
ACROPOLIS INSTITUTE OF TECHNOLOGY AND RESEARCH

Department of IT

Synopsis On *ILLUMA*

1. Introduction

1.1 Overview

Photography has become an integral part of modern life, with people constantly documenting their lives through photos—whether during family gatherings, social events, or trips with friends. However, one significant problem persists: the photographer is often left out of the group photo. This issue can seem trivial but is quite disruptive when it comes to capturing memories where everyone is supposed to be included. Whether it's a spontaneous family gathering or a vacation photo at a scenic location, the photographer is often excluded, unless they resort to using selfie sticks or asking a stranger for assistance.

Illuma, a cutting-edge mobile and web application, aims to solve this problem by using artificial intelligence (AI) and image processing techniques to seamlessly integrate the photographer into group photos. The core functionality of Illuma revolves around taking two photos—one with the group and another with the photographer—and using AI to merge them into a single, cohesive image. By automating this process, Illuma ensures that the final picture looks as though everyone was present at the same time, with no artificial blending or awkward overlaps.

1.2 Purpose

The primary purpose of Illuma is to make group photography inclusive, ensuring that no one is left behind in the picture, not even the person taking it. In an era where photography plays a vital role in our personal and social lives, Illuma bridges the gap between technology and everyday use cases, making it easier than ever to create perfect group photos without additional tools like tripods, timers, or selfie sticks.

Traditional methods for capturing group photos often disrupt the moment. For example, when using timers, people may rush to get into position, causing the natural flow of the photo to be lost. Asking a passerby to take the photo can also lead to suboptimal results, with the photographer's preferences regarding framing or lighting being overlooked. Illuma eliminates these issues by allowing users to capture memories effortlessly, while maintaining full control over the process.

The purpose of Illuma extends beyond photography—it's about enhancing the experience of preserving memories. By offering an intuitive and effective solution, Illuma ensures that all participants in a group can be part of the memory, without compromising on quality or convenience.

2. Literature Survey

2.1 Existing Problem

The problem of excluding the photographer from group photos is a longstanding one, with several attempted solutions over the years. Traditional methods of group photography include the use of timers, selfie sticks, and tripods, but these have significant limitations:

- **Timers:** Cameras with timers allow the photographer to be included in the picture by setting a countdown. However, this method often results in rushed photos, with people scrambling to get into place before the timer goes off. Moreover, the lack of control over framing and composition can result in poorly captured photos.
- **Selfie Sticks:** A popular solution in recent years, selfie sticks allow the photographer to include themselves in the photo by extending the camera's reach. However, selfie sticks often result in unnatural framing, limited angles, and awkward compositions. Additionally, the presence of the stick in the photo can be distracting, leading to less polished results.
- **Tripods:** Using a tripod allows the photographer to set the camera in a fixed position and join the group for the photo. While this solves the problem of framing, it requires the photographer to carry additional equipment, which is cumbersome for casual outings or spontaneous moments. Moreover, tripods are impractical for crowded or tight spaces.
- **Asking Strangers:** One of the most common solutions is to ask a passerby to take the photo. While this allows the photographer to be included, it introduces the risk of poor framing, incorrect focus, or simply not capturing the moment as intended. Additionally, in some situations, handing over one's camera or phone to a stranger can pose a security risk.
- **Manual Editing:** For those with access to photo editing software like Photoshop, manual editing allows the photographer to merge themselves into the group photo. However, this process is labor-intensive, time-consuming, and requires a high level of technical expertise. Even with skilled editing, the final image may not appear natural, as achieving seamless blending between two images is challenging without professional tools.

These traditional methods have failed to provide a simple, effective, and high-quality solution for including the photographer in group photos. This gap in the market creates an opportunity for a new approach, one that leverages modern technology to automate the process while delivering professional results.

