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# Obus: A Two-Dimensional (2D) Game Preserving Bidayuh Folklore and Symbolism

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**ABSTRACT**

Digital games have the potential to preserve cultural heritage, including the fading traditions of Bidayuh folklore and symbolism. This project aims to develop a 2D game that digitally adapts Bidayuh traditions, providing a modernised way to transmit this cultural knowledge. A 2D HTML game prototype titled Obus was designed and developed. The prototype was hosted on Itch.io for online testing and a separate executable file was distributed for offline testing. Distributed questionnaires consisted of open-ended and close-ended questions based on the Technology Acceptance Model (TAM). Responses were collected online and using non-probability sampling techniques. The study involved 33 participants across Malaysia, and their feedback was analysed to determine the feasibility of using game-based learning for cultural preservation. Perceived usefulness achieved a Cronbach's alpha value of 0.74012 while perceived ease of use scored 0.54606. Overall, the System Usability Scale (SUS) results were encouraging (mean=72.27, SD=12.54, n=33), suggesting that the implementation of digital games was perceived as useful and usable. The findings indicated its potential as an engaging and educational tool for preserving Bidayuh heritage while needing to focus on ease of use.

***Keywords:***
Computer animation; game-based learning; cultural heritage; folklore; symbolism; Bidayuh culture

## 1. Introduction

### *1.1 Research Background*

The Bidayuh community, also known as 'Land Dayak,' is an ethnic group native to Borneo. The term was coined as a combination of two common words of the Bidayuh dialects: Bi implying people and Dayuh which bears the meaning of land therefore it is correct to assume Bidayuh is synonymous with land people. They settled in Sarawak and are recognised as Bumiputera, the native people. Historically, Chang [1] remarked a decline in population due to conflicts with neighbouring aggressive

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groups, leading them to settle in hilly terrains such as in Bau, Kuching and Serian Districts for safety. Despite this, the Bidayuh remain the second-largest Dayak sub-group in Sarawak, comprising 8% of the total population. There are six main groups of Bidayuh in Sarawak: Bisadong, Bibukar, Biatah, Bijagoi, Bisingai, and Dayak Selako-Lara, named after their respective areas of residence. The Bidayuh community has experienced a decline in its growth rate, but Kheung and Adruce [2] projected its overall population to increase. By 2020, the total number of Bidayuh individuals could reach approximately 220,000.

Preserving cultural heritage and legacies is essential in Malaysia, which is home to diverse ethnic heritages. Cultural institutions in Malaysia are embracing digital media for storage and convenient access to documentation, ensuring the survival of cultural heritage in the face of technological changes as studied by Salleh and Bushroa [3]. In the context of the Bidayuh community, digital edutainment has been explored as a means to document their culture and transmit knowledge about daily commodities, language, apparel, and faith as supported by Jimel [4] exploration with video games. Furthermore, video games can serve a purpose similar to that of interactive virtual museums.

Folklore plays a significant role in the Bidayuh community, serving as oral narratives passed down from generation to generation. These folklores not only entertain but also reflect societal standards, virtues, beliefs, and opinions. Sone [5] highlighted their crucial role in instilling moral values in children and shaping the ethics and guidelines for daily life. Folklore provides insights into the Bidayuh culture's perspective on the world, offering a deeper understanding of their narrative. The use of Bidayuh folklore is often shared by experienced elderly individuals in various settings, which Campbell *et al.,* [6] documented as botang romin - the Bidayuh's longhouse gallery, bori umoh - farm huts, or baruk - multipurpose halls. Symbols are another important aspect of Bidayuh culture, often existing in physical forms and closely tied to animism. Rites and rituals associated with these symbols are essential for the Bidayuh community. Sigdel [7] reported honouring and appeasing the spirits associated with these objects were in line with a community's wish to prevent calamity and seek favour.

The preservation of Bidayuh folklore and symbolism has been neglected compared to efforts made for other ethnic communities worldwide. The modernisation of the Bidayuh community has led to a diminishing interest in traditional rituals and symbols, with technology and Western folklore taking precedence. Meanwhile, religious conversion, particularly to Christianity, has further contributed to the decline of traditional practices among the younger generation, as Christian routines are seen as more convenient in daily life, eroding the significance of Bidayuh traditions. It becomes inevitable to ask, "How else can we safeguard our culture?". To address this issue, the following research questions will be the keys to this study:

i. How should Bidayuh folklore and symbolism take form in a digital game?
ii. How effective would a digital game be in preserving Bidayuh heritage?

Overall, preserving Bidayuh folklore, documenting their culture through digital means, and understanding the significance of symbols are crucial for maintaining the identity and heritage of the Bidayuh community. Bidayuh heritage as a whole has relied on traditional means of preservation and dissemination. Though the traditions and customs have persevered thus far, efforts must consider future outlooks especially in the era of digital evolution. The study aims to develop a prototype of a 2D digital game using Bidayuh folklore and symbols and assess the effectiveness of digital games in preserving Bidayuh heritage through the mixed method approaches.

