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DEVELOPMENT AND EVALUATION OF AUGMENTED REALITY IN INTRODUCING TRADITIONAL MALAY HOUSES IN MALACCA FOR TOURISM



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SITI NUR FARAH NATASHA BINTI AZHAR

SULTAN IDRIS EDUCATION UNIVERSITY

2025



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DEVELOPMENT AND EVALUATION OF AUGMENTED REALITY IN
INTRODUCING TRADITIONAL MALAY HOUSES IN
MALACCA FOR TOURISM

SITI NUR FARAH NATASHA BINTI AZHAR

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FACULTY OF COMPUTING AND META-TECHNOLOGY
SULTAN IDRIS EDUCATION UNIVERSITY

2025



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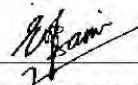
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ABSTRACT

Tourism is a cornerstone of economic development, with cultural heritage serving as a key driver of sustainable tourism. Malacca, a UNESCO World Heritage Site in Malaysia, is home to rich traditions and historical assets, including traditional Malay houses. However, their preservation faces significant challenges due to urbanization, reduced accessibility, and low public awareness about their importance. This study aims to develop and evaluate Exp AR: Malacca, an augmented reality (AR) application designed to promote and preserve the cultural and historical significance of traditional Malay houses in Malacca. Using the ADDIE instructional design model with a case study approach, the application was created with interactive 3D models and immersive features and deployed alongside a physical map. Qualitative data were collected through interviews and observations involving nine participants, namely two industry experts, two local residents, and five tourists. Thematic analysis revealed that Exp AR: Malacca enhanced user engagement, educational value, and overall satisfaction. These findings demonstrate the application's effectiveness in enriching the cultural tourism experience and fostering deeper appreciation of Malacca's heritage, effectively bridging the gap between modern digital tools and cultural preservation. The implications of this study include sustainable tourism development and the implementation of innovative digital media in heritage management, ensuring that traditional Malay houses remain valuable and accessible to future generations.

PEMBANGUNAN DAN PENILAIAN REALITI TERIMBUH DALAM MEMPERKENALKAN RUMAH TRADISIONAL MELAYU DI MELAKA UNTUK PELANCONGAN

ABSTRAK

Pelancongan merupakan asas kepada pembangunan ekonomi, dengan warisan budaya berfungsi sebagai pemacu utama pelancongan lestari. Melaka, sebuah Tapak Warisan Dunia UNESCO di Malaysia, adalah rumah kepada tradisi yang kaya dan aset bersejarah, termasuk rumah tradisional Melayu. Walau bagaimanapun, pemeliharaan mereka menghadapi cabaran yang besar disebabkan oleh urbanisasi, kebolehcapaian yang berkurangan, dan kesedaran awam yang rendah tentang kepentingan mereka. Kajian ini bertujuan untuk membangun dan menilai *Exp AR: Malacca*, sebuah aplikasi realiti terimbu (AR) yang dicipta untuk mempromosi dan memelihara kepentingan budaya dan sejarah rumah tradisional Melayu di Melaka. Menggunakan model reka bentuk pengajaran ADDIE dengan pendekatan kajian kes, aplikasi ini dicipta dengan model 3D interaktif dan ciri-ciri imersif serta digunakan bersama-sama dengan peta fizikal. Data kualitatif dikumpul melalui temu bual dan pemerhatian yang melibatkan sembilan peserta, iaitu dua pakar industri, dua penduduk tempatan, dan lima pelancong. Analisis tematik mendedahkan bahawa *Exp AR: Malacca* meningkatkan penglibatan pengguna, nilai pendidikan, dan kepuasan keseluruhan. Dapatan ini menunjukkan keberkesanan aplikasi dalam memperkaya pengalaman pelancongan budaya dan memupuk penghargaan yang lebih mendalam terhadap warisan Melaka yang secara berkesan merapatkan jurang antara alat digital moden dan pemeliharaan budaya. Implikasi kajian ini termasuk pembangunan pelancongan lestari dan pelaksanaan media digital yang inovatif dalam pengurusan warisan yang memastikan rumah tradisional Melayu kekal berharga dan mudah dicapai untuk generasi akan datang.

