

Malaysia Run: The Development of a Mobile Game Application to Promote Malaysia Culture using Gamification Approach

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Abstract: There are many local movies produced to promote Malaysian cultures to people all around the world. However, there is less game application focus on this purpose. Furthermore, due to the Coronavirus Disease 2019 (COVID-19) pandemic, the implementation of the travel restrictions had stopped everyone from travelling to other countries, even though in Malaysia. Thus, children can only learn about these cultures on the book and website. Malaysia Run is designed based on the gamification approach and developed for the Android platform to allow children enjoys playing the game while absorbing knowledge about Malaysia, such as the flag and capital city of states. This game consists of six levels which introduce six regions of Malaysia: Northern Region, Central Region, East Coast, Southern Region, Sabah, and Sarawak. Moreover, Game Development Live Cycle Model (GDLC) is chosen as the methodology, while Unity Game Engine and C# programming language are used to develop this application. Malaysia Run has conducted Alpha Testing, and Beta Testing by involving ten target users aged between 6 and 12 years old. The user acceptance test model that has been used is System Usability Scale (SUS). The findings indicate the level of user acceptance is high by receiving satisfactory results with 92.6% positive feedback. The objectives of this project have been achieved, and its advantages and limitation are identified. Next, there are few improvements that could be made in future to enhance the game. Lastly, perhaps Malaysia Run can really help children to understand more about Malaysia.

Keywords: Malaysia, Children, Running Game, Android

1. Introduction

Malaysia is a unique and beautiful country and there is a lot of interesting information worthy of being known by everyone. Thus, Malaysia Run game is proposed to introduce the beauty and characteristics of Malaysia to the users, such as the local building, local cuisine, flag, and capital city of the state. The users can enjoy playing the game while absorbing all the information cheerfully. Plus, the target

platform of Malaysia Run game is Android platform. This is because Android users are around triple as compared to IOS users until September 2019, that is 72.87% and 26.45% respectively [1].

Unfortunately, many children can only learn about these cultures on the book and website. Due to the Covid-19 pandemic, the implementation of the travel restrictions had stopped everyone from travelling [2]. Furthermore, there is a lot of local movies produced to promote Malaysia local cultures to people all around the world, but there is less game application focus on this purpose. Mobile game is important to bring educational benefits for the children, like games that can test children knowledge of history, mathematics or other areas of interest, can enhance learning and make it more fun for children to stay engaged in a particular subject [3]. Thus, Malaysia Run game that aims to introduce the characteristics of Malaysia interestingly to users is developed. There are three objectives in the project. First, to design the content of Malaysia Run in 2D and 3D by applying the third-person view based on the gamification approach. Second, to develop Malaysia Run on the Android platform. Third, to test Malaysia Run to the target users, children aged from 6 to 12 years old using Alpha and Beta Testing.

Malaysia Run will be designed entirely in the English language, the design of the background will use the local building in Malaysia and the objects gained by the character along the game will be designed as the local food in Malaysia. Malaysia Run is designed in the form of single-player game mode and the platform used is mobile-based with the Android operating system. Moreover, Malaysia Run is planned to be developed with the Unity Game Engine and C# as the programming language used to write scripts. Malaysia Run consists of six levels that represent the six regions of Malaysia, which are the Northern Region, Central Region, Southern Region, East Coast, Sabah, and Sarawak [4]. Thus, the user can learn about the uniqueness of each state in Malaysia from the North part to East Malaysia. This design of the game levels provides the user with a feeling like travel around Malaysia virtually.

Furthermore, Section 2 in this report will discuss the related work of this project, while Section 3 will explain the methodology used in developing the application. Next, Section 4 will discuss the results and discussion of the game application, Malaysia Run. Lastly, Section 5 discusses the conclusion.

2. Related Work

2.1 Domain Background





Malaysia consists of 13 states and 3 federal territories. Each state contains its characteristics that enable the people to recognize it in a short quick time. For example, each state in Malaysia has its unique flag and capital city. Furthermore, Malaysia cuisines are undoubtedly one thing that the Malaysians are proud of. Malaysia cuisine generally represents its various ethnicities. According to the survey made by a Dutch e-commerce travel website, Booking.com, over 50000 global travellers, around 61% of them decide the travel destination for the local food and drink. Plus, Ipoh, Perak and Johor Bahru in Malaysia are listed in the top 10 destinations for tasty local food [5]. Hence, local cuisine in Malaysia is undoubtedly a great recognition of Malaysia.

Thus, an application that allowed the children to gain knowledge about Malaysia is required to be developed. All this information that may help someone to know more about Malaysia should be learnt by the children in order to able to promote Malaysia to their friends, especially those who are born in other countries.

2.2 Comparison of Related Applications

There are three existing applications chosen to be compared with the proposed application, namely Malaysia Run. The selected existing applications are Quiz Run [6], Trivia Race 3D [7], and Run Math Runner [8]. In this section, the comparison is being recorded and tabulated in Table 1. Table 1 shows the comparison based on several aspects, such as platform supported, category, language used, internet connection requirement, settings, strengths, and weakness.

Table 1: Comparison between the existing applications

Features	Quiz Run [6] 	Trivia Race 3D [7] 	Run Math Runner [8] 	Malaysia Run, proposed application 
Platform	Android 4.1 and above	Android 5.0 and above	Android 5.0 and above	Android 4.4 and above
Category	Trivia	Trivia	Casual	Casual
Language	English	English, German	English	English
Target user	Not specific	Not specific	Not specific	Children aged between 6 and 12 years old
Internet Connection	Not require	Not require	Not require	Not require
Purchases	In-Game Purchases	In-Game Purchases	Free to use	Free to use
Sound effect	Not available	Not available	Available	Available
Background music	Available	Available	Available	Available
Ability to adjust music and sound volume	No	No	No	Yes
Local content of Malaysia	No	No	No	Yes
Button design	- Consistent - Hard to see as the colour same as the background colour	- Consistent - Clear to recognize the function of button	- Consistent - Flat design	- Consistent - Clear to recognize the function of button - Use different colour with the background colour
Informative comments	Yes	No	No	Yes
The existing of exit button	No	No	No	Yes
Font	- Easy to read as all text in sentence case	- Easy to read as all text in sentence case	- Hard to read as all text in uppercase	- Easy to read as all text in sentence case
Weakness	- Unable to revise previous questions	- The exit button does not exist in the game - Unable to revise previous questions	- Total number of levels did not show - Same icon used for Shop page and Home page.	- Only cover 6 levels - The questions in the game are not randomize
Strengths	- Free to use - San-serif font style - Consistent button	- Free to use - San-serif font style - Consistent button	- Free to use - San-serif font style - Consistent button	- Free to use - San-serif font style - Consistent button - Malaysia's local content as the design

3. Methodology

Malaysia Run used Game Development Life Cycle (GDLC) as the methodology in developing the game application. GDLC is a concept and guideline which contains all the game development process. During the game development, the developers may face various challenges that require a specific approach to solve the problems. In the GDLC model, there are six phases, which are Initiation, Pre-Production, Production, Testing, Beta Testing, and Release, as displayed in Figure 1.