### *1.2 Research Motivation*

The Bidayuh community has a rich culture and history, but like many indigenous groups, it faces the challenge of keeping its traditions alive in a modern world. This study is driven by the need to preserve and celebrate the unique folklore and symbols of the Bidayuh people. By creating a digital game that features elements of Bidayuh culture, we aim to connect with younger generations and ensure that these important cultural stories and values continue to be shared and appreciated. This approach could also serve as a model for protecting the heritage of other indigenous communities in today's digital age.

### *1.2. Literature Review*

#### *1.2.1 Bidayuh folklore*

The Bidayuh community lacked a writing system until the White Rajah's reign, thus a majority of the folklore was delivered orally. Ridu *et al.,* [8] classified Bidayuh folklore classified into three categories: sasia, susud toga and dondan. Sasia relates to ethnohistory, susud toga being genealogy and dondan is legends and fables. Folklore was a beloved form of entertainment to the Bidayuh with a scarcity of other recreational varieties within a means of education due to the lack of formal education as noted by Campbell *et al.,* [6]. Ridu *et al.,* [8] observed the narrator and audience for the sessions vary depending on the location:

i. Baruk: Limited to male members of the community only particularly due to restrictions of the baruk. A narrator is usually an elderly man while the audience is younger men and boys.
ii. Botang romin: The audience is large and varied in age and gender.
iii. Bori umoh: Typically, the narrator is an elderly woman and the audience is younger members of the community.

#### *1.2.2 Bidayuh symbolism*

Foh [1] enunciated the Bidayuh communities are united based on four aspects: assets, duties, fear, and protection which anchors well with animistic faith. The Bidayuh's animistic beliefs are tied to nature as it provides the necessities for their daily life: harvested crops from the lands they tendered to, game meat from hunts, fishes from streams, water from the rivers, and shelter on hills that protect them from pirates and headhunters of other Dayak tribes matching the four common aspects. These four common aspects are property, labour, fear, and practices for safety as eluded by Awang and Ungang [9]. Additionally, the Bidayuh believe in the existence of spirits, conducting ceremonies and fulfilling adat to honour said entities for health, prosperity, and safety. These spirits often belong to inanimate objects, plants, animals, or even lingering souls of the dead thus it was important for the members of the community to look after said objects or their representatives. These objects and representations are regarded as the cultural symbols of the Bidayuh.

#### *1.2.3 Existing games*

Game-based learning approaches have become a global trend due to their widespread adoption, offering unique opportunities to preserve cultural heritage, a notion Malegiannaki and Daradoumis

[10] supported. It is widely used in today's teaching and learning to explore and transmit cultural traditions, promoting a deeper understanding and respect of cultural heritage.

In his book, Wildt [11] recounted *Ōkami*, developed and published by CAPCOM, as a captivating video game that blends Japanese heritage with universal appeal. Originally released for PlayStation 2, it features Amaterasu, a white wolf embodying the Shintō sun goddess, accompanied by Issun, a Poncle inspired by Ainu folklore. Drawing heavily from Japanese mythology, the game diverges from the traditional Yamato-no-Orochi myth, casting Amaterasu as the hero who vanquishes the malevolent creature. Ōkami combines action-packed gameplay, quests, and side missions in a 3D world, incorporating the use of the Celestial Brush to engage players in the game's artwork and mechanics. Although not strictly faithful to the original myths, Ōkami serves as an introduction to Japanese mythology, utilising its deities' identities and symbols while crafting its plot and relationships.

Thunderbird Strike is a 2D side-scrolling game by Elizabeth LaPensée that puts players in control of the thunderbird, a revered entity from North American indigenous lore. The game addresses real-world issues faced by Native Americans, which Kinder [12] reiterated on topics of land reclamation and the destruction of pipeline development sites. LaPensée incorporates symbolism and a woodland art style to capture the native theme while ensuring accessibility by releasing the game for free on mobile platforms. While Thunderbird Strike lacks mythology and a complex narrative, it serves as a platform for raising awareness about indigenous struggles and the importance of justice and land preservation.

E'Gadung, developed by Gee, Pangayan and Kordmodanlou, is a mobile 2D platformer game with nine levels. Gee and Pangayan [13] conceived the game with an aim promote Kimaragang folklore and enhance understanding of traditional culture. Players control Gadung as he embarks on a journey home, following the storyline of a Kimaragang folktale. The gameplay focuses on avoiding bee attacks, collecting honeycombs and coins, and progressing through locked levels. The game features character designs inspired by Kimaragang culture but lacks significant symbolism and cultural influence in its art direction. Despite this, E'Gadung remains faithful to the original folktale and incorporates traditional music.

## 2. Methodology

This section discusses the materials and methodology used to conduct this study. The study initiated with the selection of folklore and symbolism to include followed by how to best portray them in a game. The chosen folklore was the ‘Caves of Krokong’ based on Munan [14] retelling. Symbolism present in the digital game were a rhinoceros hornbill and a red-legged crake. In a report by Kayad and Saman [15], the former is a homage to Sarawak’s identity as the Land of the Hornbills and a baruk’s design, while the red-legged crake (sikukuak) is known as a bird of bad omen. The overall colour scheme was based on the colours the Bidayuh associate with (black, white, yellow, red) while the environment design bore hints of a Bidayuh village.