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LIST OF ABBREVIATIONS

3D	Three Dimensional
AR	Augmented Reality
GDP	Gross Domestic Product
QR	Quick Response
TAP	Think Aloud Protocol
VR	Virtual Reality

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Tourism plays a crucial role in Malacca's economy, making a substantial contribution to its Gross Domestic Product (GDP). Despite their distinctiveness, traditional Malay houses remain relatively unfamiliar to tourists. Therefore, introducing tourists to these architectural gems becomes essential for promoting cultural tourism in Malaysia, especially Malacca. This research aims to explore the potential of augmented reality (AR) in introducing traditional Malay houses in Malacca, enhancing the overall tourism experience.

1.2 Background Research

Heritage culture supports the destination's economic, social, and environmental growth as well as the protection and promotion of cultural assets, tourism is a significant segment of the tourist industry (Jung et al., 2018; Brooks et al., 2023). However, cultural heritage tourism also faces some challenges, such as natural decay, limited accessibility, and insufficient engagement for tourists (Sevim & Çalışkan, 2021). This include the traditional Malay houses in Malacca, which is the focus of this study.

Traditional Malay houses in Malacca are significant due to their rich cultural heritage, reflecting the diverse influences of Malay, Chinese, Indian, and European cultures (Noh & Imron, 2025). These houses embody Malacca's historical role as a crucial trading port in Southeast Asia, making them important historical landmarks. Architecturally, they showcase a unique fusion of styles, combining elements like the elevated floor and steep roof of the Malay "*rumah kampung*" with Chinese materials such as timber and tiles. These houses, recognized as part of a UNESCO World Heritage Site, possess significant global cultural and historical importance. They attract both tourists and locals, serving as tangible symbols of Malacca's rich history and multicultural identity. This blend of historical significance and architectural fusion makes the traditional houses particularly emblematic of Malaysia's diverse heritage. Hence, this is when AR comes into play.

AR enhances real-world environments by integrating digital overlays such as information and images, creating an immersive and engaging user experience. As stated by

Liu et al. (2023), by blending vivid visuals and evocative mental imagery, AR amplifies immersion in cultural storytelling. It has found widespread application across diverse domains, including education, entertainment, health, and tourism. Specifically, AR has been harnessed in cultural heritage tourism — a form of travel that involves exploring historical and cultural sites, artifacts, and traditions of a destination (Fadli et al., 2022).

An important factor in the success of AR applications in tourism is usability — the ease with which users could interact with the system to achieve their goals effectively and satisfactorily. In the context of cultural heritage, high usability ensures that tourists could navigate and engage with the AR content intuitively, without technical difficulties (Cheng & Qian, 2025). This leads to a more immersive, informative, and enjoyable experience.

For applications like Exp AR: Malacca, good usability should not only enhance tourist satisfaction but also supports better learning outcomes by allowing users to focus on cultural content without being hindered by interface issues.

The technology addresses some of these challenges by providing a novel and innovative way of introducing and showcasing the cultural heritage to the tourists (Unal et al., 2021; Hanji et al., 2023). AR could also enhance the tourist experience by adding digital layers of information and images to the real-world view of the cultural heritage, such as historical facts, stories, legends, or 3D models. Additionally, AR could increase the accessibility and information for the tourists by allowing them to explore and learn about the cultural heritage at their own pace and preference, using their own devices, such as smartphones or tablets (Richardson, 2024). AR has shown to improve the engagement and

learning outcomes for the tourists by creating a realistic and immersive environment that stimulates their senses, emotions, and cognition (Geroimenko, 2021).

A lot of researches has shown AR could provide a balanced, engaging, and cost-effective solution for introducing Malacca's traditional Malay houses to tourists. Unlike VR, which often separates users from real-world experiences, or traditional methods that fail to capture attention in an increasingly digital age, AR integrates historical richness with modern interactivity. Its accessibility, sustainability, and scalability make it an ideal tool for promoting cultural heritage while preserving the authenticity and legacy of Malacca's unique architectural treasures.