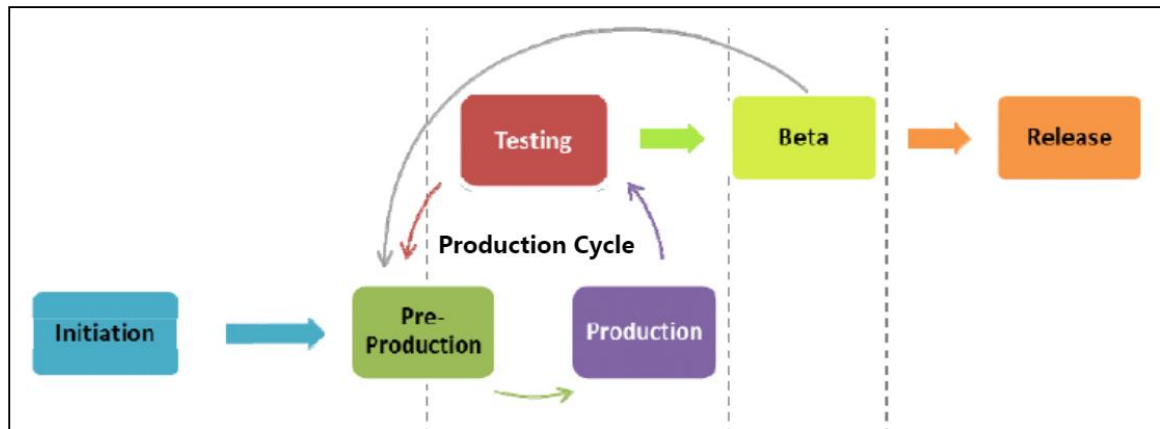


Figure 1: Game development life cycle (GDLC) model [9]

3.1 Initiation Phase

In this phase, the problem statements, objectives, scopes, target user, expected result, and importance of the project of the Malaysia Run application are determined and presented in the proposal. Gantt chart is an ideal tool to display the details of every task throughout the project graphically as taskbars include start and end date, duration, and dependency relationships between activities. Hence, a Gantt chart of the project, Malaysia Run, is created using Gantt Project software. Moreover, three existing applications are being reviewed, compared, and analyzed in this phase, as explained in Section 2.2. The review of the existing applications is vital in creating an application that had improved the weakness of the existing applications and maintained their strengths.

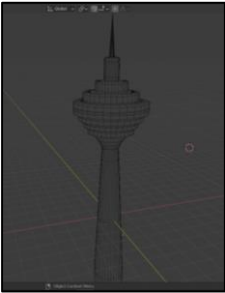


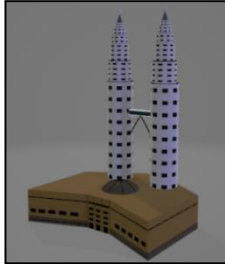
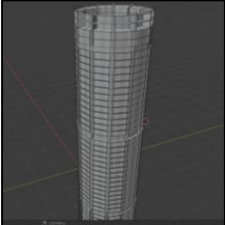
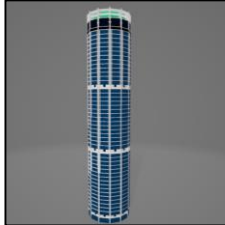
3.2 Pre-production Phase

The Pre-production Phase is the first phase in the production cycle in the GDLC model. This phase defined the game design and game prototype creation. The props design is created in this phase to let the props modelling can go smoothly in the next phase, the Production Phase. Besides, the detailed storyboard, flowchart, and navigational structure of the game application are designed. The detailed flowchart is attached in Appendix A.

3.3 Production Phase

Production Phase is the essential process in the production cycle which involves the assets creation, source codes creation and importation of all the assets into the Unity project. The storyboard created is used as guidance in the assets' creation process. Since Malaysia Run is a 3D game, the 3D game assets are created using Blender software and imported into the Unity project. Table 2 depicts the 3D models modelled using Blender software. The 3D models are Kuala Lumpur Tower, Petronas Twin Towers, and Komtar Tower Penang.

Table 2: 3D models modelled using Blender software

3D model	3D models in modelling process	Result of 3D modelling
Kuala Lumpur Tower		
Petronas Twin Towers		
Komtar Tower Penang		

Besides, scripting is required to create game physics, the interaction between characters and game objects, and the number of coins collected using source codes. The main functions of Malaysia Run include updating coins amount collected, update marks gained, and game over feature. Figure 2 indicates the script used to update the coins amount collected in the coin panel, level complete panel, and game over panel. The coins amount collected is stored in the variable, namely MoneyAmount. Next, the Game Control Script is applied in every level of the game to keep updating the value of coins collected from time to time.

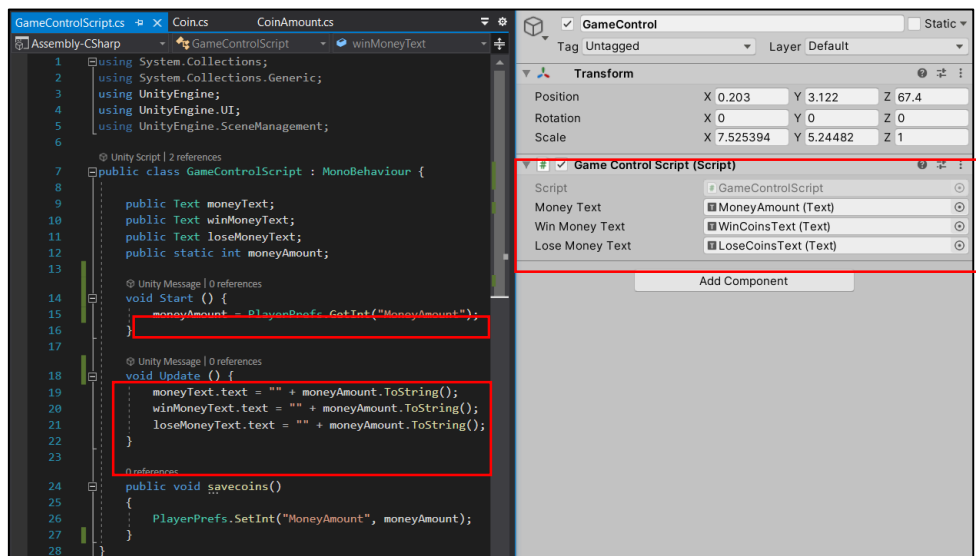


Figure 2: Update coins amount feature

Furthermore, Figure 3 reveals the script used to update the marks gained feature, namely Count Question No script. There are ten questions prepared for every level. After the user answers correctly for a question, the marks panel should update the marks gained. Thus, a Count Question No script is created, and it is applied to the correct answer object. According to the Count Question No script, when the character collides with the game object with the tag “Score”, the scoreUI will be added by one. While the score gained reach ten, it means ten questions are answered correctly, and a certain level is completed. The next level is unlocked for the user.