In this study, object-oriented systems analysis and design were employed to structure the digital game development, ensuring adaptability and responsiveness to cultural nuances. The gaming industry, much like the software sector, frequently employs object-oriented methodologies. The game's structure is broken down into a use case model using the unified modelling language (UML) include an activity diagram, use case diagram, sequence diagram and class diagram.

Furthermore, the Technology Acceptance Model (TAM) was utilised to gauge user adoption of our digital game. TAM evaluates two primary aspects: the game's perceived value (Perceived

Usefulness) and its ease of use (Perceived Ease of Use). This approach helps ensure our game meets user needs and expectations.

### *2.1 Participants*

A total of 33 respondents across Malaysia were recruited to test the game and provide feedback through a survey. The prototype is deployed on itch.io platform. Both the Itch.io and survey links were released to the public for online user testing using social media platforms such as Facebook, WhatsApp, and LinkedIn. All eligible participants provided informed consent online before completing the survey administered via Google Forms. Additionally, physical user testing was conducted by directly meeting with users in person.

### *2.2 Instruments*

To evaluate the users' learning experience using Obus 2D Game, we started by gauging their opinions to determine the PU and PEU on the player's end. The open-ended and close-ended questions were adapted based on the TAM. The questions were framed with the game's utilitarian orientation in mind as Wang and Goh [16] discovered different genres bore different acceptance rate. Moreover, usability questions were developed based on the System Usability Scale (SUS) with consideration towards Anikina and Yakimenko [17] findings on edutainment technology. The SUS is a widely used assessment tool comprising 10 items rated on a five-point Likert scale, ranging from strongly disagree to strongly agree. Mohsin *et al.,* [18] and Ridzuan *et al.,* [19] established the tool as a dependable and user-friendly instrument for evaluating the usability of a system. Essentially, the distributed questionnaire applies the TAM as a primary form of assessment and the SUS secondarily.

### *2.3 Unified Modelling Language (UML)*
#### *2.3.1 Activity diagram*

The activity diagram, depicted in Figure 1, provides a visual representation of the game's activity flow and functionality. It helps analyse and understand how users interact with the application, showcasing the overall flow of the game's activities.

An aesthetically pleasing and user-friendly graphical user interface (GUI) plays a vital role in enabling effective communication between players and the game. It significantly influences players' willingness to engage with the application. For this project, the game was developed using the Godot Game engine. Meanwhile, the interfaces and assets were designed using Clip Studio Paint, with minor animations created using the Live2D program. It is important to highlight that any assets used in the project that were not developed from scratch, such as images, videos, and audio, will be properly credited to their respective owners.

