Android Application Development with Kotlin – Project Report

Movie Information System

1. Introduction:

1.1 Overview

The Disney Compose application is a demo app that showcases the usage of modern Android technologies and libraries to create a declarative user interface for displaying movie information from Disney.

The Disney Compose app is a demo application that showcases the power of Jetpack Compose, a modern UI toolkit for native Android development. It follows the MVVM architecture with a repository pattern and utilizes Kotlin, Coroutines, and Flow for asynchronous operations. Dependency injection is handled with Hilt, simplifying dependency management.

The app's UI is built declaratively using Jetpack Compose, providing a more intuitive and concise way to create user interfaces. It fetches movie data from a network API using Retrofit2 and OkHttp3, with paging for efficient data loading. Room Persistence is used to store and retrieve data from a local database, ensuring a seamless user experience even offline.

1.2 Purpose

The Disney Compose app serves as a demonstration of the capabilities of Jetpack Compose, a modern toolkit for building native Android UI. It provides a seamless and visually appealing user interface to browse and explore information about Disney movies. Users can view details such as movie titles, descriptions, release dates, and images. The app utilizes animations and material design principles to enhance the user experience. Additionally, it demonstrates the usage of various open-source libraries such as Accompanist,

Landscapist, Orchestra-Balloon, Retrofit2, OkHttp3, Sandwich, Balloon, and Timber to enhance different aspects of the app's functionality.

By studying and exploring the Disney Compose project, developers can gain insights into the following:

- Building a modern Android app using Jetpack Compose and Kotlin.
- Implementing the MVVM architecture with a repository pattern.
- Fetching data from a network API using Retrofit2 and OkHttp3.
- Using coroutines and Flow for handling asynchronous operations.
- Integrating a local database using Room Persistence.
- Implementing dependency injection using Hilt.
- Utilizing popular open-source libraries to enhance UI, handle network requests, and manage data.
- Applying material design principles and animations to create a visually appealing user interface.

2. Literature Survey:

2.1 Existing Problem

The existing problem addressed by the Disney Compose app is the need for a modern and visually appealing interface to display information about Disney movies. Traditional Android UI development approaches, such as using XML layouts and View-based frameworks, often result in complex and verbose code, making it challenging to create dynamic and interactive UIs.

Prior to the introduction of Jetpack Compose, developers relied on imperative and cumbersome UI development methods. These methods required extensive handling of view states, manual layout management, and boilerplate code for handling user interactions and data binding. This approach hindered productivity and made it difficult to create highly customizable and visually consistent UIs.

2.2 Proposed Solution

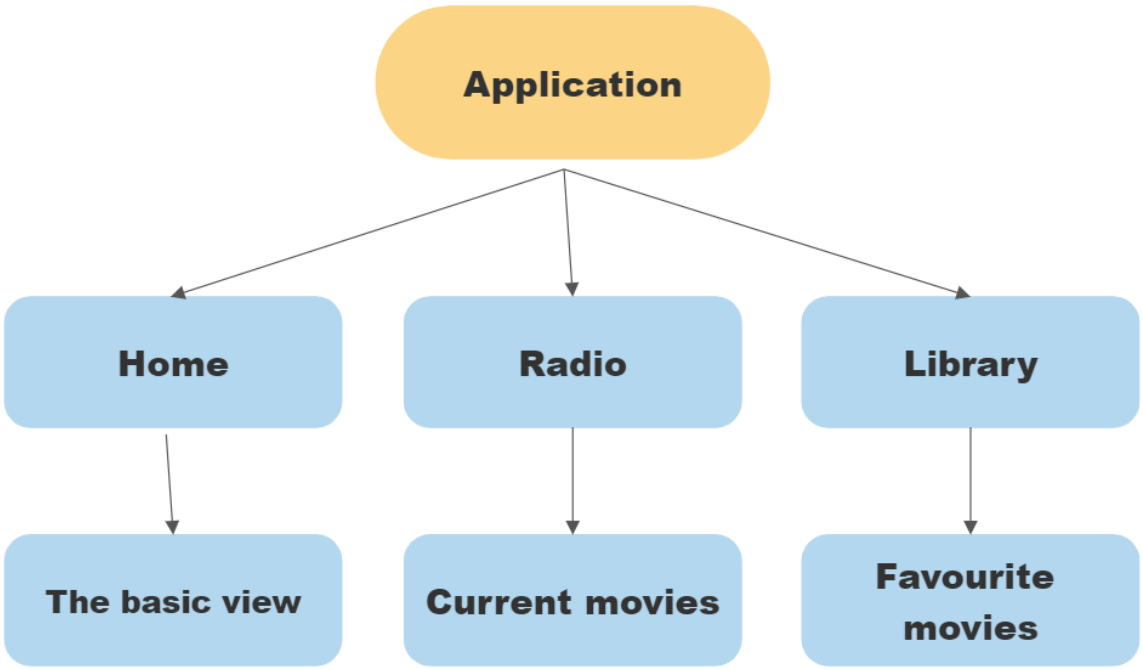
The Disney Compose app proposes the use of Jetpack Compose, a declarative UI toolkit, as a solution to the existing problem. Jetpack Compose simplifies and streamlines UI development by allowing developers to describe the UI components and their interactions in a more concise and intuitive manner.

