforms are:

1. Windows: 7/10 - Intel Quad Core i5 or AMD equivalent with 4GB RAM and 2GB of free disk space.
2. MacOS: 10.13 - Any new Mac with an Intel processor or Apple Silicon with 4GB RAM and 2GB of free disk space.
3. Ubuntu: 18.04 - Intel Quad Core i5 or AMD equivalent with 4GB RAM and 2GB of free disk space.

Our quantification of compatibility is not limited to design alone. We have performed rigorous testing on all supported platforms throughout the development process. This diligence ensures that our application delivers consistent performance and user experience, regardless of the platform in use.

Performance

The system needs to guarantee that users can upload images to the application within a reasonable timeframe. It should also provide the capability for users to edit images with responsive latency and avoid consuming an excessive amount of computer resources.

Quantification

Our application provides a cache system where the user can upload assets to the application that allows the user to access assets more efficiently. We also enabled the integration of WebViews within the plugin system. This integration would empower the plugin to leverage canvases and other functionalities, enabling users to edit images more efficiently.

Testing Environment

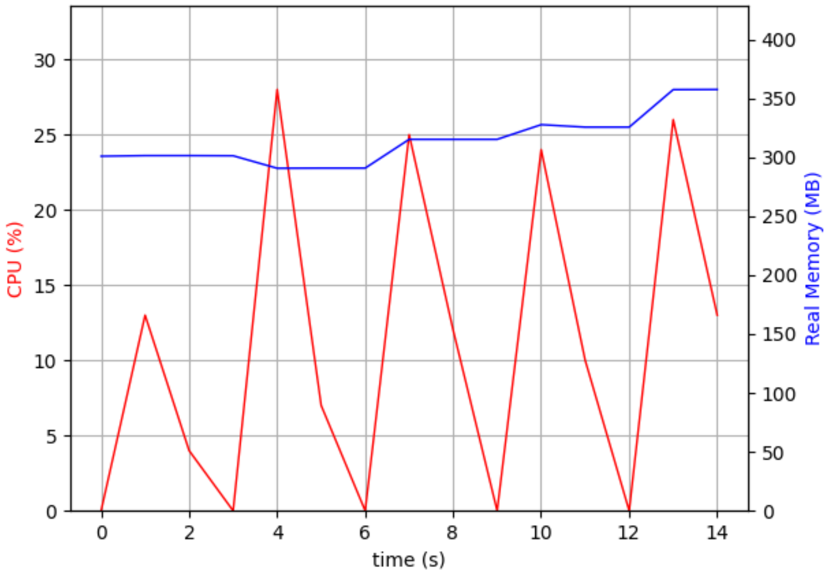
CPU: Inter Code i7-8565U

Memory: 16GB

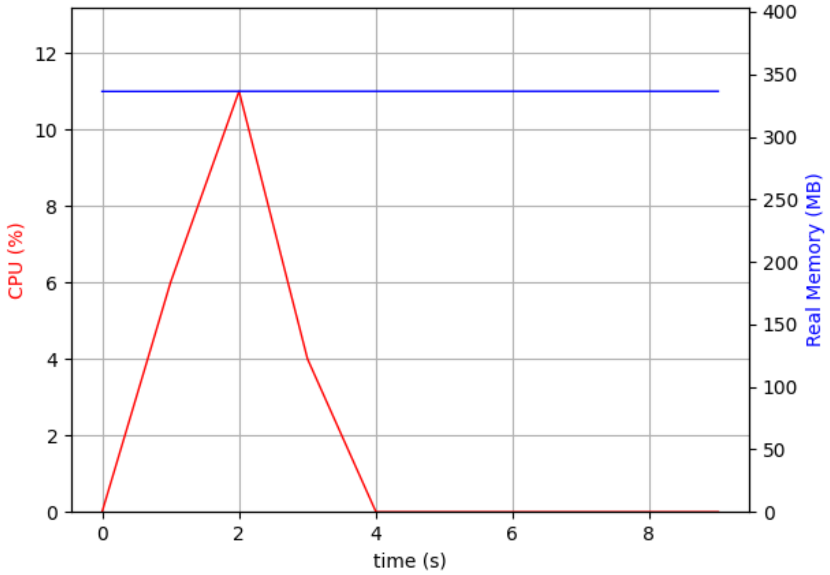
Tested:

- CPU utilization
- Memory Usage

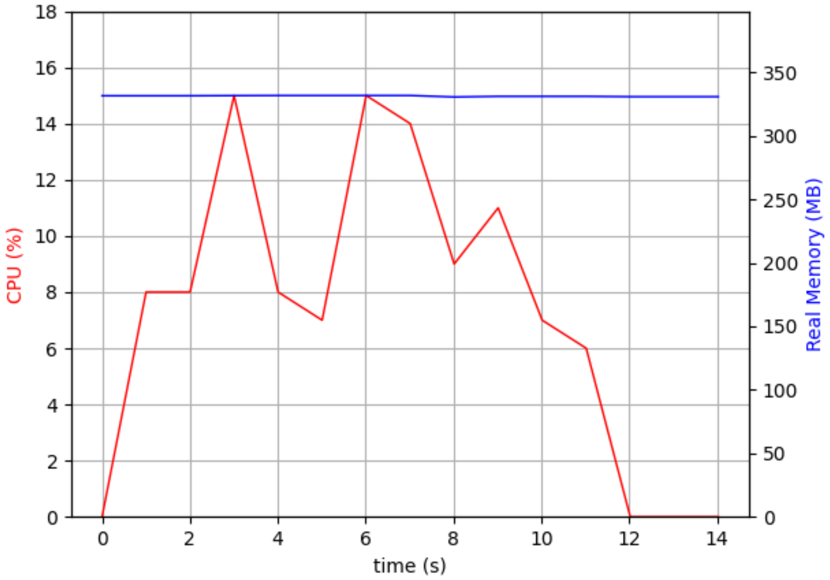
Adding 5, 10MB images to the cache system.



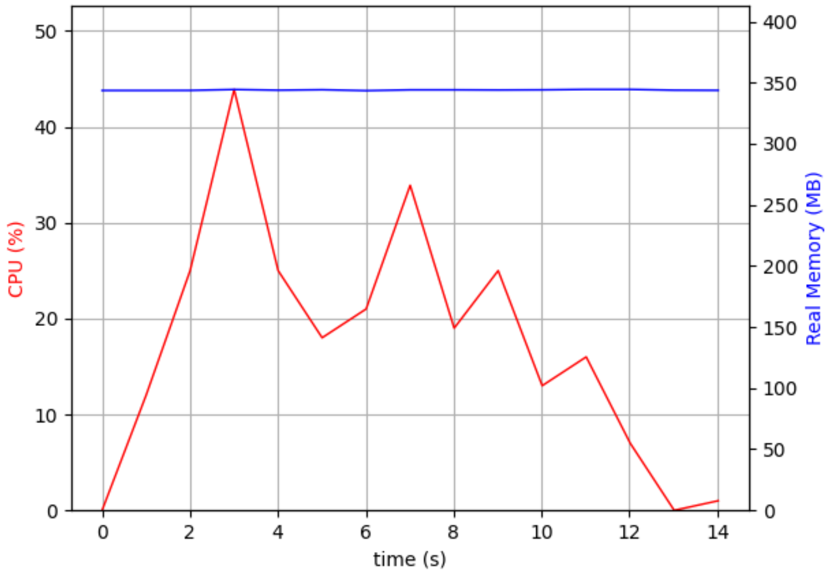
Removing all 5 images from the cache system at once.



Changing input in a small graph, consisting of 1 node, in quick succession using the GLFX plugin.



Changing input in a Big graph, consisting of 15 nodes, in quick succession using the GLFX plugin.



Security

Security focuses on safeguarding Blix, its data, and its users from potential threats. In the digital era, where cyber threats are continually evolving, a robust security approach is indispensable to maintain user trust and protect valuable data.

Quantification

Blix has been engineered with an emphasis on offline usage, providing user convenience while additionally enhancing its security posture. However, our commitment to security extends beyond this design consideration. We have integrated several security measures and best practices aimed at achieving optimal security standards. These include:

Sandboxing of renderers and webviews

A core security feature of our application is the sandboxing of renderers and webviews. This mechanism isolates these components into a separate process. This segregation restricts their capabilities and limits their access to sensitive data or system resources, effectively thwarting potential security breaches. This practice aligns with OWASP's recommendation of implementing secure defaults.

Context isolation

We have further fortified our application's security by implementing context isolation. This security measure delineates the Electron runtime's context from the application's context, thereby shielding powerful internal Electron APIs from malicious scripts. This practice is consistent with OWASP's principle of least privilege.

Disabling of Node integration in renderers

To safeguard our application from remote code execution attacks, Node.js integration within our renderers has been disabled. This strategy obstructs malicious scripts from obtaining direct access to low-level system resources, significantly enhancing overall security.

Open-source Plugin code

In our pursuit of transparency and collaborative security improvement, the code for our plugins is open-source. This allows for community-driven security audits and contributes to the overall hardening of our application's security.

In conclusion, these security measures - sandboxing, context isolation, disabling of Node integration - along with our open-source plugin code, work in tandem to create a robust security environment for our application. In alignment with OWASP guidelines, these strategies ensure our application is resilient against a plethora of security threats, thereby safeguarding our users and their data.