1.3 Problem Statement

The study intends to address the low level of awareness and appreciation of the traditional Malay houses among the tourists who visit Malacca. Traditional Malay houses in Malacca are an important part of the cultural heritage of Malaysia, as they reflect the diversity and richness of the Malay culture and architecture across the states. However, due to various factors, such as urbanization, modernization, and environmental degradation, many of these houses are at risk of deterioration or disappearance (Saedon, 2022). Moreover, many of these houses are not easily accessible or visible to the tourists, as they are located in rural or remote areas, or hidden by the modern buildings (Azzran, 2021). Furthermore, many of these houses lack sufficient information or interpretation for the tourists, as they

rely on traditional methods, such as brochures, guides, or signs, which are often outdated, incomplete, or inaccurate. As a result, many tourists are unaware or uninterested in the traditional Malay houses, and miss the opportunity to explore and learn about the historical and cultural values of these houses (Sulaiman, 2017).

This problem is relevant and significant to the field of cultural heritage tourism, as it affects the economic, social, and environmental development of the destination, as well as the preservation and promotion of the cultural heritage (Said et al., 2017). If the problem persists, it may lead to the loss or damage of the traditional Malay houses, the decline or dissatisfaction of the tourist demand, and the erosion or distortion of the cultural identity and diversity of Malaysia. The problem also creates a gap or need for a novel and innovative way of introducing and showcasing the traditional Malay houses to the tourists, which could overcome the limitations and challenges of the traditional methods, and enhance the tourist experience and the promotion of the traditional Malay houses (Ramele & Wongso, 2021).

This is where AR technology comes in, as it could provide a realistic and immersive experience for the tourists, by adding digital layers of information and images to the real-world view of the traditional Malay houses, such as historical facts, stories, legends, or 3D models (Elshahawy et al., 2023; Basheer et al., 2023). AR technology could also increase the accessibility and information for the tourists, by allowing them to explore and learn about the traditional Malay houses at their own pace and preference, using their own devices, such as smartphones or tablets (Mohanty, 2020). Additionally, AR technology



improve the engagement and learning outcomes for the tourists, by creating a fun and interactive environment that stimulates their senses, emotions, and cognition through immersive learning (Mokmin et al., 2023).

Therefore, this study aims to address the problem by implementing AR to introduce Malacca's traditional Malay houses for tourism, and by evaluating the usability of AR on the tourist experience and the promotion of traditional Malay houses in Malacca.

1.4 Research Objectives

The research objectives (RO) of this study are:



RO1: To explore users' experiences with AR technology, such as educational value and satisfaction.

RO2: To develop an AR application to promote traditional Malay houses in Malacca for tourism purposes.

RO3: To assess the usability of the AR application, such as architectural presentation and interactive features, in showcasing traditional Malay houses in Malacca.



1.5 Research Questions

The research questions (RQ) of this study are:

RQ1: How does the use of AR technology influence the users' past experiences, such as educational value and satisfaction?

RQ2: How was the AR application developed to promote traditional Malay houses in Malacca for tourism purposes?

RQ3: How does the usability of the AR application, such as architectural presentation and interactive features, contribute in showcasing traditional Malay houses in Malacca?

1.6 Operational Definition

This study employs several key operational definitions to ensure clarity and alignment with its objectives. Augmented Reality (AR) is a technology that superimposes digital content—such as images, sounds, or data—onto the real-world environment in real time. Within the context of this research, AR specifically involves the use of devices like smartphones to enhance tourists' interaction with and perception of traditional Malay houses in Malacca. By integrating additional layers of information and creating immersive experiences, AR serves as the primary tool for introducing and promoting these cultural landmarks.

Cultural authenticity, as defined in this study, is the accurate representation and preservation of genuine cultural elements, traditions, and practices. It emphasizes maintaining the integrity of traditional Malay houses by preventing their distortion or misrepresentation. Furthermore, cultural authenticity seeks to safeguard these heritage assets against commodification, ensuring that the portrayal of traditional Malay houses remains an authentic celebration of the region's diverse heritage.

The term heritage in this study pertains to the cultural, natural, and architectural assets passed down from previous generations that hold significance for present and future communities. Specifically, this research focuses on the cultural and architectural aspects of traditional Malay houses, which are invaluable representatives of Malaysia's historical and cultural identity. These houses embody unique designs and construction techniques, offering insight into the nation's past while contributing to its cultural landscape.

Tourism, is the activity of people traveling to and staying in locations away from their usual surroundings for leisure, recreation, or business. In the context of this study, tourism encompasses the exploration and appreciation of traditional Malay houses in Malacca. By engaging tourists with these cultural assets, this research aims to enhance their understanding and appreciation of Malaysia's heritage while contributing to the growth of the local tourism industry.

