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Development of Mobile Augmented Reality-Based Boarding House Search Application

Awanda Bintang Pamungkas, Ledy Elsera Astrianty
Universitas Teknologi Yogyakarta

ABSTRACT

This research focuses on developing a mobile application for boarding house search utilizing Augmented Reality (AR) technology. The application integrates AR features to provide an interactive and immersive experience, enabling users to visualize boarding houses in 3D and explore detailed information in real time. The ADDIE model was adopted as the development framework, encompassing Analysis, Design, Development, Implementation, and Evaluation phases. The application features include a 360-degree view, GPS navigation, real-time updates, and an intuitive user interface to enhance the boarding house search process. Black box testing results indicate that the system performs efficiently across key functionalities such as registration, login, navigation, and booking. The findings demonstrate the potential of AR technology to address challenges in property search, offering innovative solutions for both users and property owners. This study contributes to the advancement of AR-based applications in the housing sector, emphasizing their role in improving user satisfaction and decision-making.

Keywords: *Augmented Reality, Boarding House Search, Mobile Application, Real Estate Technology, 360-Degree View*

Corresponding author
Name: Awanda Bintang Pamungkas
Email: bintangpamungks45@gmail.com

INTRODUCTION

Augmented reality (AR) technology continues to develop rapidly and enables the integration of digital information, such as 3D models, images, and multimedia, into the user's real-world environment seamlessly (Gomes et al., 2016; Jamali et al., 2015). The development of mobile devices with advanced capabilities, such as high-resolution cameras, powerful processors, and extensive connectivity, has driven the widespread adoption of AR applications (Gomes et al., 2016). One promising application of mobile AR is in the field of information retrieval, where users can efficiently find and access information from large databases (Chandra et al., 2016).

The development of mobile AR-based information retrieval applications can provide various benefits to users. By presenting digital content overlaying a real-world environment, AR can enhance users' understanding and interaction with the information

being accessed (Pavlova et al., 2023). This is especially useful in situations where users need to quickly find and retrieve specific data or documents from large repositories (Schneider et al., 2019). In addition, the integration of AR technology can make the information retrieval process more intuitive and engaging, potentially increasing user satisfaction and productivity (Mendes et al., 2019).

This issue of the journal aims to explore recent advances and research in the development of mobile AR-based information retrieval applications. The articles presented will cover a wide range of topics, including technical challenges and solutions in the implementation of AR-based information retrieval, user experience and interaction design considerations, as well as potential applications and their impact in various fields (Alvaro-Tordesillas et al., 2019).

The articles in this issue will provide valuable insights and guidance for researchers, developers, and practitioners working on the integration of AR technologies into information retrieval applications. By showcasing the latest developments and best practices, this issue of the journal is expected to contribute to the advancement of mobile AR-based information retrieval solutions and encourage their widespread adoption (Okvi Nugroho, 2020).

METHOD

The ADDIE method is a widely recognized instructional design model that provides a structured approach to the development of education and training programs. The model consists of five main phases: Analysis, Design, Development, Implementation, and Evaluation (Leung et al., 2024; Moses Adeleke Adeoye et al., 2024; Park & Huffman, 2020)