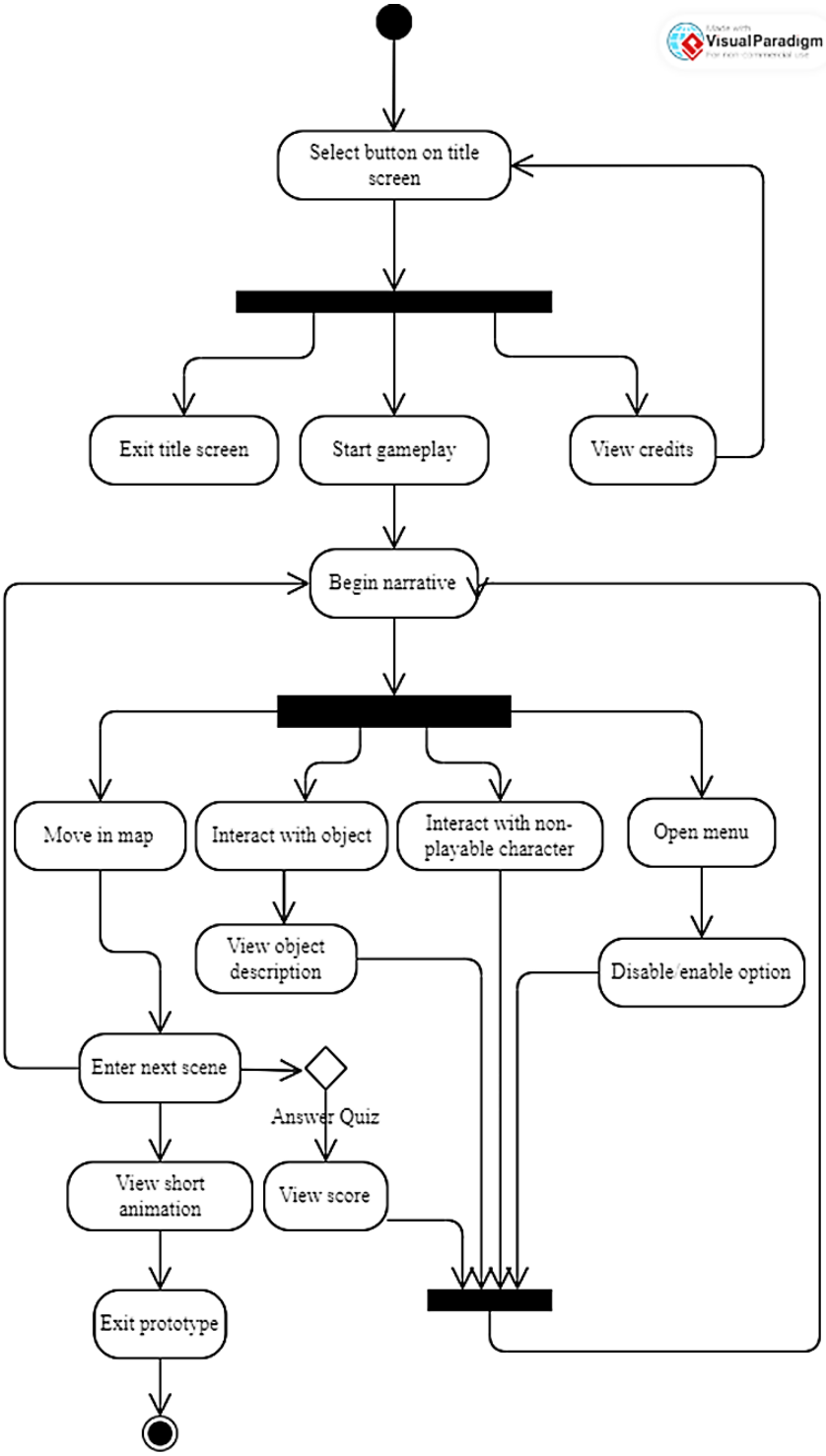


**Fig. 1.** Activity diagram of Obus 2D Game

When the player opens the Obus 2D Game on their machine (i.e. laptop or personal computer), the main menu appears (Figure 2). The player is presented with four options to start with; Start, Credits, Settings and Exit. Starting the gameplay will initiate the first scene of the prototype while viewing the Credits will display the information of involved parties and tools in the production of the prototype. In Settings, the player can choose to either enable or disable the audio or adjust the volume. Exiting the title screen will close the game. Players can move to the left or the right or jump around the map (Figure 3). Should the players reach the end of a map's domain, they will enter another scene which may be another map as well.


**Fig. 2.** Obus' main menu


**Fig. 3.** Tutorial dialogue in scene 1

Players may decide to interact with objects or NPCs. If they decide to interact with an object, a short description of the object will be presented, and if need be, along with a close-up image (Figure 4). For NPCs, a conversation with them will be initiated. The conversation may either be simple fillers or parts of the narrative.

Considering the non-penalising nature of the prototype, the outcome of the collective answers of the quiz will affect the quiz scores but not influence the narrative and end of the prototype. Throughout the gameplay, the player may choose to open a menu that will pause the gameplay and offer the player to either enable or disable the audio of the prototype. In the final scene (Figure 5), an animation of the original folklore will be played automatically. After the animation finishes, the prototype reaches its conclusion and ends.

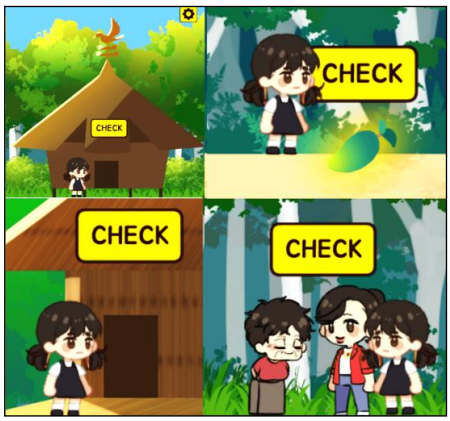


**Fig. 4.** Interact with NPCs or objects

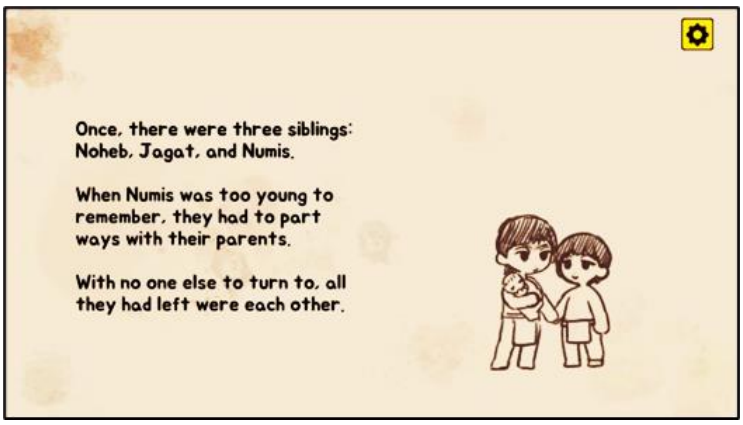


**Fig. 5.** Animation of the folklore

*2.3.2 Use case diagram*

A use case diagram illustrates an application's functional needs using symbols such as actors and use cases. Figure 6 depicts several interactions between the actor (player) and the system (Obus 2D Game). When the game is executed, the player has three options to choose from. 'Start' will begin the gameplay while 'Credits' will display information on the developer and necessary credits to be made per copyright or software licenses. 'Exit' will close the prototype. During the gameplay, the player will experience 'Narratives' which will include 'Quizzes'. At any point, the player may open the 'Menu' which contains a toggle for the prototype's audio and adjust the volume.

