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Photo Editor – Photo Editing App

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Abstract: *Photo Editor, a robust photo editing application designed to provide a seamless user experience with advanced editing capabilities. The app features drawing tools with customizable brushes, filters, text editing, emojis, stickers, and intuitive gesture controls for scaling and rotating elements. It supports undo/redo functionality and efficient image saving, making it a powerful tool for creative editing. The development and implementation aspects of this feature-rich editor are discussed in detail*

Keywords: Photo Editing, Image Processing, Filters and Effects, User Interface Design, Digital Image Enhancement

I. INTRODUCTION

Photo editing applications play a crucial role in digital image enhancement, offering tools for modifying and improving visual content. This application integrates features such as customizable brushes, filters, text and sticker additions, and gesture-based controls to facilitate seamless editing. With a focus on efficiency and usability, it provides intuitive functionalities suitable for both casual users and professionals

II. METHODOLOGY

1. SOFTWARE INTEGRATION:

- Image Processing Libraries – Utilizes OpenCV and GPUImage for real-time image manipulation and effect application.
- Architecture Design – Implements the MVVM (Model-View-ViewModel) architecture for better code separation and performance.
- Third-Part Apps – Integrates Glide/Picasso for image caching, ensuring efficient loading and rendering.
- Storage Management – Supports local and cloud storage solutions for saving and retrieving images.

2. USER INTERACTION:

- Apply Sepia Filter - Enhances the image with a sepia effect.
- Add Text "Hello World" - Overlays customizable text with various fonts and colors.
- Undo Last Action -Enables non-destructive editing with step-by-step reversal.
- Gesture Control- Implements pinch-to-zoom, rotation, and drag functionalities for precise editing.

3. IMAGE PROCESSING & EDITING TOOLS:

- Filter Application – Offers real-time filter previews with optimized rendering.
- Layered Editing– Supports multi-layer adjustments for non-destructive modifications.
- Brush and Shape Tools – Enables freehand drawing, predefined shapes, and opacity adjustments.
- Text and Sticker Overlays – Provides multiple fonts, colors, and stickers with customization options.

4. SYSTEM PERFORMANCE & OPTIMIZATION:

• Multi Threading – Ensures smooth UI interactions while processing high-resolution images.
• Memory Management – Uses efficient algorithms to minimize RAM usage and prevent crashes.
• GPU Acceleration – Offloads complex rendering tasks to enhance speed and responsiveness.

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5. EXPORT & SHARING FEATURES:

• Multiple Formats – Supports exporting in PNG, JPEG, and high-quality compressed formats.
• Social Media Integration – Allows direct sharing to platforms like Instagram, WhatsApp, and Drive.
• Batch Processing – Enables users to edit and export multiple images simultaneously for improved productivity.

III. IMPLEMENTATION

1. BACKEND INFRASTRUCTURE:

• Programming Languages & Frameworks - Developed using Kotlin and Java in Android Studio, ensuring seamless integration with Android devices.
• Image Processing Engine - Utilizes OpenCV and GPUImage for real-time filters, effects, and transformations.
• Data Storage & Management - Implements local storage for offline access and integrates cloud services for remote saving and sharing.
• MVVM Architecture - Separates UI, business logic, and data handling using Model-View-ViewModel (MVVM) to improve scalability and maintainability.
• Performance Optimization - Employs multi-threading and GPU acceleration for efficient rendering, ensuring smooth performance even with high-resolution images.

2. FRONTEND AND USER EXPERIENCE:

• User Interface (UI) - Designed using XML layouts and Material Design principles, ensuring an intuitive and visually appealing experience.
• Interactive Features - Supports pinch-to-zoom, drag-and-drop for stickers, and real-time filter previews to enhance usability.
• Editing Tools - Provides crop, rotate, brightness/contrast adjustment, filters, brush tools, text overlays, and stickers, allowing comprehensive image customization.
• Undo/Redo Functionality - Implements non-destructive editing, enabling users to revert or reapply changes effortlessly.
• Export & Sharing - Supports saving in PNG, JPEG formats and direct sharing to social media and cloud platforms.

3. SYSTEM INTEGRATION AND OPTIMIZATION:

• Third-Party Integrations - Uses Glide/Picasso for optimized image loading and caching.
• Efficient File Handling - Supports batch processing for multiple images and optimized memory management to prevent crashes.
• Security Measures - Implements permissions handling for accessing storage and camera while ensuring data privacy.
• Testing & Debugging - Utilizes unit testing and user acceptance testing (UAT) to ensure a bug-free experience before deployment.

IV. CONCLUSION

The photo editing app provides a seamless editing experience with real-time filters, text overlays, and brush tools while ensuring high performance through MVVM architecture and GPU acceleration. With multiple export options and social media integration, it meets modern user needs, with potential future enhancements like AI-driven automation and cloud-based features.

V. ACKNOWLEDGMENT

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