Task Progress Update Report

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1. Overview of Tasks

Task 1 : Development of CLAHE_uint32

Objective: Implement CLAHE processing for unsigned 32-bit integer data.

Status: Done

Details:

- Linked Threshold CLAHE (uint32 method) with 1D pointer integration into the UI.
- Resolved output differences between CLAHE methods in D2D and uint32 by updating the uint32 method to preserve bright image regions.
- Integrated combined CLAHE into the uint32 method and linked it to the UI.
- Replaced nested loops with single-loop implementations using row-column indexing (`i / width` and `i % width`) and applied OpenMP for parallel processing.
- Double-checked all CLAHE-related functions to ensure consistent and efficient performance.
- Removed unused flags (e.g., `afterNormalCLAHE`) for code cleaning.
- Combined separate CLAHE classes into one unified header and source file (CLAHE.h and CLAHE.cpp).
- Conducted demonstrations and provided function explanations for easier team integration.
- Submitted the updated CLAHE functions.

Task 2 : Addressing OpenCV Parallel Backend Warnings

Objective: Ensure compatibility and efficient parallel processing despite OpenCV backend warnings.

Status: Done

Details:

- Analyzed OpenCV warnings related to missing DLLs for parallel processing backends (ONETBB, TBB, OpenMP).

- Ensured that fallback mechanisms and custom parallel processing using OpenMP and `std::async` remain operational.
- Concluded that these warnings do not affect the program functionality, allowing safe execution without resolving missing DLLs.
- Suggested optional resolution for enabling OpenCV parallel optimization by installing required DLLs.

Task 3 : Research on Free-License Alternatives to Qt

Objective: Identify free-license libraries for UI development and signal-slot mechanisms.

Status: In Progress

Details:

- Explored alternative libraries:
  - **Dear ImGui** and **SFML**: Lightweight and suitable for rapid development.
  - **wxWidgets**: Mature framework for full-scale applications.
  - **Boost.Signals2** and **EventPP**: Robust options for signal-slot systems.
  - **Cairo + SDL2**: Effective for custom 2D graphics scenes.
  - **FLTK**: Lightweight and efficient for simple UI applications.
- Created a simple test program with Qt for loading, displaying, and saving images.
- Attempted implementation in FLTK but faced installation issues.
- Successfully set up wxWidgets 3.2.6 environment and implemented basic UI features. Resolved errors related to missing DLLs and configuration settings.
- Encountered issues with UI rendering in wxWidgets but continued refining the application.

2. Roadblocks/Challenges

- Debugging CLAHE_uint32 for seamless integration and accurate data scaling.
- Addressing UI rendering issues in wxWidgets applications.
- Testing and refining single-loop optimizations in CLAHE functions.
- Ensuring compatibility between free-license libraries and project requirements.

3. Conclusion

- Successfully optimized CLAHE functions and integrated them with the UI.
- Enhanced parallel processing functionality despite OpenCV backend warnings.
- Progressed in researching and implementing alternative libraries to Qt, with initial success in wxWidgets setup.
- Continued focus on debugging CLAHE_uint32, improving library integration, and ensuring seamless functionality in upcoming tasks.