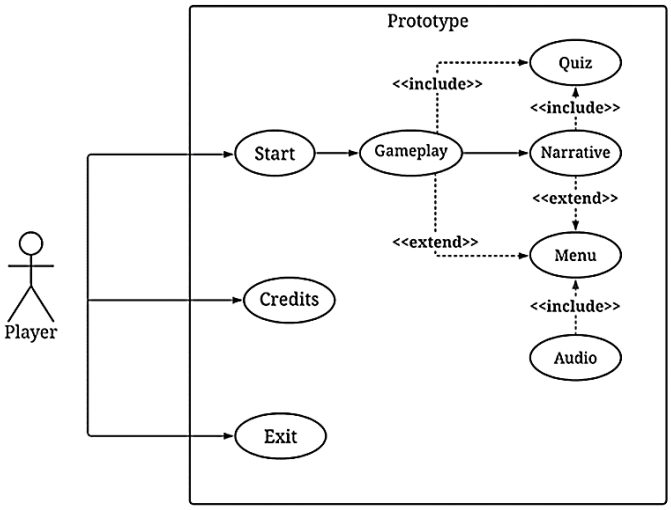


**Fig. 6.** Class diagram of Obus 2D Game

### *2.3.3 Sequence diagram*

The sequence diagram for the Obus 2D Game illustrates the connections between various use cases (Figure 7). The game begins when the player selects 'Start' on the title screen, initiating gameplay and the first scene. Narrations may be triggered during scenes, potentially followed by quizzes where the player selects answers and scores are evaluated. The game provides an evaluation to the player, followed by another narration. Interacting with NPCs initiates narrative sequences, and a menu may be triggered during scenes.

