

Application of Interactive Games on Tourism Objects Based on Augmented Reality Gamification

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ABSTRACT

The development of information technology is always growing rapidly, especially in the field of android smartphones. Android smartphones can now be obtained at a fairly affordable price. With rapid development, there are so many innovations that can be developed by the smartphone itself, even the tourism sector such as The Sila's Agrotourism can get the impact of several innovations that exist along with the times such as Augmented Reality. In this research, the author uses two augmented reality methods, namely Marker Based Tracker and also Markerless. Where Marker based tracker is a method that uses image illustrations in the form of QR codes or special logos to identify an object in the Augmented Reality application. While Markerless is a method that does not require a marker or image to display the object. So that this research produces an augmented reality game using the marker-based tracker method and also markerless which takes the GPS tracker method as its markerless method. This test uses 3 tests, namely Blackbox testing, Response Time testing and also User Experience Questioner (UEQ). Where the UEQ results filled in by 35 respondents get results above average (Excellent). So that it shows that this game is good and as expected.

Keywords: Augmented Reality; Marker Based Tracker; Markerless; Gamification AR

1. INTRODUCTION

Bali is one of the provinces in Indonesia that is known by the world for its tourism . The beauty of the area is very admired by tourists both domestically and abroad so it is not surprising that Bali's biggest financial income is in its tourism prospects (Koerniawati, 2022; Prena & Baru, 2022; Yudhiantara et al., 2023). But as we know that the tourism sector in Bali is very dependent on its natural beauty. Here I want to provide innovation in the field of tourism by combining it with the field of technology. With the development of technology as it is today, it is undeniable that the tourism sector can also benefit from technological developments (Fahri, 2022; Yudhiantara et al., 2019), one of which is The Sila's Agrotourism. The Sila's Agrotourism is one of the tourist attractions in Bali which is very well known by tourists both at home and abroad for the beauty of its destinations (Komalasari et al., 2020).

The Sila's Agrotourism is one of the attractions that provides tourist destinations by combining adventure and education. The Sila's Agrotourism is located at Banjar. Batusesa, Village. Candikuning, District. Baturiti, Regency. Tabanan Bali which has been established since 10 years ago precisely in October 2012. The Sila's Agrotourism always develops contemporary rides that they have such as: Cycling, ATV (All Train Vehicle), Flying Fox, Paintball, Horse Riding, Kid's Zone, Ferris wheel, Archery, and many more so there is no doubt that The Sila's Agrotourism is one of the best choices to be a tourist attraction.

The development of information technology is always growing rapidly, especially in the field of smartphones. Smartphones can currently be obtained at a fairly affordable price (Hasyim et al., 2023; Tutik & Rosadi, 2022). With rapid development, there are so many innovations that can be developed by the smartphone itself , even the tourism sector can get the impact of several innovations that exist along with the times. An example is an interactive android game using advanced Augmented Reality (AR) technology with different features such as combining virtual objects into the real environment or our environment (Aditama et al., 2023; Sudipa et al., 2022). Augmented Reality itself aims to give a real impression on an object by using 3-dimensional digital media so that we as users can also interact with the 3-dimensional interactive game. For now there are 3 types of operating systems from the smartphone itself,

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one of which is android (Aristana et al., 2024; Lubis et al., 2022). Android is an operating system (OS) that is generally often used on mobile devices, especially smartphones. In addition, android is also free open source so that users are free to develop the operating system (Riyanti et al., 2024; Rohman & Subarkah, 2024) .

There are research objectives that can later be utilized by The Sila's Agrotourism to be used as a new innovation in the field of tourism combined with the field of technology with the concept of android games that use augmented reality technology. So that people or tourists are interested in this new innovation and experience. The research implication is that it can provide new innovations to attract more prospective tourists to visit The Sila's Agrotourism.

2. LITERATURE REVIEW

Augmented reality (AR) gamification has emerged as a promising approach to enhance tourism experiences by engaging users at a deeper level and improving their overall experiences of a destination (Woods, 2020). Location-based AR games have shown potential in transforming tourism marketing, although their adoption in the tourism sector remains limited (Lacka, 2018; Ramli et al., 2022). AR applications in tourism often utilize real-object tracking, such as using images as markers like brochures or information boards (Meily et al., 2021). These applications aim to make it easier for tourists to interact with destinations through interactive media (Fitriani et al., 2022).