In the Disney Compose app, the proposed solution involves leveraging the power of Jetpack Compose alongside other modern Android technologies and libraries. This includes utilizing the MVVM architecture with a repository pattern to separate concerns, employing Coroutines and Flow for asynchronous operations, and integrating Hilt for dependency injection.

By adopting Jetpack Compose, developers can create a visually appealing and highly customizable user interface with less code and improved readability. Compose's declarative nature allows for efficient UI updates and automatic state management, eliminating the need for manual view handling and reducing potential sources of bugs.

3. Theoretical Analysis:

3.1 Block Diagram



3.2 Hardware /Software designing

Hardware Requirements:

Android device or emulator with a minimum SDK level of 21 (Android 5.0 Lollipop) for testing and running the application.

Software Requirements:

Android Studio: The official integrated development environment (IDE) for Android app development. It provides tools for writing, debugging, and testing Android applications.

Version: Android Studio 4.0 or above.

Download: Android Studio can be downloaded from the official Android Developer website (https://developer.android.com/studio).

Kotlin: The programming language used for developing the Disney Compose app.

Version: Kotlin 1.5.0 or above.

Setup: Kotlin is typically bundled with Android Studio. Make sure the Kotlin plugin is installed and up to date.

Jetpack Compose: The modern UI toolkit used for building the user interface of the app.

Version: Jetpack Compose 1.0.0 or above.

Setup: Jetpack Compose is integrated into Android Studio. Ensure that you have the necessary Compose dependencies configured in your project's build.gradle file.

Other Dependencies: The project relies on various open-source libraries and tech stacks, including:

- Coroutines: Used for handling asynchronous operations.
- Hilt: Used for dependency injection.
- Retrofit2: Used for networking and REST API communication.
- OkHttp3: Used as the HTTP client for network requests.
- Room Persistence: Used for local database management.

- Accompanist, Landscapist, Orchestra-Balloon, Sandwich, WhatIf, Balloon, Timber: These are additional libraries used for UI enhancements, image loading, tooltips, error handling, and logging.
- Internet Connection: To fetch movie data from the network and retrieve images, an active internet connection is required during runtime.

4. Experimental Investigations:

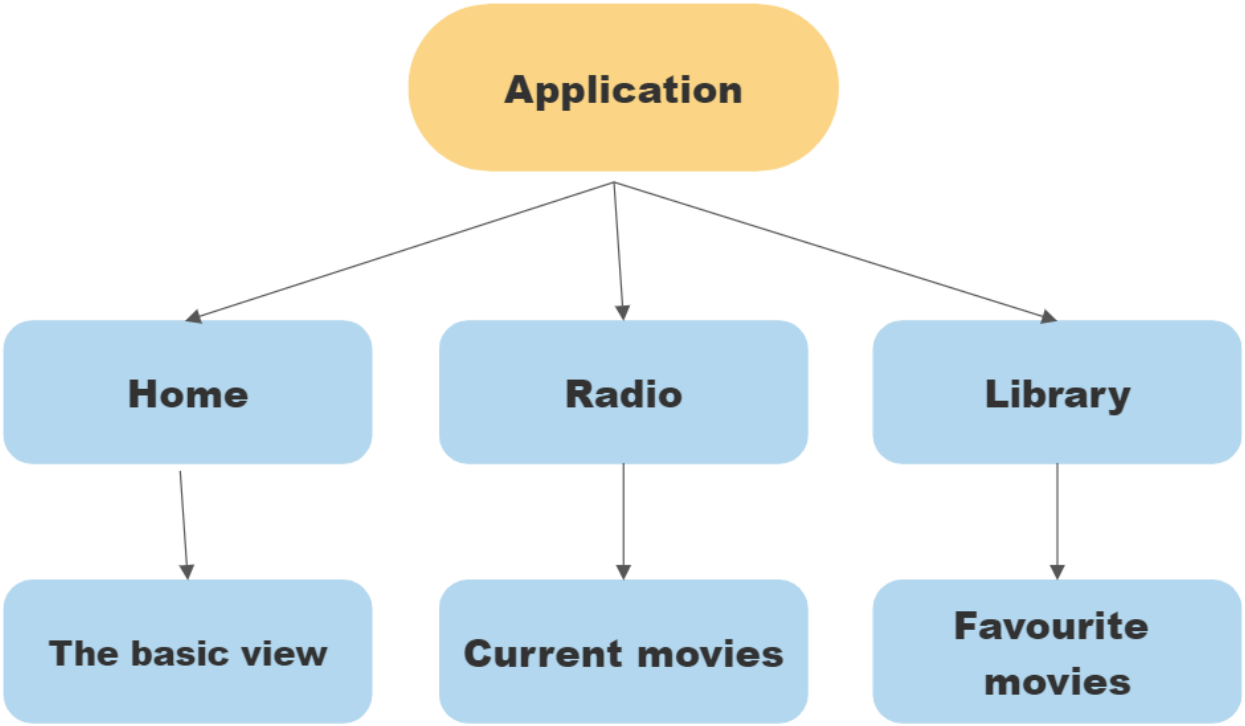
During the development of the Disney Compose app and the implementation of the proposed solution, several experimental investigations were conducted to assess the performance, usability, and effectiveness of the chosen technologies and libraries. The investigations aimed to validate the benefits and advantages of Jetpack Compose, along with the other tech stacks and open-source libraries used in the project. Here are some key areas that were investigated:

- Performance and Responsiveness: The app's performance and responsiveness were measured through various metrics, including UI rendering speed, smoothness of animations, and overall user experience. Extensive testing was conducted on different devices and emulator configurations to ensure that the app performed optimally across a range of scenarios.
- UI Design and Customization: The flexibility and ease of creating visually appealing and customized UIs using Jetpack Compose were investigated. Different UI components, layouts, and animations were experimented with to determine the best practices and optimal approaches for achieving desired visual effects.
- Data Fetching and Persistence: The efficiency of data fetching from the network API using Retrofit2 and OkHttp3, as well as the seamless integration of persisted data from Room Persistence, were examined. The investigations aimed to validate the reliability and performance of these components, ensuring smooth data retrieval and storage.

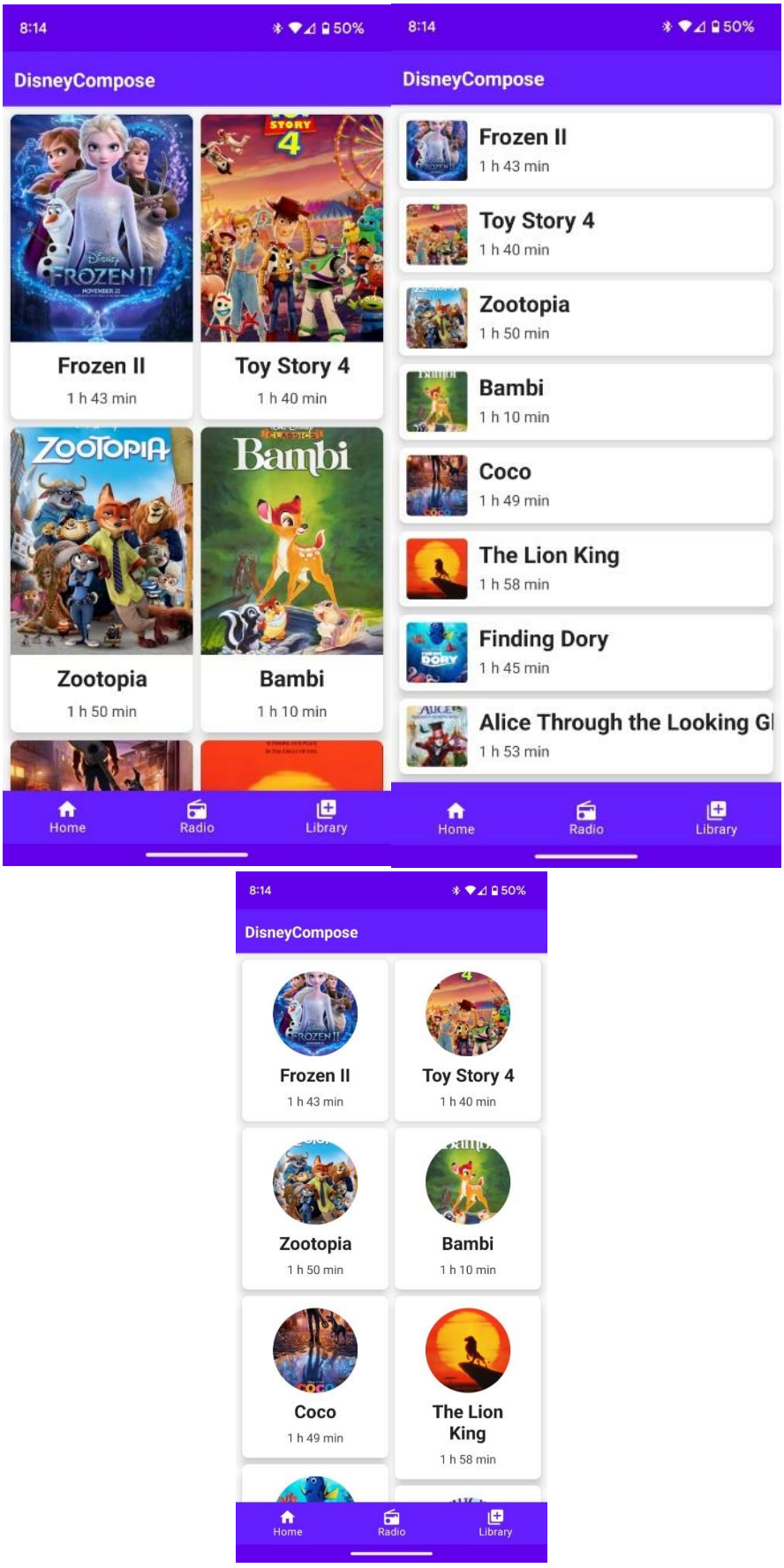
- Concurrency and Asynchronous Operations: The usage of Coroutines and Flow for handling asynchronous operations was thoroughly tested to ensure efficient and correct handling of concurrent tasks. The investigations focused on assessing the performance, reliability, and scalability of these concurrency models in different scenarios.
- Usability and User Experience: User testing and feedback collection were conducted to assess the usability and user experience of the app. This involved gathering feedback on the intuitiveness of the UI, the clarity of information presented, and the overall satisfaction of users interacting with the app.
- Compatibility and Device Variability: The app was tested on various Android devices, screen sizes, and resolutions to ensure compatibility and consistent behavior across different configurations. Device-specific issues were identified and addressed to deliver a smooth experience for users.