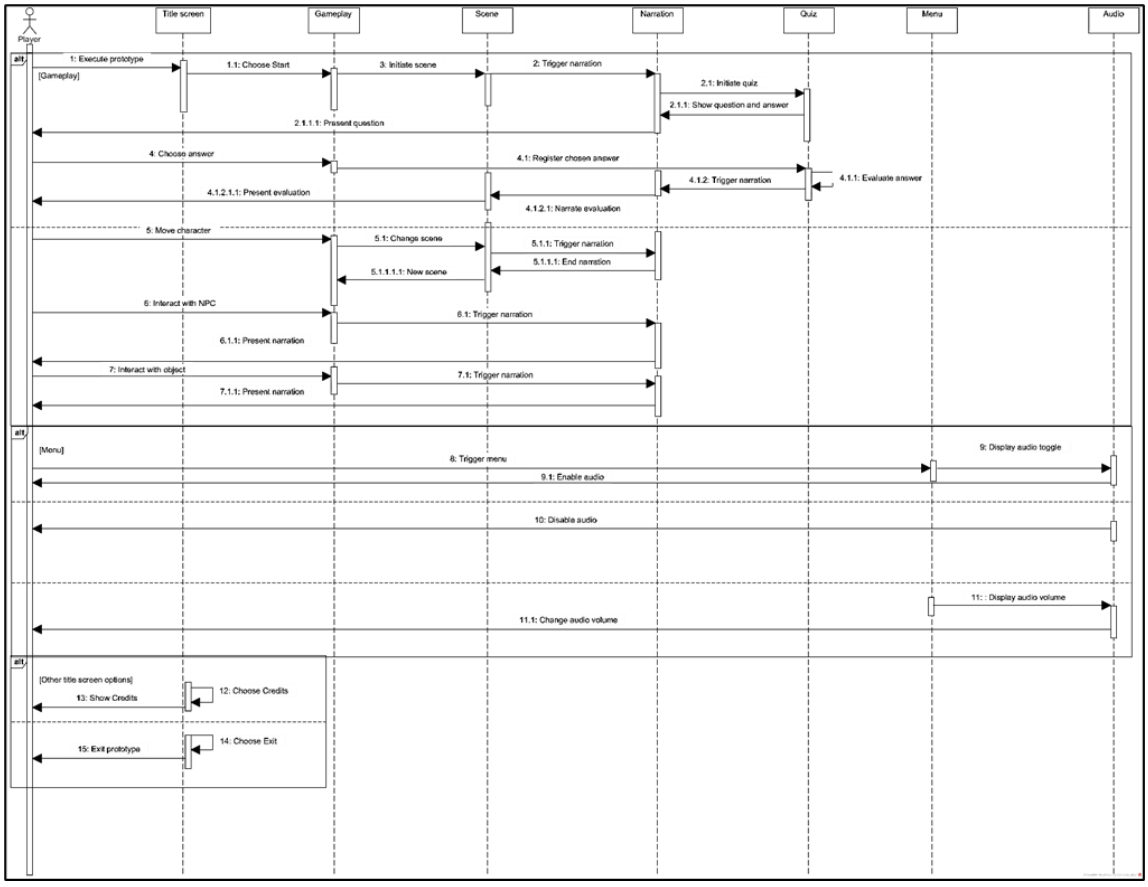


**Fig. 7.** Sequence diagram of Obus 2D Game

Within the menu, players can adjust audio settings, enabling or disabling audio and adjusting volume. Players navigate the map by moving the character, and the scene changes when the character moves outside the map's domain. Additional features include the 'Credit' option, which displays information about the parties involved and the tools used in the game, directly on the player's screen. The 'Exit' option allows the player to promptly exit or end the game.

### *2.3.4 Class diagram*

A class diagram is a graphical depiction of the structure of an application that shows the connections and relationships between different classes and their attributes. The Prototype class in Figure 8 serves as the central component that allows users to access the other classes represented in the diagram.