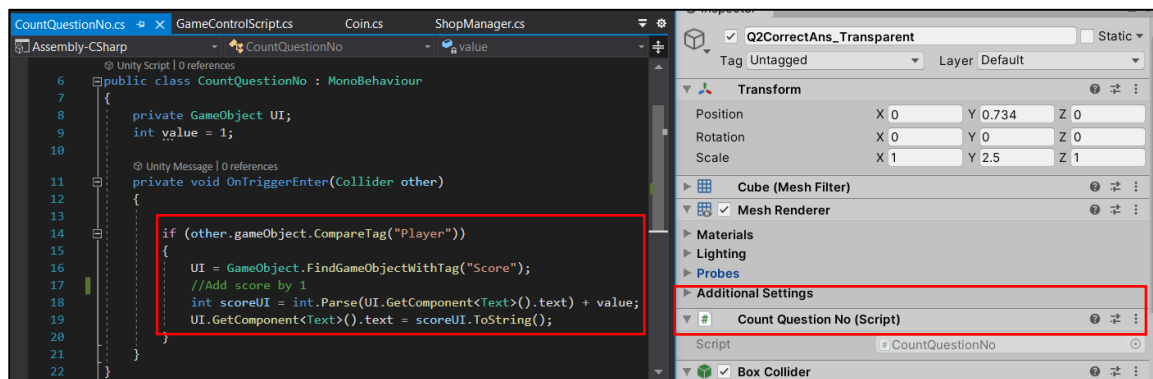


Figure 3: Update marks gained feature

Furthermore, Figure 4 depicts the scripts used to set up the game over feature in the game: Player Controller script and Player Manager script. According to the Player Controller script, when the player collides with the object with a tag of “Obstacle”, it will change the Boolean of gameOver function in the Player Manager script into true. Next, as detailed in the Player Manager script, when the Boolean of gameOver function is true, the game over panel will be shown, and the time scale will become zero. Therefore, the character will stop running since the speed of the movement depends on the time scale.

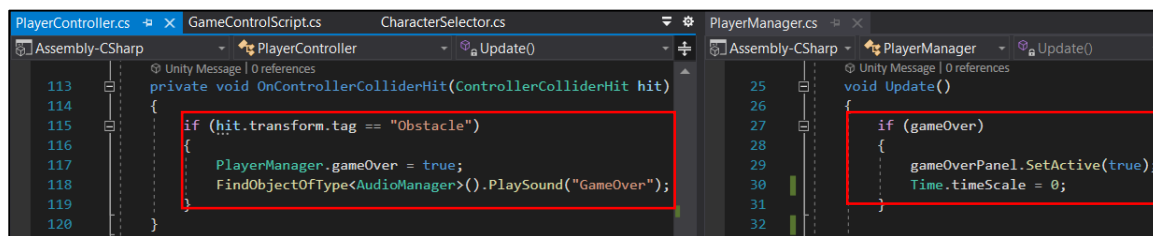


Figure 4: Game over feature

3.4 Testing Phase

Alpha Testing is conducted to test the game usability and playability. Alpha Testing is carried out when the development process is almost complete and before the Beta Testing. Alpha Testing is conducted to check whether the actual results match the expected result or not. Alpha Testing has been carried out to test the functionality of the buttons in the game. All bugs found in the Alpha Testing has been recorded and fixed before going to the Beta Testing phase. Table 3 shows the result of Alpha Testing.

Table 3: Results of Alpha Testing

Button	Expected result	Actual result	Improvement required
Start button	Navigates to Level Selection Menu.	Succeed.	No.
Shop button	Navigates to Shop Page.	Succeed.	No.
Credits button	Navigates to Credits Menu.	Succeed.	No.

Table 3: Results of Alpha Testing (continued)

Button	Expected result	Actual result	Improvement required
Next button	Navigates to the previous scene.	Succeed.	No.
Exit button	Displays the Exit panel.	Succeed.	No.
Yes button	Terminates the application.	Succeed.	No.
Settings button	Displays the Settings panel.	Succeed.	No.
Level buttons	<ul style="list-style-type: none"> • Displays loading screen before the level scene loaded. • Navigates to level scene. 	<ul style="list-style-type: none"> • The progress bar does not fill up according to the loading progress. • Succeed. 	<ul style="list-style-type: none"> • Check the Level Loader script. • No.
Information button	Displays the Information panel.	Succeed.	No.
Pause button	<ul style="list-style-type: none"> • Displays Pause panel. • Pause the running character. 	<ul style="list-style-type: none"> • Succeed. • Succeed. 	<ul style="list-style-type: none"> • No. • No.
Play button	<ul style="list-style-type: none"> • Closes Pause panel. • The character remains running. 	<ul style="list-style-type: none"> • Succeed. • Succeed 	<ul style="list-style-type: none"> • Succeed. • Succeed
Replay button	The certain level loads again.	Succeed.	No.
Next button	Navigates to the next level scene.	Succeed.	No.
Home button	Navigates to Home Page.	Succeed.	No.

3.5 Beta Testing Phase

Beta Testing is carried out to the third-party or external end-users to get direct feedback from the end-users. Hence, the Malaysia Run application is tested by ten target users in 09th to 11th June 2021. Due to the Covid-19 pandemic, the testers involved are neighbors, children aged from 6 to 12 years old. The direct feedback from the testers is collected and recorded. After testing the application, the testers had been given a set of questionnaires using Google Form. They are required to answer all the questions to gather the feedback related to the application. Google Form had been chosen as the method instead of paper form because the auto-generated figures and pie charts can easier the process of analyzing data. The results of Beta Testing are presented in Section 4.

3.6 Release Phase

The Release Phase is the final phase in the GDLC model. Malaysia Run is fully developed can run and play successfully on the target platform, an Android device. Malaysia Run is built in the .apk format from Unity Game Engine. After that, the .apk file of Malaysia Run is installed in an Android device, as shown in Figure 5. Furthermore, Malaysia Run has published on the Google Play Store and it is a free download application as indicated in Appendix B.



Figure 5: Malaysia Run installed in an Android device

4. Results and Discussion

The results and discussion section presents the analysis of the testing phase. The testing phase has involved ten children aged between 6 and 12 years old. The testing phase aims to measure the usability and effectiveness of Malaysia Run towards the target users. The testing results can determine that the objectives are achieved and suggest improvements to enhance the game application.

A set of questionnaires that consists of three sections is prepared and request to tested users to answer. The three sections are Level of User Acceptance, Level of Functionality, and Level of Performance. The user acceptance test method that has been used to measure the user acceptance level of Malaysia Run is System Usability Scale (SUS) [10].

Figure 6 indicates the analysis of Section A in the Beta Testing questionnaire. There are four questions aim to test the user acceptance level of Malaysia Run is asked. According to the chart generated, most respondents gave a positive answer, which means the game is easy to use, easy to learn and provides an enjoyable playing experience to the users. Questions 1 is “The game is easy to play”. There are 50% of respondents strongly agreed the game is easy to play, 40% of respondents agreed the statement, while only 10% disagreed with it. Next, Question 2 is “The game is easy to learn”. There are 50% of respondents strongly agreed the game is easy to learn, 40% of respondents agreed the statement, while only 10% claimed the understandable level of the game is moderate. Plus, Question 3 is “The design of the game is beautiful”. All respondents agreed the design of the game is beautiful. Lastly, Question 4 is “The game is interesting”. There are 50% of respondents strongly agreed the game is interesting, 30% of respondents agreed with the statement, while 20% of them claimed its interesting level is moderate.