2.2 Proposed Solution

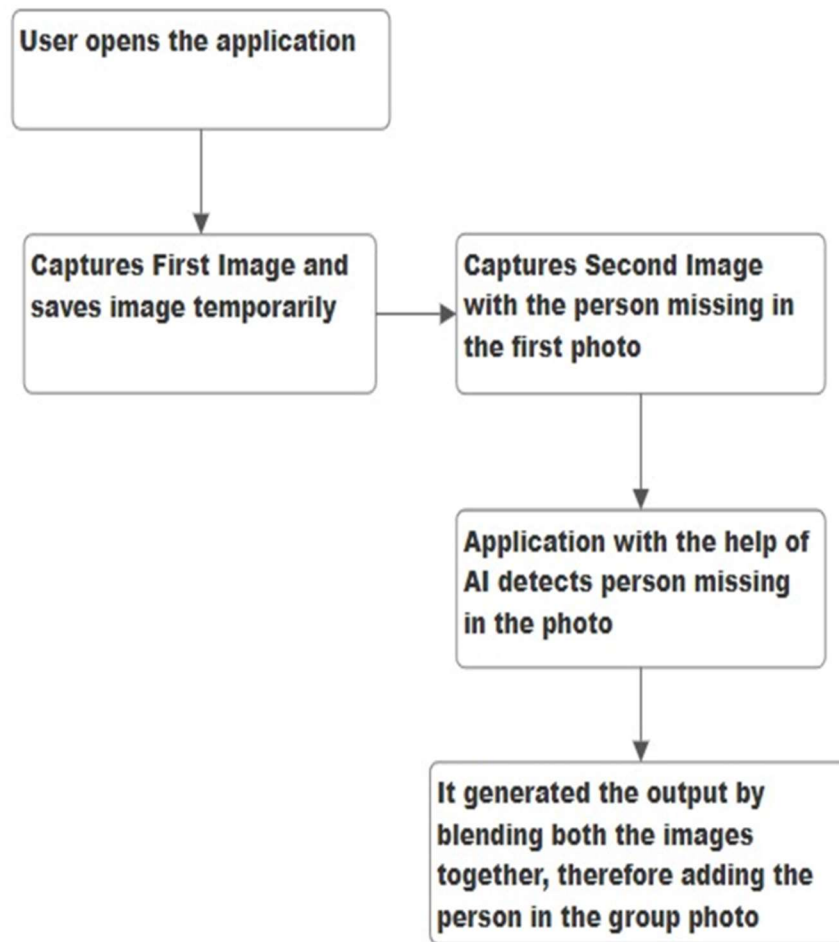
Illuma offers an innovative, AI-driven solution to this problem. By taking two photos—one of the group and another with the photographer—the application intelligently merges the two images into one, creating a final group photo where everyone is included. The merging process is made possible through the use of several advanced techniques:

- **Image Acquisition:** The user takes two photos from the same angle—one with the group and another with the photographer. This ensures that the background and lighting remain consistent across both images.
- **Image Alignment:** Illuma uses AI algorithms such as SIFT (Scale-Invariant Feature Transform) or ORB (Oriented FAST and Rotated BRIEF) to detect key features in both images. By identifying and matching these features, the application aligns the two photos, ensuring that the perspective and scale are consistent.
- **Object Detection and Segmentation:** The application employs deep learning models, such as Mask RCNN, to detect and segment the people in the photo from the background. This allows Illuma to isolate individuals and ensure that only the necessary parts of each image are merged.
- **Image Blending:** Using techniques like alpha blending or Poisson image editing, Illuma merges the two images into one. These techniques ensure that the transition between the two photos is smooth and that the final image looks cohesive. The AI adjusts for factors such as lighting, shadows, and color balance, making the final image appear as though it was captured in a single shot.
- **Fine Tuning:** Illuma's AI also addresses edge cases, such as overlapping areas where individuals may obscure one another. The application automatically corrects for such issues, ensuring that the final image looks natural and polished.

By automating these complex processes, Illuma makes it easy for users to create perfect group photos with minimal effort. The proposed solution is not only efficient but also ensures high-quality results, making it accessible to users with little to no technical expertise.