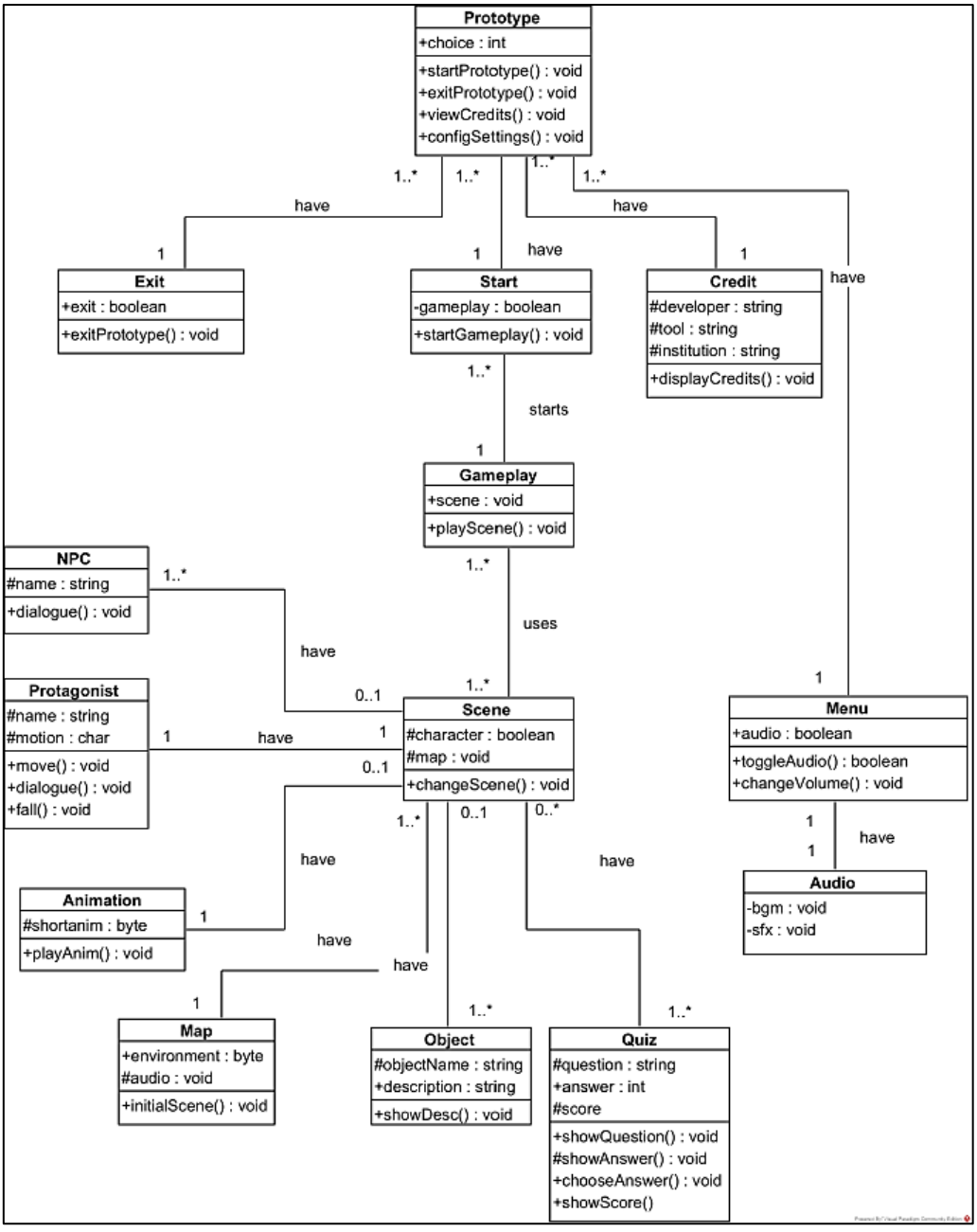


**Fig. 8.** Class diagram for Obus 2d game

### *2.4 Technology Acceptance Model (TAM)*

Davis [20] proposed the Technology Acceptance Model (TAM) relating a user's reception of a system to the probability of system utilisation. The model comprises four constructs: perceived usefulness (PU) and perceived ease of use (PEU) as independent variables, attitude toward using as the mediator, and actual system use as the dependent variable. Though, Zaineldeen *et al.,* [21] recapitulated TAM was met with several criticisms due to deficient attention towards external variables and unsatisfactory variation when it comes to conducting analysis. Over the years, the TAM underwent several developments to address the limitations, leading to TAM2 and TAM3. The developments involved more determinants for deeper analyses, forming more complex models as described in Putra [22] review. Notably, from Wibowo [23] study, it was evident the basic principle behind all three versions is estimating the adoption or rejection of a system.

The selection of TAM as the preferred model for this study can be attributed to its widespread recognition and its ability to provide a dependable measure of user approval. This model primarily focuses on two key factors, namely Perceived Usefulness (PU) and Perceived Ease of Use (PEU). According to Rahman and Bakar [24], the term "PU" refers to the degree to which a user believes that using the system will enhance their performance, while "PEU" pertains to the degree to which a user believes that using the system will require minimal effort. By assessing these two constructs, TAM offers insights into potential barriers and facilitators to system adoption, guiding the design and implementation process to better align with user needs and expectations.

## 3. Results

Table 1 illustrates the participants' responses to the open-ended and close-ended questions. Results of the first four questions correspond to PU while the remaining indicates PEU. At first glance, it is telling that the game was deemed useful and easy to use. In ascertaining the reliability of the study's findings, the coefficient of Cronbach's alpha for each construct had to be measured. The reliability test was performed to determine the internal consistency and usability of the stated measurement. Alpha value for PU was calculated to be 0.74012 and PEU was determined to be 0.54606.

According to Park and Park [25], an alpha value higher than 0.6 denotes acceptable reliability while Umar *et al.,* [26] suggested, an alpha of 0.80 is generally a reasonable target, implying these values are appropriately robust. This signifies the findings for PU are reliable. On the other hand, results for PEU are found to be unreliable. Cronbach's Alpha defines the internal consistency or average correlation of items used in this study. The reliability assessment for PEU contradicts the initial assumption that the system is easy to use. The contradiction could have been the ramifications of a small sample size or scoring inaccuracies as reiterated by Taber [27].

Players appreciated the game's art direction, which effectively relayed the intended message through appropriate graphical assets. The design choices were commended for having thematically suitable character and environment designs. Colour selections and legible typefaces attributed to its accessibility to players of all ages. In line with Raptis *et al.,* [28] verdict, content visualisation is crucial in factoring player engagement with the game and consequently, how much information is attained. In cohesion, the visual conceptualisations had the capacity to pique their interest in Bidayuh culture.

i. "Bidayuh folklore and symbolisms can be learned immediately while having fun. It is fun and mysterious which makes the learning much more fun because it increases curiosity regarding the folklore and symbolisms."

ii. "I like the art style for each character plus the background scenery and the font is easy to read."
iii. "Visuals and context. The visual art of characters and background feels pleasing to look at together with the font. It's suitable with the theme and art."

**Table 1**
Acceptance and usability of Obus 2D Game

| Aspect | S.D[a] | D[a] | N[a] | A[a] | S.A[a] |
|---|---|---|---|---|---|
| The prototype improves my understanding of the Bidayuh folklore and symbolism. | - | - | 1 | 10 | 22 |
| The prototype makes learning the Bidayuh folklore and symbolism easy. | - | 1 | 2 | 6 | 24 |
| The prototype makes learning the Bidayuh folklore and symbolism fun. | - | - | 2 | 9 | 22 |
| The prototype makes learning the Bidayuh folklore and symbolism engaging. | - | 1 | 3 | 6 | 23 |
| The prototype is easy to use and play. | - | - | 1 | 9 | 23 |
| Learning how to use and play the prototype is easy. | - | - | 2 | 6 | 25 |
| Interaction with the prototype's content is clear. | - | - | 2 | 9 | 22 |
| Interaction with the prototype's content is understandable. | - | - | 2 | 8 | 23 |
| It is easy to find information throughout the prototype. | - | - | 1 | 8 | 24 |

[a] S.D = Strongly Disagree, D = Disagree, N = Neutral, A = Agree, S.A = Strongly Agree

Furthermore, players responded positively to the project's premise delivery. Notably, they suggested that this delivery method could be applied to other native Sarawakian cultures, highlighting the favourable perception of digital games as a modern medium for traditional cultures. Many players expressed that the game could educate the public about the Bidayuh community, while others commented on its potential for expansion into specific genres. A few players even suggested its use as edutainment in educational institutions like museums or schools. Though, Luiro *et al.,* [29] accented an edutainment design should consider a compromise between an easily digestible strategy and faithfully adapting the cultural heritage.

i. "I believe this project can be used as a medium to know more about Bidayuh especially to those who have no idea about their culture, folklore etc."
ii. "Can be as a platform and medium to promote more culture in Sarawak. Add more story and theme maybe can do for different race and religion."
iii. "It is a fun and interactive game, so I think it's potential will be huge among educators who are looking for new ways to make their teaching and learning more interactive and engaging."
iv. "Can be incorporated in cultural museum and young children's education syllabus."