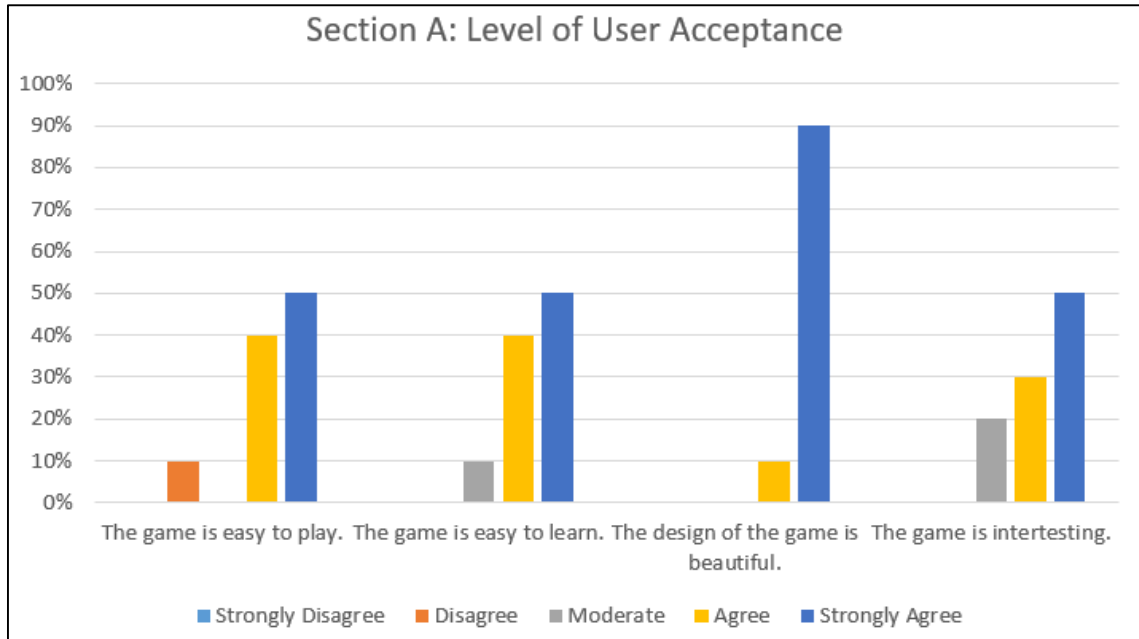


Figure 6: Analysis of Section A: Level of User Acceptance

Figure 7 depicts the analysis of Section B in the Beta Testing questionnaire. There are four questions asked to test the functionality level of Malaysia Run. From the chart generated, the majority of the respondents gave positive answers, which means the game has functioned well. Question 1 is “I can listen the background music and sound effects”. There are 70% of respondents strongly agreed with the statement, while 30% of them agreed with it. Next, Question 2 is “The questions given in the game is clear and understandable”. 50% of respondents strongly agreed that the questions given are clear and understandable, 40% of respondents agreed with the statement, while only 10% of them disagreed with the it. Besides, Question 3 is “The function of the buttons in the game is well-working”. All respondents strongly agreed that the buttons in the game had functioned well. Lastly, Question 4 is “The character movement can be controlled easily”. There are 80% of respondents strongly agreed that they could easily control the character movement in the game, while 20% of them agreed with it.

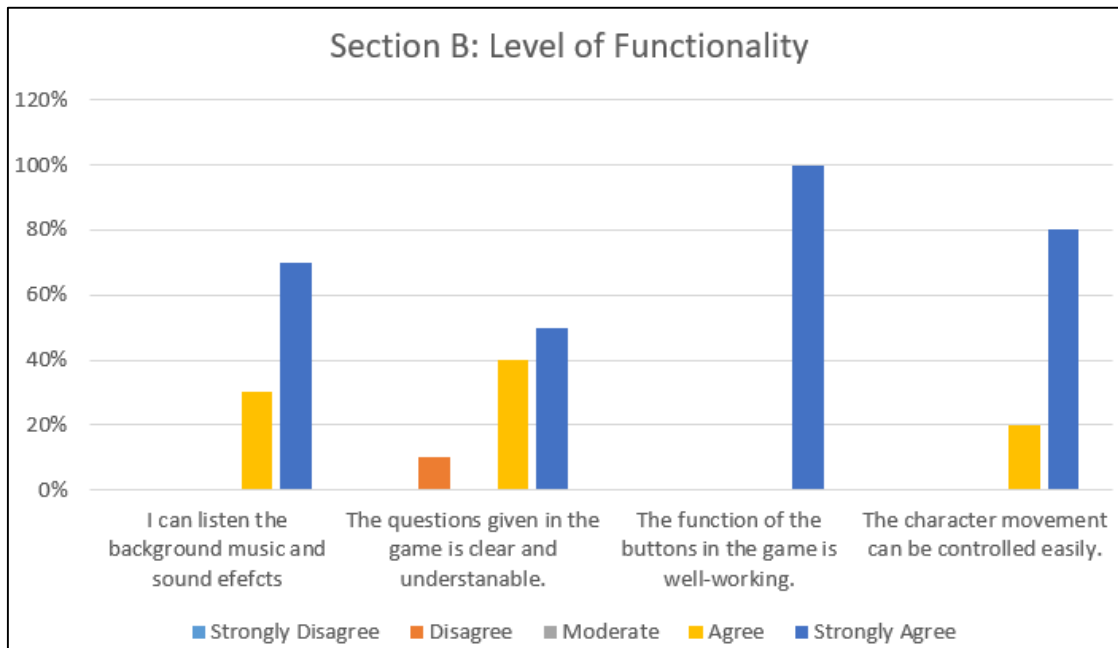


Figure 7. Analysis of Section B: Level of Functionality

Figure 8 reveals the analysis of Section C in the Beta Testing questionnaire with three questions to test the performance level of Malaysia Run. Question 1 is “The game is working fine and smooth”. From the chart generated, for the first question, there are 90% of respondents strongly agreed that the game is working fine and smooth, while 10% of them agreed with it. Next, Question 2 is “I enjoy playing the game”. There are 80% of respondents strongly agreed that they enjoyed playing the game, 10% of respondents agreed with the statement, while 10% of them claimed that the enjoyment of the game is moderate. Lastly, Question 3 is “What do you think about other states in Malaysia after you playing the game?”. The majority of them claimed that they know more about other states in Malaysia after playing Malaysia Run. At the same time, a user said that she had learnt the information via internet sources before. Plus, 20% of respondents said that the questions are a bit difficult for them.

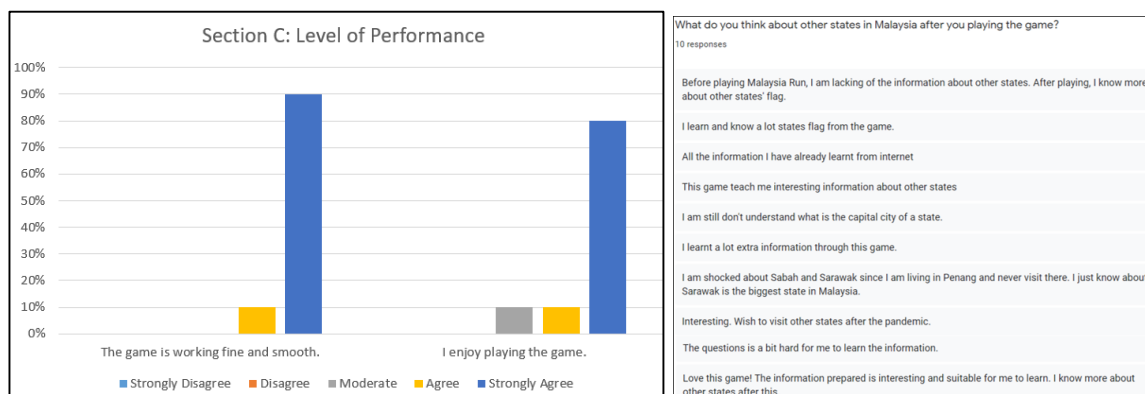


Figure 8: Analysis of Section C: Level of Performance

5. Conclusion

To conclude, Malaysia Run: Android-Based Running Game is suitable for children to learn and understand Malaysia’s information and characteristics while playing the game. Throughout the game, children can recognize the flag of each state in Malaysia and its capital city. Plus, Malaysia Run consists of Malaysia local content, which emphasizes Malaysia’s local buildings, including Petronas Twin Tower, Kuala Lumpur Tower, and Komtar Tower. The objectives of this project have been achieved. Plus, Malaysia Run has a few advantages, such as it has high level of user acceptance as the design of the game is attractive and colourful, as well as it applies background music and sound effects that provide instant response to the user.