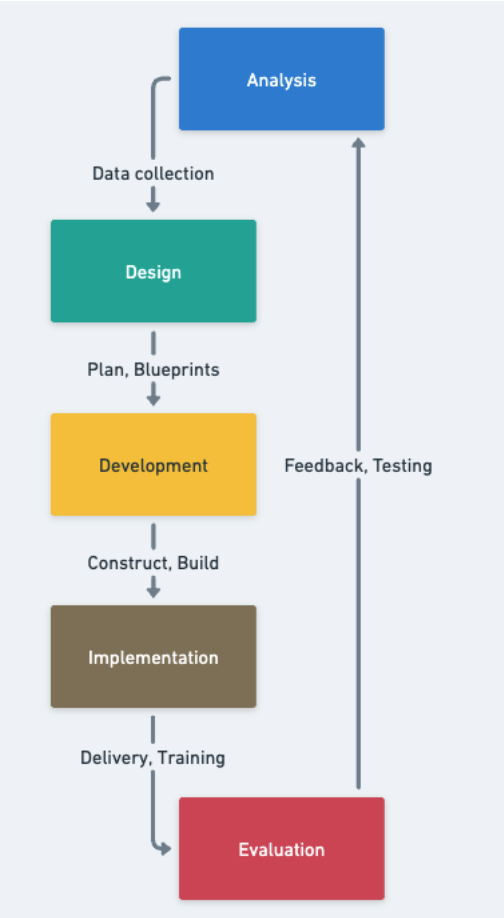

Figure 1 ADDIE Method

In the analysis phase, user needs, goals, knowledge, and skills are identified to determine the target audience, their preferences, and any constraints or limitations that may affect the development of the application. This phase ensures a thorough understanding of the end-users and their specific requirements. Additionally, it includes defining the learning objectives and the expected outcomes of the application to align the development process with clear and measurable goals (Leung et al., 2024; Moses Adeleke Adeoye et al., 2024; Park & Huffman, 2020). Moving to the design phase, a detailed plan is created, involving the selection of appropriate learning strategies, user activities, and evaluation methods to achieve the set objectives. This phase also includes the development of a framework or storyboard that outlines the flow and structure of the application, providing a clear blueprint for subsequent phases (Leung et al., 2024; Moses Adeleke Adeoye et al., 2024; Park & Huffman, 2020).

The development phase focuses on transforming the design blueprint into tangible outputs by creating materials, multimedia elements, and interactive features within the application. This includes rigorous testing to ensure the quality and effectiveness of the developed components before deployment (Leung et al., 2024; Moses

Adeleke Adeoye et al., 2024; Park & Huffman, 2020). The implementation phase marks the delivery of the final product to the intended users. This involves launching the application and providing necessary technical support to enhance the user experience and ensure smooth adoption (Leung et al., 2024; Moses Adeleke Adeoye et al., 2024; Park & Huffman, 2020). Finally, the evaluation phase assesses the overall effectiveness of the application in achieving its predetermined objectives. This includes both formative and summative evaluations, where data on performance, user satisfaction, and the application's impact are analyzed to identify areas for improvement and inform future developments (Leung et al., 2024; Moses Adeleke Adeoye et al., 2024; Park & Huffman, 2020).

FINDING AND DISCUSSION

Analysis

In the analysis stage of the proposed system, system requirements are identified based on two main categories, namely functional and non-functional requirements. This analysis aims to ensure that the system can meet user needs effectively and efficiently. In addition, various visual tools such as flowcharts, activity diagrams, and use case diagrams are used to comprehensively describe the process flow and interactions in the system. Flowcharts are used to show the steps in the boarding house search process, activity diagrams describe user and system activities in more detail, while use case diagrams facilitate understanding of the interactions between actors and the system.

This approach provides a clear framework in understanding and describing the core features to be developed, ensuring the system can provide an optimal solution to user needs. Each requirement in the functional category, such as input, process, and output, is identified and designed to support a seamless user experience. In addition, non-functional requirements are also considered to ensure the security, reliability, and scalability of the system.

Design

In the design stage, researchers visualize the process flow of mobile-based property search applications with Augmented Reality (AR) features through flowcharts. This diagram provides a systematic overview of the steps taken by the user, starting from opening the application to getting property information or contacting the owner. The process begins when the user opens the application and selects the “Search” option on the main screen. After that, the user can specify the desired location. If the selected location is invalid, the system will prompt the user to re-enter the location. Once the location is validated, the app displays a list of properties in the area using an interactive AR display. The user can select a property to view its details or return to the property list if they wish to continue searching. The process ends when the user successfully obtains property information or contacts the owner according to their needs.

This flowchart is designed to provide a clear understanding of the application process flow, including user input, data processing, and system output. In the context of this research, flowcharts not only serve as a visual communication tool, but also a guide for developers in designing and implementing system logic in a structured manner. Using

this diagram, the steps involved in the AR-based boarding house search process can be outlined in detail and consistently, thus ensuring an optimal and efficient user experience. Before discussing more about the flowchart used, here is a general description of the process flow represented by the diagram.