The integration of virtual and augmented reality in serious tourism games presents opportunities to enhance tourist motives and experiences, impacting their perceptions and behaviors towards a destination. (Triantafillidou & Lappas, 2022). Gamification, when applied in tourism contexts using AR, geocaching, and GPS-based applications, can significantly contribute to engaging tourists and providing interactive experiences (Widarti et al., 2020). Furthermore, the use of AR and gamification in the tourism industry not only imparts knowledge but also enhances the learning experience by providing realistic contexts and reconstructions of events (Panhale et al., 2023).

The gamification of tourism has the potential to increase brand awareness, loyalty to destinations, and overall satisfaction among tourists (Gupta et al., 2020; Rallis et al., 2021). By incorporating game design elements, gamified applications can offer meaningful interactions and rewarding experiences to users. Additionally, the adoption of gamification and smart tourism in the industry aims to shift tourist behavior towards sustainability, emphasizing the importance of customer adoption patterns and perceptions during the process (Sirat et al., 2023; Yoo et al., 2017).

The application of interactive games based on AR gamification in tourism holds significant promise for transforming tourism experiences, engaging users, and enhancing their interactions with destinations. By leveraging AR technology, gamification elements, and location-based features, tourism stakeholders can create immersive and interactive experiences that cater to the evolving preferences of modern tourists.

3. METHOD

Markerless Augmented Reality

In this markerless augmented reality method, users no longer need to use markers to display digital data data (Oufqir et al., 2020). Qualcomm has provided tools for the development of augmented reality based on the device itself, with the tools provided can make it easier for developers to create applications without markers (Pooja et al., 2020).

Marker Based Tracking

Marker Based tracking is one of the methods in Augmented Reality (AR) technology. In general, this method uses image illustrations in the form of QR codes or special logos to identify an object in the Augmented Reality (AR) application (Kanko et al., 2021). This marker-based tracking method was chosen in this research because of its suitability in the recognition of 3-dimensional objects which require stationary objects both logos and QR codes as objects.

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Interactive Game Flow

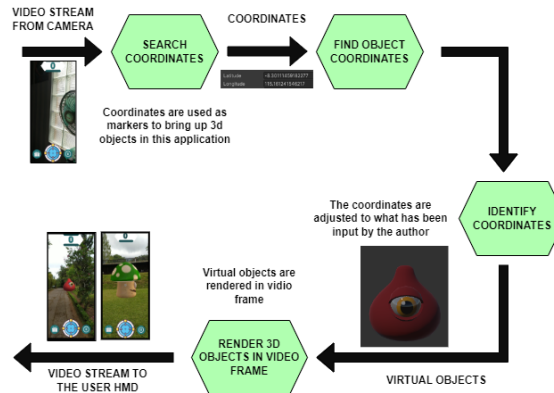


Fig.1 Interactive Game Flow

In Figure 2 explains the flow and also the concept of applying the Augmented Reality interactive game this time where it starts from the user's camera that is ready to display the 3D objects that have been provided. Then the user is required to approach the coordinates that have been determined by the author in making this interactive game. So that the system will identify the coordinates of the system with the coordinates of the user's smartphone, if the user's coordinates match the system, it will bring up a 3D object on the user's camera.

4. RESULT

System Implementation

The following is the system implementation of the MonstAR Interactive Game

Application Splash Screen Page



Fig.2 Application Splash Screen

This Figure 2 page is a page that will be displayed when the user enters the application. And on this page contains several related logos that are useful as loading screens.

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Login Page

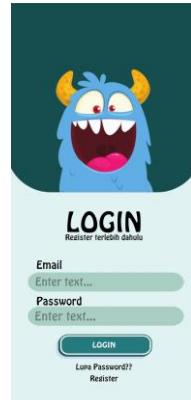


Fig.3 Application Login

In Figure 3 is the login page used by users to enter the application where this login page as well as creating an account for each player by inputting an email and password as the user's own identity that they have created on the register page. Users can create an account in order to enter the interactive game this time. In this menu the user is allowed to enter a username, email and password to carry out the account creation process. This page is used by users who forgot the password from their account. This menu contains an Email column which is intended to reset passwords via email address.

Home Page



Fig.4 App Home Page

In Figure 4 is this page displayed if the user successfully performs the login process that has been provided by this interactive game system. Then on the main page contains related to what menus are in this interactive game.

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Gift Description Page



Fig. 5 Gift Description

In Figure 5 is this page users can see related information about rides in each type such as type A which contains ATVs and also PaintBall. the Point interface page which functions as information about the points earned by tourists by pressing the Check Point button, as well as a place to redeem prizes by entering a special code. And this page can be accessed on the Point menu that has been provided on the main menu.