Next, usability in this study refers to the ease of use, efficiency, and satisfaction experienced by users when interacting with the AR application, Exp AR: Malacca. It

encompasses how effectively tourists could understand the features and access cultural content related to traditional Malay houses. Usability also involves the application's intuitiveness, responsiveness, and overall ability to support meaningful and engaging learning experiences. This definition is critical in evaluating how the AR technology enhances user engagement and educational outcomes within the context of cultural heritage tourism.

Finally, the term traditional in this research denotes practices, objects, or architectural styles that have been passed down through generations within the Malay cultural context. It includes elements such as design features, construction techniques, and cultural practices associated with traditional Malay houses, ensuring that these elements are highlighted and preserved in the promotional efforts facilitated by AR technology.

1.7 Study Limitations

AR technology has a positive and significant impact on the cultural heritage tourism, and that there is a growing interest and demand for AR applications in this field. However, some gaps and limitations were encountered during the research:

i. Technological Constraints:

The success of the proposed research is dependent on the accessibility and practicality of AR technology. Technical limitations, such as device compatibility, network connectivity,

and hardware requirements, may have an impact on implementation and user experience (Buhalis & Sinarta, 2019).

ii. Cultural Sensitivity:

Traditional Malay houses are culturally and historically valuable. The research may face issues relating to cultural sensitivity and the need to balance technological advancements with cultural authenticity.

iii. Sample Representativity:

The sample population's representativeness may influence the research's findings. A broad sample of industry experts, local residents, and tourists is necessary to obtain reliable and generalizable results.

iv. Time Constraints:

The research timeline that needs to be completed within one year was challenging as the approval from authorities and samples took some time.

v. Lack of Comprehensive Historical Documentation:

The study faced limitations due to insufficient or fragmented historical records and documentation on certain traditional Malay houses in Malacca. This lack of detailed information hindered the accurate development of AR content, such as architectural reconstructions and cultural narratives, potentially affecting the depth and authenticity of the user experience provided by the application.

1.8 Importance of Research

This research is critical as it explores into the strategic use of AR technology to enhance cultural tourism in Malacca. As stated before, the traditional Malay houses are threatened into deterioration or disappearance. The study intends to boost the tourism experience by analyzing how AR might immerse tourists in traditional Malay houses, generating greater respect for Malacca's rich cultural identity. Beyond its immediate impacts, the study is expected to make a substantial contribution to the development of Malacca's tourism industry, providing insights that could attract a larger audience and encourage economic growth.

Most importantly, this study recognizes the delicate balance between technological advancement and the preservation of cultural heritage, as there are concerns about balancing technological advancement and preservation of cultural authenticity (Mendoza et al, 2023). Traditional Malay houses represent historical and cultural richness, and the research aims to employ AR not only to attract tourists, but also as a dynamic instrument for cultural preservation. The research envisions using AR to document and enhance cultural narratives, ensuring Malacca's cultural heritage is preserved for present and future generations. Finally, this research serves as a connection between technological advancement and the preservation of cultural authenticity, resulting in a more sustainable and enriched Malacca's cultural tourism scene.

1.9 Summary

Chapter 1 lays the groundwork for this study, emphasizing the potential of AR technology in promoting and preserving the cultural heritage of traditional Malay houses in Malacca. It highlights the critical role of tourism in economic development and the importance of integrating innovative approaches to enhance visitor engagement and appreciation for cultural heritage. Despite the rich history and architectural value of traditional Malay houses, challenges such as limited awareness, urbanization, and inadequate accessibility have hindered their prominence as cultural tourism assets.

The chapter introduces AR as a transformative tool that addresses these challenges by providing immersive, engaging, and context-rich experiences for tourists. Unlike traditional methods, AR overlays digital content onto real-world environments, offering a dynamic and interactive way to explore and learn about cultural heritage. This study aims to investigate the usability of AR in showcasing these architectural treasures, emphasizing its role in promoting cultural appreciation and sustaining Malacca's heritage tourism. By outlining the research objectives, questions, and operational definitions, this chapter sets the stage for exploring how AR could bridge the gap between technological advancement and the preservation of cultural authenticity.