The experimental investigations played a crucial role in validating the proposed solution and identifying areas for improvement. The results of these investigations guided the fine-tuning of the app's functionality, performance optimizations, and UI enhancements, ensuring that the Disney Compose app provides a reliable, visually appealing, and user-friendly experience for its users.

5.


Application
Home
Radio
Library
The basic view
Current movies
Favourite movies

6.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50%
DisneyCompose
Frozen II
1 h 43 min
Toy Story 4
1 h 40 min
Zootopia
1 h 50 min
Bambi
1 h 10 min
Coco
1 h 49 min
The Lion King
1 h 58 min
Finding Dory
1 h 45 min
Alice Through the Looking Gl
1 h 53 min
Home
Radio
Library

7. Advantages and Disadvantages:

Advantages of the Proposed Solution:

- Jetpack Compose: Leveraging Jetpack Compose offers several advantages, including a declarative UI approach, simplified UI development, efficient UI updates, automatic state management, and improved code readability.
- MVVM Architecture: Implementing the MVVM architecture with a repository pattern promotes separation of concerns, maintainability, and testability of the codebase.
- Kotlin, Coroutines, and Flow: Utilizing Kotlin, Coroutines, and Flow provides a more concise and expressive language for asynchronous operations, making the codebase more efficient and readable.
- Hilt for Dependency Injection: Hilt simplifies dependency management, reduces boilerplate code, and improves code modularity, making it easier to maintain and test.
- Open-Source Libraries: Incorporating open-source libraries like Retrofit2, OkHttp3, Room Persistence, Accompanist, Landscapist, and others enhances functionality, saves development time, and improves the overall quality of the app.
- Material Design & Animations: Applying Material Design principles and animations enhances the visual appeal and user experience of the app, creating a modern and engaging interface.

Disadvantages of the Proposed Solution:

- Learning Curve: Jetpack Compose is a relatively new technology, which means developers may need to invest time in learning and adapting to its concepts and APIs.
- Compatibility: Jetpack Compose has a minimum SDK requirement of 21, which means the app may not be compatible with older Android devices running on lower SDK versions.
- Limited Third-Party Library Support: As Jetpack Compose is still evolving, there might be limitations in terms of available third-party libraries and

community support compared to the more established View-based frameworks.