Admin Dashboard Page

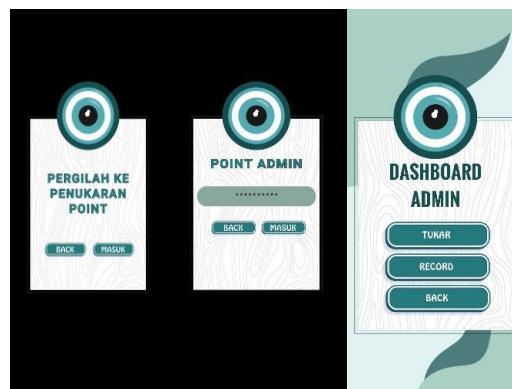


Fig. 6 Admin Login Page

In Figure 6 is a page that functions for officers to enter a special code in the application that is used to redeem points that have been obtained by users of this interactive game application.

Admin Point Redemption Page

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Fig. 7 Redemption Page

In Figure 12 is the Point interface which functions as information about the points earned by tourists by pressing the Check Point button, as well as a place to redeem prizes by entering a special code. And this page can be accessed on the Point menu that has been provided on the main menu. The redemption history page contains the total number of times the rides at The Sila's agrotourism have been redeemed by users.

Guide Page



Fig.8 Application Tutorial Page

In Figure 8 is a Tutorial page that serves as a guide for tourists to play interactive games using this augmented reality. And this menu can be accessed through the Tutorial menu that has been provided on the main menu.

AR Game Page



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Fig.9 AR Game Page

Figure 9 is the Difficulty interface which functions as displaying the difficulty level for playing this game and on this menu there is also a MonstAR menu provided so that users can see what monsters are scattered in The Sila's Agrotourism area.

Game Page

On the AR Game page, if the Traveler presses one of the difficulty levels provided, it will display the storyboard as well as have entered the game phase of this interactive game.

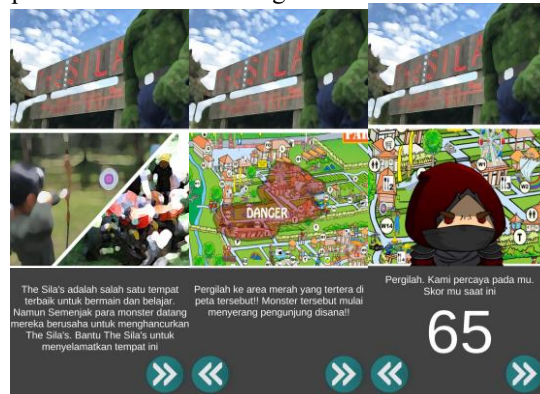


Fig. 10 Storyboard

After tourists read all the storyboards, the system will display an AR Camera that requires tourists to explore the scope of The Sila's Agrotourism in order to see and also hunt the monsters that have been provided.

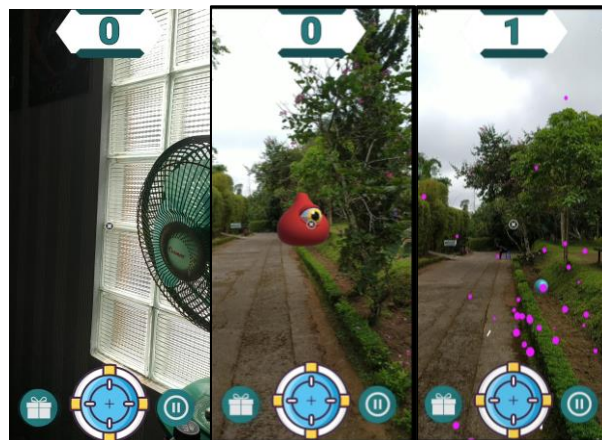


Fig. 11 Game View

In this game display also contains a reward menu which is intended as a guide for users to find out what rewards they can get. In this game display also contains a pause menu which contains volume settings for both the backsound and button sounds and also a button to lead to the Main Menu.

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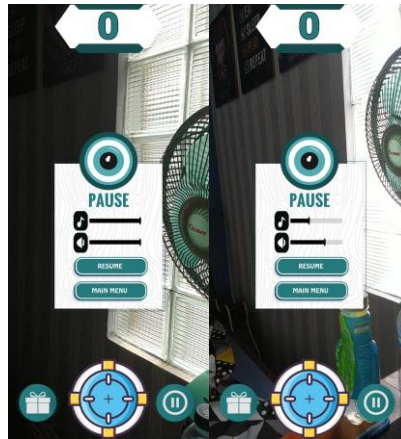


Fig. 12 Game Pause Page

MonstAR page

On the AR Game page if the Tourist presses the MonstAR menu, it will display the camera that is already available and ready to scan the marker provided. Which is where this menu is specifically designed to see what types of monsters are in the interactive game The Sila's Agroutorism.