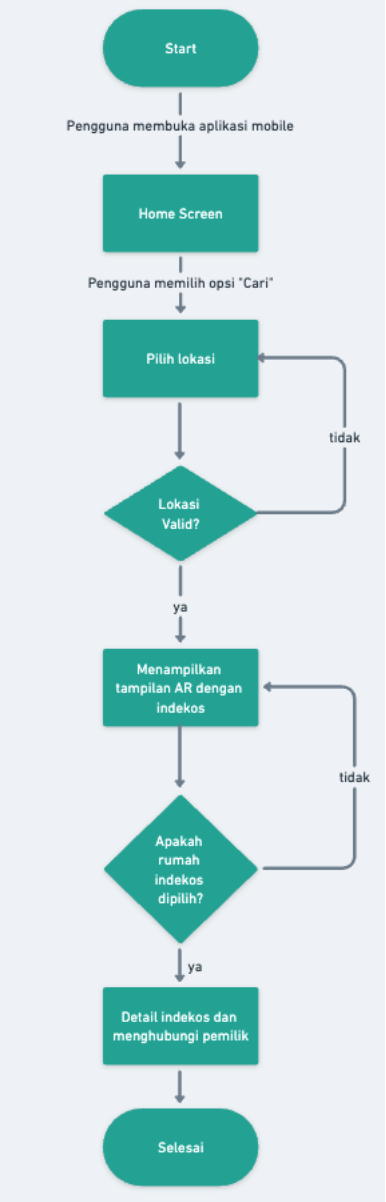

Figure 2 Flowchart Design

Development

The development stage is an important phase in system development, where the design that has been made in the previous stage is implemented through writing program code. At this stage, developers use various programming languages and frameworks to

realize the functionality of the application according to the needs and objectives of the research. The main focus in this stage is to build program logic that integrates the user interface with the system backend, as well as implementing key features such as boarding house search, AR visualization, and navigation system. In addition, this development involves initial testing to ensure the functionality runs according to specifications and meets quality standards.

This stage aims to produce an augmented reality based boarding house search application that is able to provide an interactive and efficient user experience. In this research, the development process includes steps to write code, integrate features, and test development results in stages. Before explaining the pieces of code that have been generated, here is a general description of the development approach applied in this study to realize the designed application.

Figure 3 The AI 360 feature display for viewing boarding houses

The 360-degree feature provides an interactive experience for users by allowing them to view the entire boarding room virtually. Users can explore every corner of the room and its surrounding areas, giving them a clearer picture of the room's condition without having to visit the location in person. This is especially helpful for those looking for boarding houses in distant locations or those with limited time to make a direct visit.

With this 360-degree view, users can assess the comfort and condition of the room in greater detail. This virtual experience makes it easier to observe the available amenities, from furniture and lighting to the cleanliness of the space, which is essential

when making a decision about choosing a boarding house. This feature also reduces the uncertainty that often arises when viewing photos or descriptions of boarding houses that may not be entirely accurate, providing users with greater confidence in their choice of residence.

Implementation

The implementation stage is an important phase in the development of a mobile augmented reality (AR) based boarding house search application, where all elements that have been designed and developed previously are applied into a system that is ready to be used by users. At this stage, the app is launched onto distribution platforms such as the Google Play Store and Apple App Store, enabling wide accessibility for potential users. The implementation process also includes integration with the boarding house data provider platform, so that relevant information can be accessed in real-time through the app.

Implementation steps included final testing to ensure app stability, setting up a secure online payment system, as well as training for boarding house owners in utilizing the app's features to simplify the rental process. In addition, an effective marketing strategy was implemented to increase user awareness and acceptance of the new app. By prioritizing the quality of the AR technology used, the implementation phase aims to ensure the app not only functions properly, but also provides an optimal experience for users in finding and renting boarding houses.

Evaluation

The evaluation phase is the last step in the ADDIE method which has a crucial role in ensuring the success of the development of the mobile augmented reality (AR) based boarding house search application. In this phase, a thorough assessment of the application's performance is carried out to evaluate the extent to which the predetermined objectives are achieved. This evaluation includes an in-depth analysis of the efficiency of AR technology, the accuracy of search results, and the convenience of using the application by users.

Evaluation data is collected through various methods, such as user satisfaction surveys, app reviews, and statistical analysis of feature usage patterns. The feedback obtained becomes the basis for identifying areas that require improvement as well as opportunities for further development. This evaluation process aims not only to measure the success of the application, but also to provide valuable insights to improve the quality and relevance of the application on an ongoing basis, so that it can continue to meet user needs in the long term.

The discussion of the results of this study uses black box testing, which is a test conducted to test or observe whether the software inputs and outputs have functioned as expected as shown in Table 1.