Albeit the praises, the game received criticism. In particular, the players pointed out the lack of mechanics and challenges in the game, as well as encountering bugs during gameplay. Writing-wise, players expressed a desire for the inclusion of the Bidayuh language as an option and a dictionary for those unfamiliar with it. The plot was intended to be simple yet the narrative choice backfired. Players felt the writing was amateur and could take on more directions. Garcia *et al.,* [30] reinforced a linear design would result in a dull narrative and lack of appeal. Lastly, the animation speed at the scene was too fast and the players could not consume the information in its entirety.

i. ".. if you press the spacebar accidentally, you have to re-read the entire dialogue again when the character is near check sign. There is no quit button for the dialogue."

ii. "Characters could still move during the conversation, some interaction overlaps and causes bugs."
iii. "No glossary for the word that was not clear of the meaning. Professional sentence lacking."
iv. "The animated adaptation at the end of the game ran a little too quick before I could finish reading."

Hence, the players suggested improving the game mechanics to increase player engagement and requested more content based on other Bidayuh folklore. One player specifically recommended improving the writing of the interactions. However, there were two conflicting suggestions regarding the genre of the game: one suggesting a psychological horror approach and the other suggesting a friendlier atmosphere. The contradicting styles imply the broad potential Bidayuh folklore has with a game adaptation, thus careful design considerations must be taken from the perspective of the target audience.

i. "Maybe make the buttons during the quiz mid-game can't be clicked by spacebar to avoid users mistakenly clicking the wrong answer."
ii. "Can add more adventures in the future - e.g.: levels/lives."
iii. "Game can have potential if have more content."
iv. "For the story so far, it's very interesting. Maybe you can add more psychological horror elements or a character we do not expect them to betray the main character."

Table 2 displays the descriptive statistics of the System Usability Scale (SUS) scores for the Obus 2D Game. The overall SUS score is 72.27 (mean=72.27, SD=12.54, n=33), surpassing the average SUS score (68). The minimum and maximum scores are 47.50 and 92.50, respectively. This mean value falls within the acceptable range for SUS scores, indicating a 'Good' level of usability for the Obus 2D Game, as per the classification from Dutta *et al.,* [31] and Bangor *et al.,* [32]. The survey results indicate that over 70% of participants rated the game above average, demonstrating a high perceived level of usability.

**Table 2**
Descriptive statistics for Obus 2D Game

| SUS score | Value |
|---|---|
| Mean | 72.27 |
| Standard deviation | 12.54 |
| Minimum | 47.50 |
| Maximum | 92.50 |
| Count | 33 |

## 4. Conclusions and Future Work

A digital adaptation of Bidayuh folklore and symbolism is feasible in the form of a 2D game. Folklore can be implemented as plot devices while symbolism can be inserted into the level designs. The Obus 2D Game was highly regarded by players in terms of perceived usefulness and usability but not in ease of use. The game was recognised as a suitable platform for preserving and disseminating cultural knowledge, therefore evident that digital media can be another conductive measure of safekeeping Bidayuh heritage. However, the findings of this study were limited to a small number of participants who (i) have access to a computer, (ii) are residing in Malaysia, and (iii) have a basic command of the English language.

Future research should expand the sample size to include participants from diverse age groups, locations, and language fluencies. The effectiveness of using a digital medium to preserve and deliver Bidayuh heritage can be further evaluated based on gaming platforms. Verbal responses and in-person observations should be considered in assessing the impact of the game on the participants. External factors should be taken into account as they may affect a player's experience and information attainment as recounted by Zaineldeen *et al.,* [21].

Thus, it is recommended to revise the game's design and development for future work. The game's contents can be expanded with additional Bidayuh folklore as later scenes and levels following García *et al.,* [30] recommendation on employing emergent narratives. A glossary could be added as a component to encourage Bidayuh lexicology. Voiceovers can serve as complementary aspects to the character dialogues introducing the players to the pronunciations. Likewise, it is encouraged for the content to be available in multiple languages. Including Bidayuh music as part of the soundtrack can be proposed for enriching authenticity as endorsed by Liu *et al.,* [33] study. The game can be developed further as a three-dimensional (3D) game which Terlutter [34] and Giglioli *et al.,* [35] remarked as enhancements for immersion and executive function coordination. Inspired by the approach taken by Farizah *et al.,* [19] and Khaw *et al.,* [36], it is also recommended to port the game with cross-platform compatibility (inclusive of mobile devices such as Android and iOS) as a means of increased accessibility and reach.

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