In addition, as we all know, every coin has two faces. Therefore, Malaysia Run has its limitation too. First, the questions given in the game are a bit hard for users that are aged between 6 and 7 years old. Next, there is no booster that could be purchased to improve the game’s interesting level. Lastly, the questions asked in the game is in the same sequence and not randomly given out. After gathering the feedback from the testers, a few improvements that could be done in future to enhance the gameplay of Malaysia Run have listed out. The improvements include preparing a different list of questions according to the understanding level of users, adding on booster features into the game, and randomizing the questions in the game. Lastly, perhaps Malaysia Run can be continuously enhanced and really helps children to understand more about Malaysia.

Acknowledgement

The authors would like to thank the Faculty of Computer Science and Information Technology, Universiti Tun Hussein Onn Malaysia for its support and encouragement throughout the process of conducting this study.

Appendix A

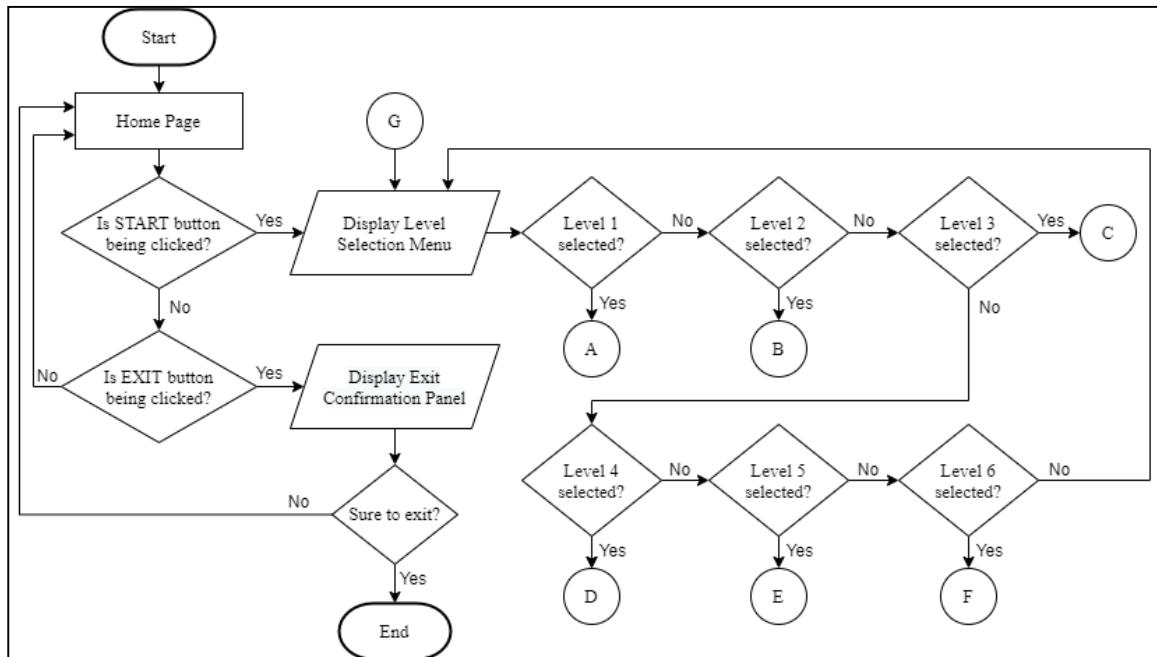


Figure 9: Main flowchart of Malaysia Run

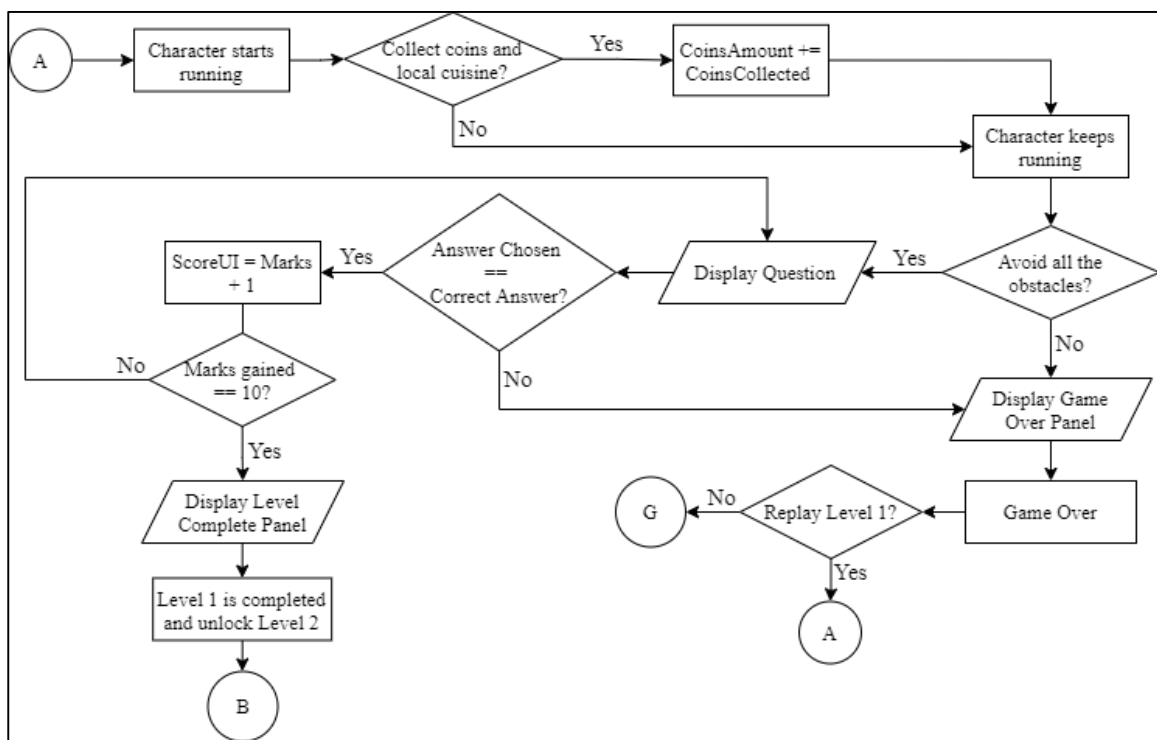


Figure 10: Flowchart of Malaysia Run (Level 1)