Table 1: Black Box Testing

NO	ACTIVITY	CASE	EXPECTATION Of RESULTS	TESTING RESULTS	DESCRIPTION
1	User Registration	Valid data input (Full Name, Email, Password, etc.)	User account created and confirmation displayed	User is successfully registered and confirmation is displayed	Successful
2	User Registration	Invalid data input (e.g. empty fields)	Registration failed, error message displayed	Error messages appear as expected	Successful
3	User Login	Correct credential input	User successfully logs in	User successfully logs in	Successful
4	User Login	Incorrect credential input	Login fails with error message	Error message displayed	Successful
5	Dashboard Navigation	Selecting a district	Relevant results displayed	Results are displayed according to the selected district	Successful
6	Ordering Function	Make a reservation at the boarding house	Booking confirmation displayed	Booking confirmed successfully	Successful
7	Saved Item Management	Saving boarding house listings	Boarding house listing saved to “Saved Items”	Boarding house saved successfully	Successful
8	Saved Item Management	Search for saved items	Relevant items are displayed	Items are displayed as searched	Successful
9	Profile Management	Update profile information	Profile changes are saved and displayed	Profile updated successfully	Successful
10	Logout	User selects the log out option	User logs out and is redirected to the login page	User successfully logged out	Successful

The test results of the mobile augmented reality-based boarding house search application show that the system successfully handles various activities well.

1. User Registration: The system successfully accepted valid inputs and rejected inappropriate inputs. The re-registration and email confirmation process works well.
2. User Login: The system handles correct credentials well and provides clear error messages for incorrect credentials. The password mask feature works effectively.
3. Dashboard Navigation: The system displays boarding house information well, including search and filter features that work as expected.
4. Ordering Function: Ordering runs smoothly, with accurate and successfully saved order data.
5. Saved Item Management: Users can save and manage favorite lists easily and the system successfully displays saved items.
6. Profile Management: The system stores and updates user information securely, as expected.
7. Logout: The logout process was successful without leaving any traces of sensitive data or active sessions.

DISCUSSION

The 360-degree Augmented Reality (AR)-based boarding house search system is a technological breakthrough that offers an efficient solution for people in finding temporary housing. With 3D AR visualization features that allow users to view properties immersively, this system changes the traditional way of finding a boarding house. The use of AR technology in a mobile platform simplifies the search by providing a clearer and more realistic picture of the condition of the boarding houses on offer. This not only improves the user experience, but also reduces information inaccuracies that often occur in conventional housing searches. This system is an answer to the challenges faced by boarding house seekers who often find it difficult to get an accurate picture of the residence they are interested in.

In addition, the implementation of additional features such as GPS navigation and user ratings increases convenience and confidence in making decisions. Users can access real-time information and get direct feedback from other users about their experience at the hostel. This provides a competitive advantage over conventional boarding house search systems that rely solely on photos or descriptions that may not always reflect actual conditions. The search and favorite features also make it easier for users to choose a boarding house that suits their preferences, making the process of finding a boarding house easier.

From an operational standpoint, the system is not only beneficial for boarding house seekers, but also for boarding house owners. The integration of online payment and digital order management allows owners to manage their operations more efficiently, reduce the possibility of errors, and improve service speed. With compatibility on various types of mobile devices, the system also ensures wide accessibility for the community. In the future, the development of AR technology can enrich the features of this system,

allowing adaptation to the changing needs of users as well as the development of the boarding house industry. Thus, the 360-degree AR-based boarding house search system has the potential to become the main platform in a more transparent, efficient, and interactive housing search.

CONCLUSION

A 360-degree Augmented Reality-based boarding house search system provides an innovative solution to the needs of modern society in finding temporary housing. By integrating 360-degree AR technology into a mobile platform, the system offers an interactive and immersive experience for users in searching and selecting a boarding house. Featured features such as 3D AR visualization, GPS navigation, user ratings, and direct communication with boarding house owners ensure convenience and ease of decision-making. The implementation of this system addresses the problem of inaccurate information by providing real-time and up-to-date data through AR, giving a clear picture of the condition and facilities of the boarding house.

The system also improves operational efficiency for boarding house owners with online payment integration and digital order management features. Designed to be compatible with a wide range of smartphones and tablets, the system ensures its availability to a wide range of people. The search and favorite features allow users to make decisions more quickly and efficiently. The development of this system also has the potential to increase the transparency of the boarding house market through a platform for reviews and ratings from other users. In the future, with the development of AR technology, the system is ready to adapt and update its features, ensuring readiness to face challenges in the boarding house industry.

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