Fig. 13 MonstAR page

In this menu the user can change the monster with the button provided if the marker has successfully brought up the monster.

5. DISCUSSION

UEQ Testing

Table 1
Reliability Test Results

UEQ Scales (Mean and Variance)		
Attractiveness	2,137	0,32
Clarity	2,096	0,39
Efficiency	2,074	0,25
Accuracy	2,044	0,20

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Stimulation	1,934	0,33
Novelty	2,096	0,22

After data processing and calculations such as Table 1, it is found that the 6 categories of statements have positive results. The highest category is "Attractiveness" which has a score of 2.137, which means that respondents have a high attraction to this Hijaiyah letter recognition application. While the lowest category is "Stimulation" which has a score of 1.934.

Table 2

Average of UEQ Test Results

Item	Mean	Variance	Std. Dev.	No.	Left	Right	Scale
1	2,1	1,3	1,1	34	troublesome	fun	Attractiveness
2	2,2	1,2	1,1	34	incomprehensible	Understandable.	Clarity
3	1,8	0,8	0,9	34	monotonous	creative	Novelty
4	2,1	0,7	0,8	34	difficult to learn	easy to learn	Clarity
5	1,9	0,7	0,8	34	less useful	useful	Stimulation
6	1,8	1,1	1,1	34	boring	Exciting	Stimulation
7	1,9	0,8	0,9	34	not interesting	interesting	Stimulation
....
25	2,4	0,5	0,7	34	not user-friendly	user-friendly	Attractiveness
26	2,3	0,4	0,7	34	conservative	innovative	Novelty

The 35 answers in Table 2 will be converted into mean, variance and standard. Each statement will be color-coded according to its category, such as efficiency, novelty, stimulation, clarity, and attractiveness. Arrows pointing upwards will be green with a mean value >0.8, indicating a positive evaluation. Horizontal arrows will be yellow with values between >0.8 to <-0.8, indicating a neutral evaluation. And the downward-pointing arrow will be red with a value <-0.8, indicating a negative evaluation.

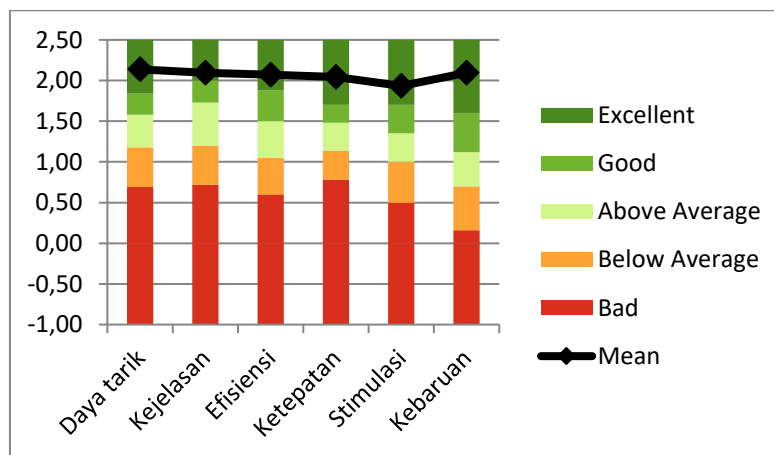


Fig. 14 Benchmark Scale Results

Based on the results of the graph above in Figure 14, it shows that the pragmatic and hedonic qualities get results above average (Excelent). These results show that this augmented reality interactive game can be used in helping new experiences for users.

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6. CONCLUSION

The conclusion of the research shows the results of the discussion above produce an augmented reality game using the marker based tracker method and also markerless which takes the GPS tracker method as the markerless method. The resulting game is an adventure-themed game that requires users to approach monsters to attack them. This game has 3 levels of difficulty where each level has different monsters and also mileage. Blackbox testing produces results as expected, where all things about the user interface run well and properly, starting from the login page to exit the application. In response time testing, it is found that from several different devices have different results depending on the specifications of the device. But in the marker detection test, on average, all devices get the same results. This proves that the marker response used is as expected. In the UEQ test, the results show that this interactive game gets a score above average (Excelent). These results show that this augmented reality interactive game can be utilized and used to add new user experiences.

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