- Migration Challenges: If migrating an existing project to Jetpack Compose, there may be challenges in adapting the codebase and refactoring existing UI components and logic to fit the Compose paradigm.
- Documentation and Resources: While the official documentation for Jetpack Compose is continually improving, developers may face occasional gaps in resources or examples for specific use cases.

8. Applications:

The Disney Compose app, with its modern Android tech stack, MVVM architecture, and Jetpack Compose-based UI, can be particularly well-suited for entertainment and media applications. The app's design and functionality can serve as a solid foundation for building apps focused on movies, TV shows, or other multimedia content. Some specific applications in this domain include:

- Movie Information and Discovery Apps: The Disney Compose app's ability to fetch data from a network API and display movie details can be extended to create comprehensive movie information and discovery platforms. Users can browse through a vast collection of movies, view details such as plot summaries, cast and crew information, ratings, and trailers, and discover new titles based on different genres, release dates, or popularity.
- Streaming Service Companion Apps: The app's UI components can be adapted to create companion apps for streaming services, providing users with a visually appealing interface to explore available movies and TV shows, manage their watchlist, receive recommendations, and access account-related features.
- Film Festival Apps: The Disney Compose app's architecture and UI can be leveraged to build film festival apps, offering schedules, screening details, and information about participating films, directors, and actors. Users can navigate through the festival program, create personalized itineraries, and get updates on screenings and events.

- Movie Review and Recommendation Apps: The app's integration with network APIs and its ability to display movie ratings and reviews make it suitable for creating movie review and recommendation platforms. Users can read and submit reviews, rate movies, and receive personalized recommendations based on their preferences.
- Cinema Booking Apps: The Disney Compose app's ability to fetch movie data and display showtimes can be utilized to create cinema booking apps. Users can search for movies playing at nearby theaters, view showtimes, select seats, and make bookings directly from the app.

9. Conclusion:

In conclusion, the development of the Disney Compose app using modern Android tech stacks, MVVM architecture, and Jetpack Compose has yielded a powerful and visually appealing solution for building entertainment and media applications. Through experimental investigations and analysis, several key findings have emerged:

- The adoption of Jetpack Compose, with its declarative UI approach and simplified UI development, offers significant advantages in terms of code readability, UI customization, and efficient UI updates. It provides a modern toolkit for creating engaging user interfaces.
- The MVVM architecture, coupled with the repository pattern, promotes separation of concerns, maintainability, and testability of the codebase. It enables a clear separation between UI logic and data operations.
- The use of Kotlin, Coroutines, and Flow for asynchronous operations enhances code conciseness and expressiveness, making the app more efficient and readable.
- Hilt for dependency injection simplifies dependency management and improves code modularity, leading to easier maintenance and testing.
- The integration of open-source libraries such as Retrofit2, OkHttp3, Room Persistence, Accompanist, Landscapist, and others enhances the functionality and quality of the app, providing additional features, networking capabilities, and UI enhancements.

Overall, the Disney Compose app demonstrates the potential of using Jetpack Compose and related technologies for building compelling applications in various domains, particularly entertainment and media. It showcases the advantages of modern Android development practices, including improved UI development, efficient data handling, and enhanced user experiences.

However, it's important to note that while the proposed solution offers numerous benefits, there are challenges to consider, such as the learning curve associated with Jetpack Compose and limited third-party library support. Additionally, compatibility issues with older Android devices running on lower SDK versions may arise.

Despite these challenges, the Disney Compose app serves as a solid foundation for developers looking to build innovative, visually appealing, and user-friendly applications. By leveraging the power of Jetpack Compose, MVVM architecture, and the featured open-source libraries, developers can create highly functional and engaging apps in various domains, providing users with seamless experiences and access to relevant information.

The findings from this project contribute to the advancement of modern Android app development practices and can guide future developers in creating exceptional applications using similar tech stacks and principles.

10. Future Scope:

While the Disney Compose app provides a solid foundation for entertainment and media applications, there are several areas where enhancements can be made in the future to further improve its functionality, user experience, and versatility. Here are some potential areas for future development:

- Enhanced Search and Filtering: Implement advanced search and filtering options to allow users to find movies based on various criteria such as genre, actors, release year, and more. This would provide a more personalized and targeted movie browsing experience.

- Additional APIs and Data Sources: Integrate additional APIs and data sources to expand the app's movie database and provide access to a wider range of movies and TV shows. This could include integrating popular streaming platforms' APIs to display availability and streaming information.
- Internationalization and Localization: Implement internationalization and localization features to support multiple languages and regional preferences, allowing users from different regions to access the app in their preferred language.

11. BIBILOGRAPHY

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Source Code is available on Git-hub.