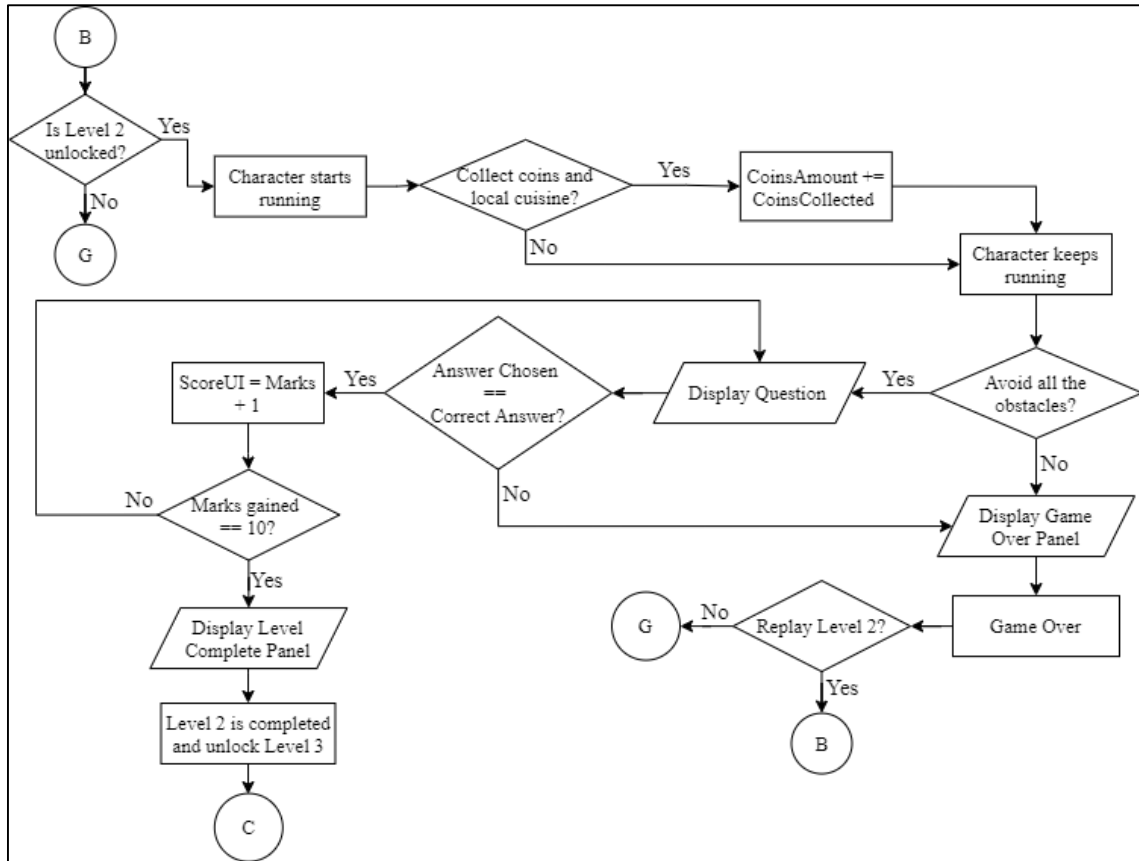


Figure 11: Flowchart of Malaysia Run (Level 2)

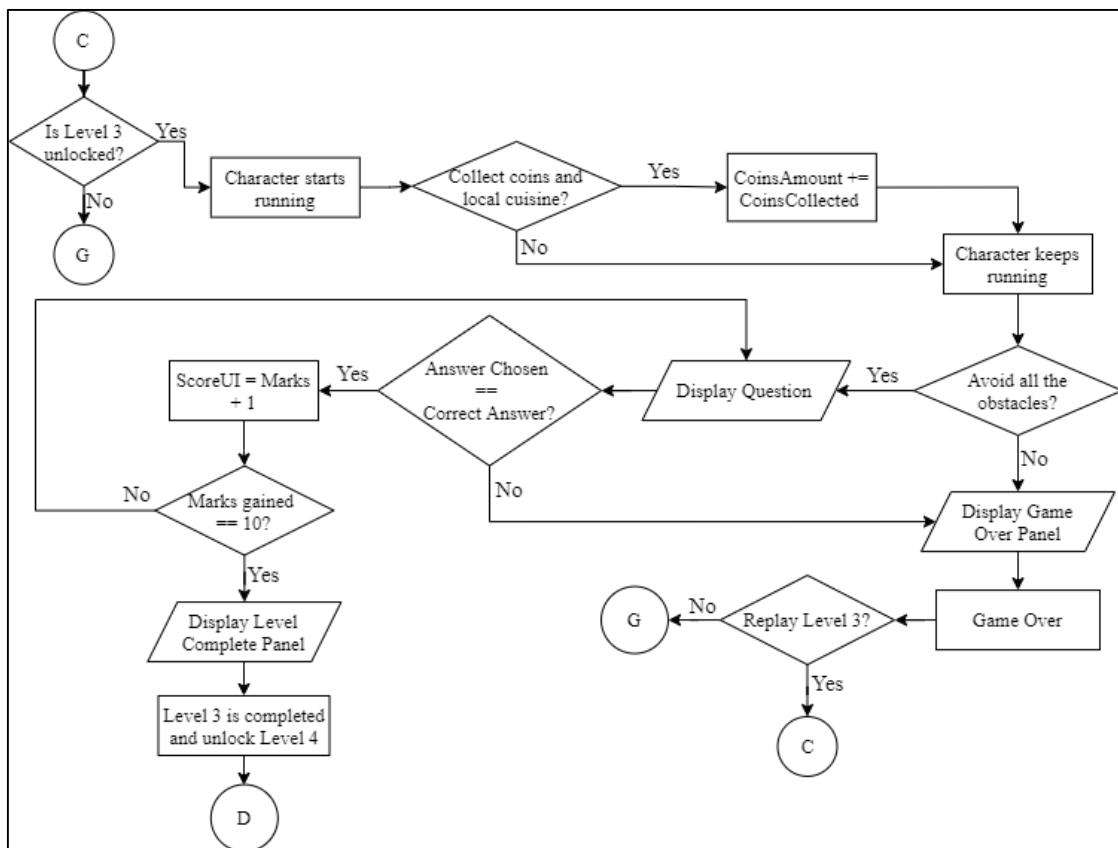


Figure 12: Flowchart of Malaysia Run (Level 3)

