

**AKHUWAT COLLEGE KASUR**  
**AFFILIATED WITH**  
**UNIVERSITY OF THE PUNJAB, LAHORE.**

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**FINAL YEAR PROJECT (FYP)**  
**PROPOSAL DOCUMENT**

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**PROJECT TITLE**  
**“Creating 360-degree image using mobile cameras”**  
**BS (IT)**  
**SESSION: 2021-2025**

**DEPARTMENT OF INFORMATION TECHNOLOGY**  
**AKHUWAT COLLEGE KASUR.**

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# **1. Introduction**

This is to create a single stunning 360-degree image that captures the entire scene. This project will use pictures taken from different phones placed in a circle to make a super wide image that shows a full 360-degree view. All devices will participate in image processing to enhance efficiency and distribute the processing load among all the devices involved. The first device will send the captured image to an adjusting device, allowing the images from the two devices to be merged and aligned in order to create a consistent and coherent 360-degree image. Similarly, the merged image will be passed on to the next device to refine the image through patching. This process will continue until all images are merged, resulting in the creation of a complete 360-degree image.

## **1.1 Project Title**

“Creating 360-degree image using mobile cameras”

## **1.2 Project Overview Statement**

The trend to capture and view immersive 360-degree environment is growing up in the fields including tourism, real estate, education and virtual tours. These applications demand realistic 360-degree view of environment so that user can explore the environment from anywhere and anytime.

However, 2D images and videos are used to display the 360-degree view partially but these are incapable to give the realistic 360-degree view of environment. There also exist hardware-based camera solution to create 3D views but these are expensive solutions for small business and individual creator.

As smartphones are growing with their cameras and image processing features along with other capabilities so, by leveraging these ones we can come up with cost effective solution which can bridge the gap between expensive solutions and need for 360-degree visualization.

Traditional 2D images are limited in their ability to represent complex 360-degree scenes, as they can only display a single perspective at any given moment. To overcome this limitation, multiple images from various angles are typically captured and combined.

However, simply stitching these images into a flat picture often results in a distorted or incomplete view, failing to provide a realistic representation of the entire scene.

While specialized 3D cameras exist to address this challenge, they are expensive, making them inaccessible for most users. This creates a gap for individuals or small businesses that need to generate immersive 3D scenes for applications such as virtual tours, real estate, tourism, and educational purposes.

Therefore, a cost-effective and accessible solution using readily available smartphones is needed. By enabling multiple devices to collaborate in capturing and processing images, it is possible to distribute computational load and enhance the quality of the resulting panoramic view. This project proposes a mobile-based solution that will help to create and view 360-degree image by leveraging distributed image processing across Android devices.

### 1.3 Project Overview Statement Template

Project Title: Creating 360-degree image using mobile cameras			
Group Leader: Sakhawat Ali			
Project Members:			
<b>Name</b>	<b>Roll no. #</b>	<b>Email Address</b>	<b>Signature</b>
Sakhawat Ali	058950	sakhawat.raza890@gmail.com	
Mehboob Arshad	058961	mehboob14@proton.me	
Project Goal:			
This project aims to develop an android application that allows users to create and view 360-degree image using single as well as multiple smartphones.			

Objectives:

Sr. No.	
1	Develop a mobile-based solution for capturing 360-degree images using multiple devices.
2	Develop a system where multiple Android devices are positioned in a circular manner to collectively capture images for a complete 360-degree view.
3	Implement distributed processing across participating Android devices to balance the computational load, where each device contributes to image stitching and alignment.
4	Develop single-device mode which enable user to capture images of all sides using a single device and seamlessly stitch them together to create 360-degree image.
5	Guide the user to align and rotate the mobile while taking images using single mobile.
6	Integrate a 360-degree viewer that allows users to view the final panoramic image in interactively manner, enhancing the user experience.
7	Design a guide to assist users in arranging devices in a circle and capturing images with minimal distortion and alignment errors.
8	Utilize computer vision techniques for seamless image stitching and enhancement.

Project Success criteria:

The project will have following features to considered it as complete.

- A functional prototype enabling collaborative image capturing, processing and creating final 360-degree image.
- Images should be stitched in a way that there should not be any distortion between

<p>images while displaying these as 360-degree image.</p> <ul style="list-style-type: none"> <li>• Successful integration of 360-degree image viewer.</li> <li>• Implement user guide to take images of required criteria.</li> <li>• Implement seamless inter-device communication and image sharing in multi-device mode.</li> <li>• Create standardize documentation of project.</li> </ul>	
<p>Assumptions, Risks, and Obstacles:</p> <ol style="list-style-type: none"> <li>1- Integration free availability of 360-degree image viewer.</li> <li>2- The system may get slow in case of too high resolution images and low hardware capacity.</li> </ol>	
<p>Organization Address (if any):</p> <p>2nd Floor,443-q,phase-ii,dha Lahore (<a href="#">Ebryx</a>)</p>	
Type of project:	<input type="checkbox"/> Development
<p>Target End users:</p> <ol style="list-style-type: none"> <li>1- Real estate professionals</li> <li>2- Tourism &amp; travel industry</li> <li>3- Architects &amp; interior designers</li> <li>4- Event planners &amp; venues</li> <li>5- Construction &amp; engineering firms</li> <li>6- Museums &amp; cultural institutions</li> </ol>	
Development Technology:	<input type="checkbox"/> Object Oriented
Platform:	<input type="checkbox"/> Android application
<p>Suggested Project Supervisor: Mr. Muhammad Naeem Akhtar</p>	
<p>Approved By:</p>	