3. Theoretical Analysis

3.1 Work Flow Diagram



3.2 Hardware/Software Designing

The development of the Illuma application requires careful consideration of both hardware and software components to ensure optimal performance and user experience. Below are the detailed requirements for each aspect:

- **Hardware Requirements:**

- **Smartphone/Device:** The primary hardware component for running the Illuma application is a smartphone or tablet equipped with a camera. For optimal results, devices should meet the following specifications:
 - **Processor:** A multi-core processor (e.g., Quad-core or higher) to handle the computational load of image processing and AI algorithms.
 - **RAM:** A minimum of 4 GB RAM is recommended for smooth operation, especially during intensive processing tasks.
 - **Camera:** A camera with a minimum resolution of 12 MP to capture high-quality images that can withstand post-processing.
 - **Storage:** Sufficient internal storage (at least 200 MB) to install the application and save captured images and merged photos.

- **Software Requirements:**
 - **Operating Systems:** The application will be available on multiple platforms, requiring compatibility with:
 - **Android:** Android 8.0 (Oreo) or later for a wide range of devices.
- **Programming Languages:**
 - **Python:** Utilized for backend development and rapid prototyping of AI algorithms. Python libraries like OpenCV, TensorFlow, and PyTorch facilitate image processing and machine learning tasks. Python Version: 3.12.7
 - **Kotlin:** Used for native mobile app development—Kotlin for Android. These languages help create an intuitive user interface and ensure smooth performance on mobile platforms.
 - **Flutter:** It is an open source framework from Google that allows developers to create applications for multiple platforms using single codebase.
- **Libraries and Frameworks:**
 - **OpenCV:** A powerful library for computer vision tasks, including image alignment, blending, and object detection.
 - **TensorFlow/PyTorch:** Frameworks for developing and training deep learning models to perform tasks like image segmentation and object recognition.
 - **Dlib:** A toolkit containing machine learning algorithms and tools for face detection and feature extraction.
 - **Scikit-Image:** A Python library for basic image processing tasks, facilitating operations like segmentation and transformations.

By combining these hardware and software components, the Illuma application is poised to deliver an exceptional user experience, allowing for seamless group photography that includes everyone, including the photographer.

4. Applications

The Illuma application has a wide array of potential applications across various sectors and user demographics. Below are some of the key areas where this solution can be applied:

- **Social Events:** Whether it's a birthday party, wedding, or casual get-together, Illuma enables participants to include themselves in group photos without the need for external assistance.
- **Travel and Adventure Photography:** Travelers often encounter stunning landscapes and iconic landmarks, and Illuma enables them to be part of the experience without cumbersome equipment. With the application, travelers can easily capture memories with their companions, creating lasting souvenirs of their adventures.
- **Corporate and Professional Settings:** In professional environments, Illuma can facilitate the capture of team photos, conference memories, and corporate events. By including the photographer in the image, organizations can create a

complete representation of their teams during important milestones, enhancing workplace culture and morale.

- **Content Creation and Influencer Marketing:** Content creators and influencers can leverage Illuma to produce high-quality group photos for their social media platforms. The seamless integration of the photographer into group shots saves time and effort, allowing creators to focus on content strategy rather than logistical challenges.
- **Event Photography Services:** Professional photographers can use Illuma as an additional service offering, enhancing their portfolio by providing clients with unique group photos that include the photographer. This can differentiate their services in a competitive market, attracting more clients looking for innovative solutions.
- **Virtual Events:** In the era of remote interactions, Illuma can be adapted for virtual events, allowing participants to capture group photos during online meetings or conferences. This ensures that everyone can be part of the memory, even in a digital space.

Through these diverse applications, Illuma addresses a common problem while providing innovative solutions that enhance the photography experience. The potential to integrate this technology into various sectors demonstrates its versatility and relevance in today's visual-centric society.

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