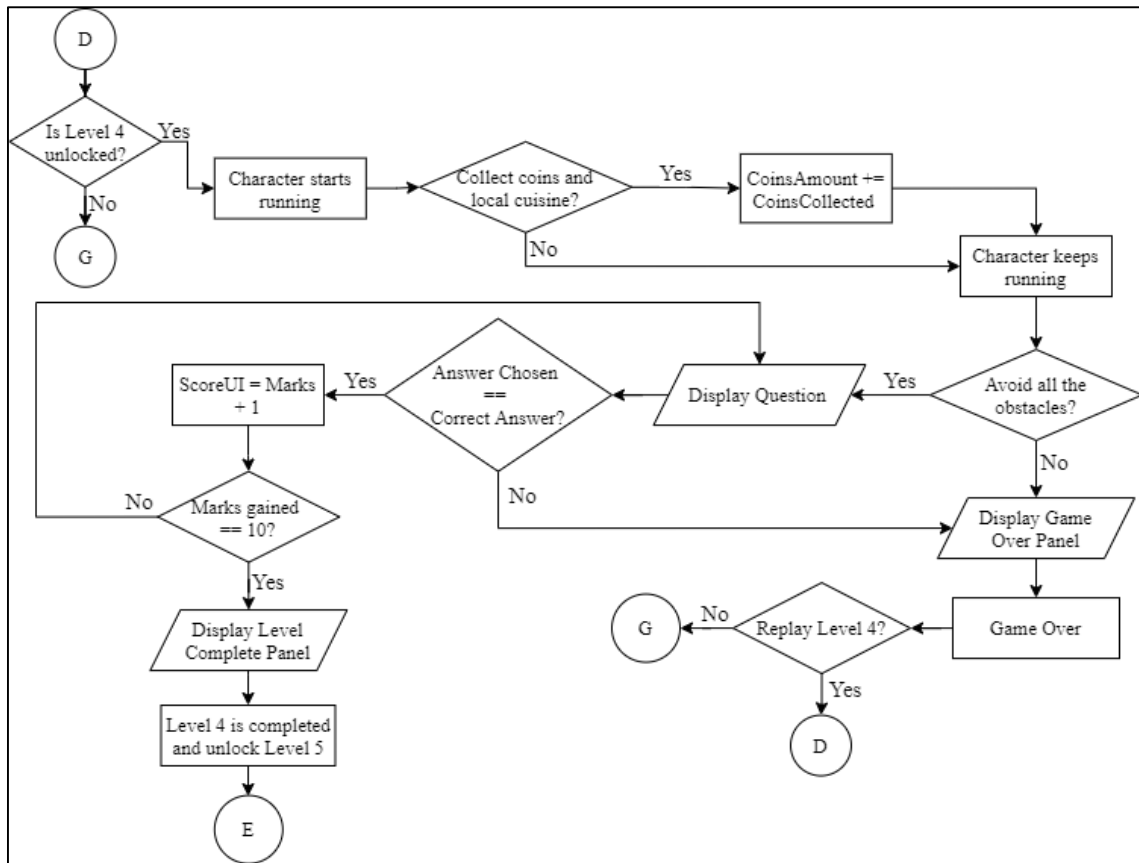


Figure 13: Flowchart of Malaysia Run (Level 4)

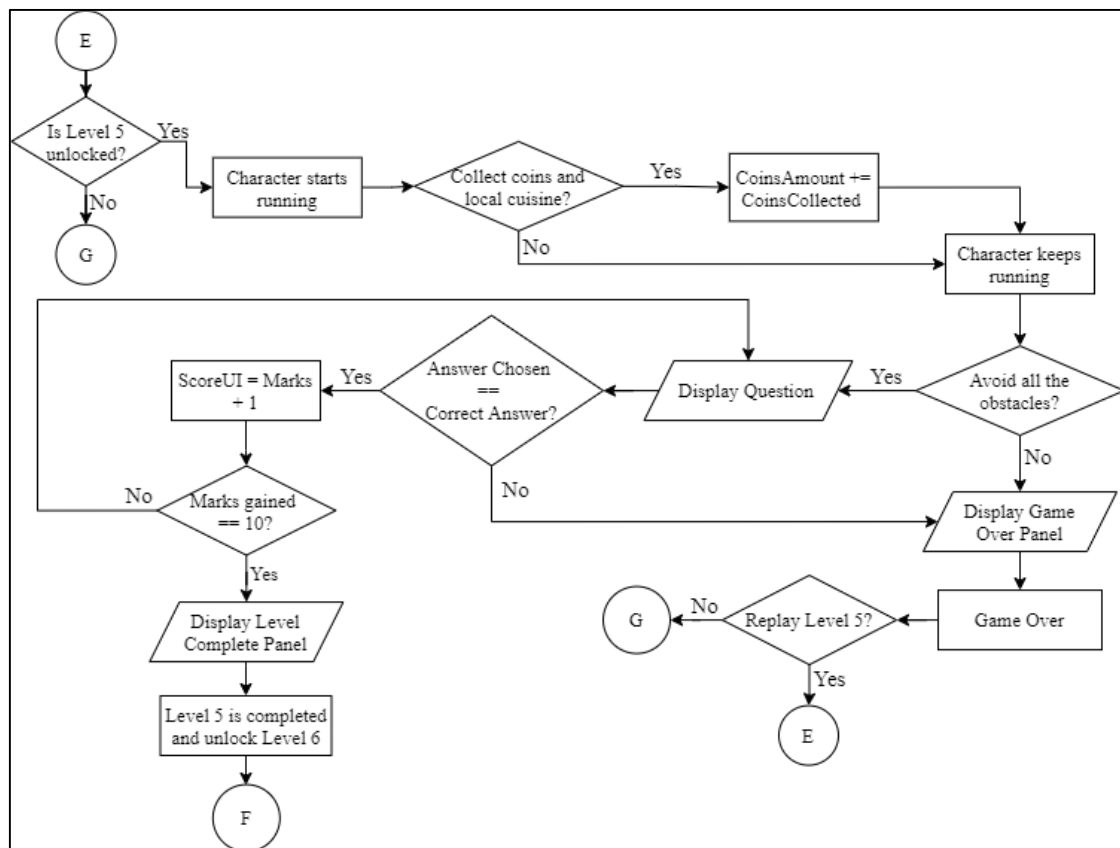


Figure 14: Flowchart of Malaysia Run (Level 5)

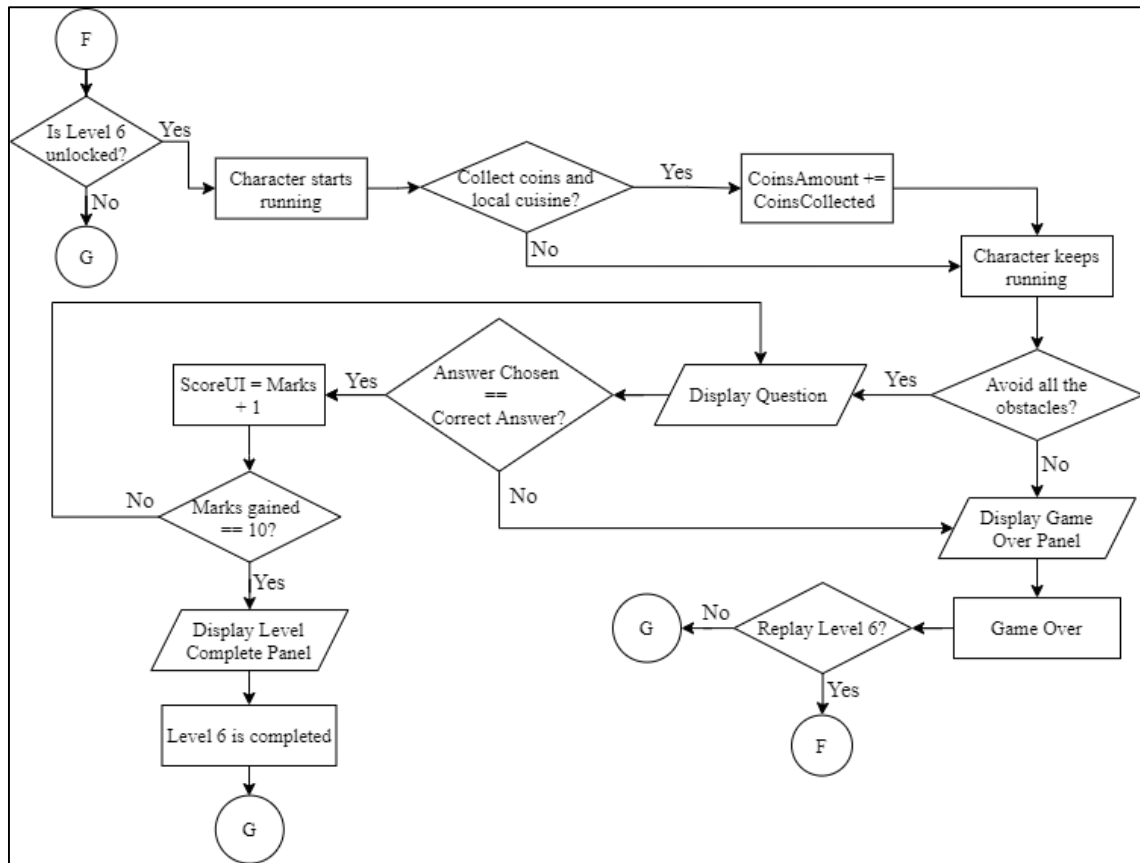


Figure 15: Flowchart of Malaysia Run (Level 6)