## **1.4 Project Goals & Objectives**

### **Goal**

This project aims to develop an android application that allows users to create 360-degree image using single as well as multiple smartphones.

### **Objectives**

- Design a guide to assist users in arranging devices in a circle and capturing images with minimal distortion and alignment errors.
- Develop a system where multiple Android devices are positioned in a circular manner to collectively capture images for a complete 360-degree view.
- Implement distributed processing across participating Android devices to balance the computational load, where each device contributes to image stitching and alignment.
- Develop single-device mode which enable user to capture images of all sides using a single device and seamlessly stich them together to create 360-degree image.
- Integrate a 360-degree viewer that allows users to explore the panoramic image interactively, enhancing the user experience.

## **1.5 High-level system components**

Generally, an integrated application is composed of many different components that work collectively to address the problem for which the system has been devised. The high-level system components / modules for our application are the following:

- **Storage & Export Module**
- **Single device mode**
- **User Interface (UI) Module**

- **Synchronization & Coordination Module**
- **Multi-Device Communication Module**
- **Image Processing Module**
- **User Guide & Settings Module**
- **Multi-device communication**
- **Camera Module**

## **1.6 List of optional functional units**

- Creating a server for image processing
- Develop application for IOS device
- Communication between IOS and Android devices

## **1.7 Exclusions**

- We will not include cloud-based image stitching in the initial phase, as the primary focus is on mobile-based distributed processing.
- The project does not aim to support professional-grade DSLR camera integration

## **1.8 Application Architecture**

We will follow 1-tier Architecture, where all processing and presentation logic reside within the mobile application.

- Kotlin & Jetpack compose (for business & presentation layer)



## 1.9 Gantt chart

Sr. No.	Task Name	Start Date	End Date	Duration (weeks)
1	Project Proposal	17-10-2024	31-10-2024	2
2	Documentation	01-11-2024	28-11-2024	4
3	Prototype	29-11-2024	05-12-2024	1
4	UI development	06-12-2024	26-12-2024	3
5	Image processing 1	27-12-2025	06-02-2025	6
6	Single device mode	07-02-2025	13-03-2025	5
7	Image processing 2	14-03-2025	24-04-2025	6
8	Multi-device mode	25-04-2025	15-05-2025	3
9	Testing	16-05-2025	22-05-2025	1
10	Deployment	23-05-2025	29-05-2025	1
11	Maintenance	30-05-2025	7-06-2025	1

## 1.10 Hardware and Software Specification

### Hardware: (Recommended)

- 3.6 GHz Octa-core Processor
- 4 GB RAM
- 50 GB Storage
- 12 MP Camera (or higher)
- Gyroscope and Accelerometer

### Software: (Recommended)

- Android 12 (API 35)

## 1.11 Tools and technologies used with reasoning

### Tools:

## **Android Studio**

Android Studio is the official IDE for Android development, providing robust tools for building, debugging, and testing applications. It offers features like code analysis, an advanced emulator, and direct integration with Jetpack Compose.

## **OpenCV**

OpenCV (Open Source Computer Vision Library) is used for image processing and computer vision tasks. It provides powerful features for real-time image and video analysis, feature detection, image stitching, and object tracking.

## **Git**

Git is a distributed version control system used for tracking changes in source code during software development. It enables collaboration, branching, and version management, allowing multiple developers to work on a project efficiently without conflicts.

## **GitHub**

GitHub is a cloud-based platform that provides Git repository hosting with additional features like issue tracking, pull requests, CI/CD integration, and collaboration tools. It enhances project management and enables teams to maintain code quality through version control and code reviews.

## **Technologies:**

### **Kotlin**

Kotlin is the official programming language for Android development, offering concise syntax, null safety, and interoperability with Java. It enhances developer productivity and ensures modern app development practices.

## **Frameworks & Libraries**

### **Jetpack Compose**

Jetpack Compose is a modern UI toolkit for building declarative and efficient UI in Android apps. It simplifies UI development with composable functions, state management, and better performance compared to traditional XML-based UI.

### **OpenCV (Image Processing in Kotlin)**

**CameraX** (Android Camera API)

**Communication:** Bluetooth/Wi-Fi Direct for device-to-device image transfer

**Storage:** Local storage with optional cloud integration