Appendix B

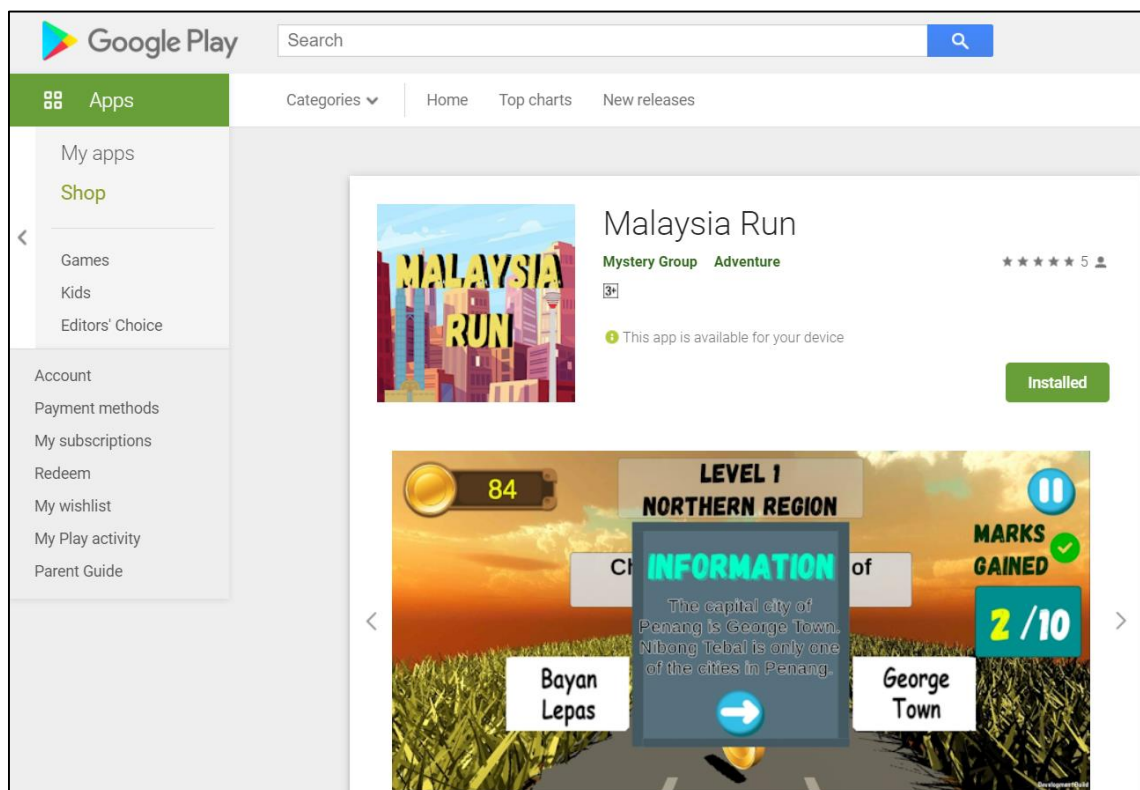


Figure 16: Malaysia Run on Google Play Store

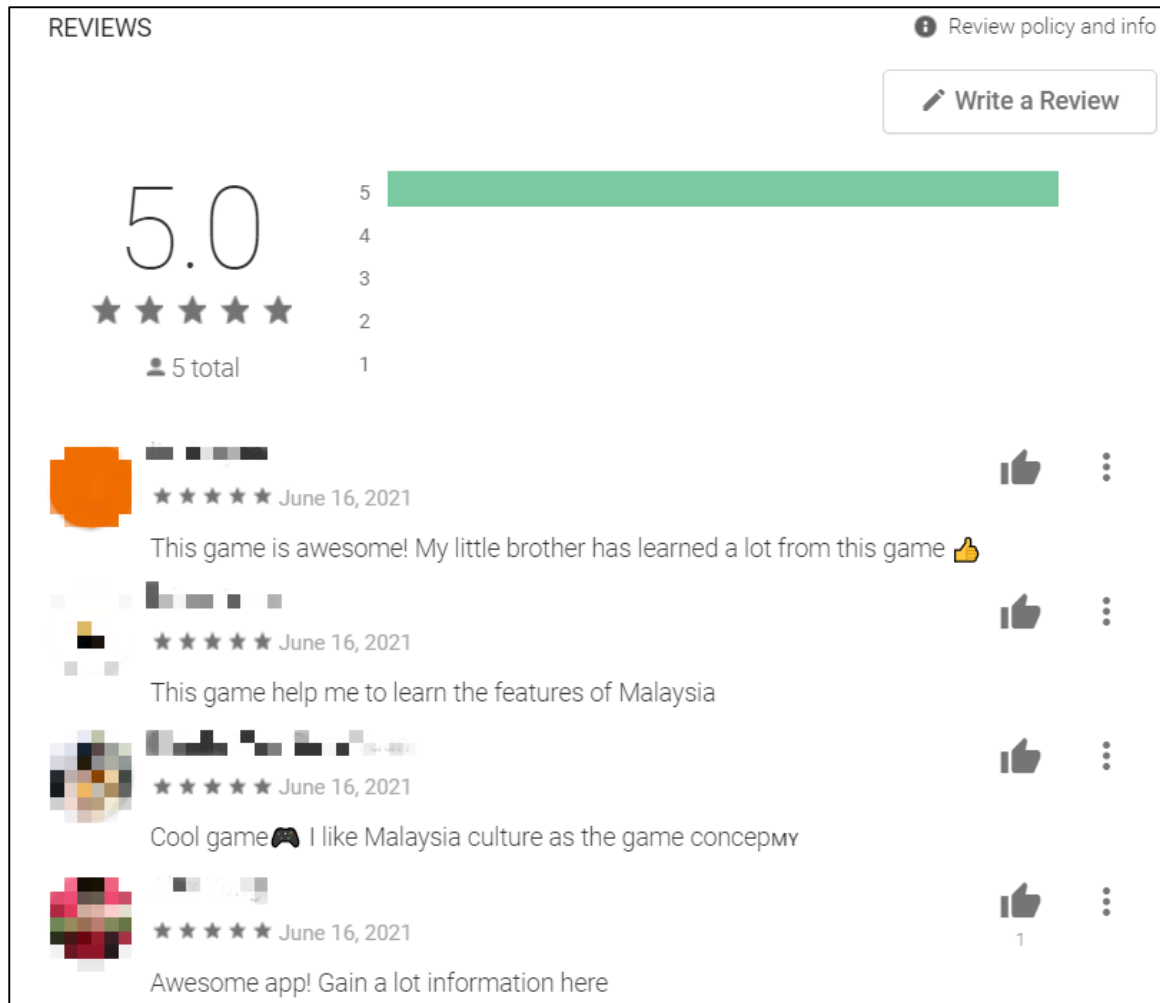


Figure 17: Malaysia Run reviews on Google Play Store

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