LAKBAY: A THREE-DIMENSIONAL GAME ABOUT DRIVING FUNDAMENTALS AND ROAD COURTESY AND SAFETY OF GEAR-1 DRIVING SCHOOL

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CHAPTER 1

INTRODUCTION

Background of the Study

Road accidents happen anywhere, anytime, with anyone. It is an inevitable circumstance that may or may not take or change our lives. It is important that we (both the pedestrians and drivers), as law-abiding citizens must be aware of the road's safety precautions and must strictly follow the rules and regulations. As for the drivers, they are the masters of the road and must be responsible for their actions especially in avoiding road accidents and taking into account the safety of the pedestrians.

The government implemented laws and regulations in order for us to have a safe and sound driving experience. The Filipino Driver's Manual of 2018 is a manual that guides motorists and all driver's license applicants in understanding the process of availing a driver's license as well as the importance and the responsibility of having it (Caguete, Sabela, Menis, & Garcia, 2018). The manual itself is in accordance with the Republic Act No. 4136 also known as the Land Transportation and Traffic Code of the Philippines which enumerates the traffic laws that all motorists (motorcycles, cars, and bike drivers) must follow on the road. Compilation of articles and chapters relative to land transportation and traffic rules to promote good driving practices not only applicable to the drivers but also to the pedestrians and law enforcers (Republic Act No. 4136 | GOVPH, 1964).

Along with this law is Chapter 2 of the Registration of Motor Vehicles which is composed of rules and regulations that an applicant is obliged to observe with regards to the issuance of a Drivers' License. Other sections of the law incorporate the preliminary provisions, responsibility for the registration and operation of the motor vehicles, and traffic rules which include the licensing and other operations related to this matter. Last August 02, 2017, President Rodrigo Duterte signed the extension of

the validity of the driver's license from three (3) years to five (5) years under the same law.

But sometimes all we need is to take the initiative and apply the following ideas: alertness while driving, avoiding aggressive driving, vehicle speed and distance, and special driving situations (Safe driving essays, n.d.). Reaching your destination safely requires attention, stay away from any distractions while driving, put down your phone, stay alert, and focus on the road. Self-control is one basic rule as a driver, there will be a lot of times that he/she will encounter unexpected confrontations on the road and one way to settle things around is having self-control (Safe driving essays, n.d.).

In concerned with this issue, the researchers proposed a study that will help the aspiring drivers and even the non-driver citizens by creating a three-dimensional game to better learn and understand the road (rules and regulations, signs, lights, and precautions).

Overview of the Current State of the Technology

Over the past few decades, Bacoor City earned its name as one of the most renowned cities in the province of Cavite. The city was known as "Bakood" during the Spaniards era and later became "Bacoor" which is now an official city in Cavite. As stated in (PhilAtlas, n.d.), Bacoor has an area of 46.17 square kilometers or 17.83 square miles which constitutes 2.93% of Cavite's total land area. Moreover, it is a coastal component city of Cavite consisting of 73 barangays and a population of 600,609 (Philippine Statistics Authority, 2016). The said figures represent 16.33% of the total population of the province making it the 14th most populous city in the country. Like any other city, Bacoor is also facing problems and issues with regard to governing the municipality. One of the said problems is vehicular road accidents which happen quite often.

Jeepneys, Buses, and Tamaraw FX Taxis are the common form of transportation for Bacooreños. Furthermore, Tricycles and pedicabs ply the different

roads in the said city. With that being said, commuters often take Jeepneys and the likes as their mode of transportation within different routes in and out of the city (About Cavite Province, n.d.). Based on Wikipedia Contributors (2021), Bacoor is described as a bedroom community with most of its citizens commuting to and from Metro Manila to work. The city is connected to Metro Manila by different expressways like the Cavite Expressway or CAVITEX and Muntinlupa, Aguinaldo Highway and Quirino Avenue, and other major thoroughfares. Considering the congestion of population of the city and its thoroughfares, it is most likely to say that Bacoor experiences daily heavy traffic frequently.

The following lists are the number of registered Vehicles in Region IV-A as of the year 2020 that falls under the category of cars with a total number of 200,845, UV with a total number of 291,874, SUV with a total number of 87,225, TRUCKS with a total number of 24,637, and BUS with a total number of 1, 481 for a grand total of 606,062. On the other hand, this is the number of registered motor vehicles, MOTORCYCLE: without Sidecar with a total of 771,461, with Sidecar with a total number of 238,635, Non-Conventional with a total number of 1,162, the Total number of Motorcycles/TCs/NCs with a total number of 1,011,258, TRAILERS with a total number of 2,687 for a grand total of 1,620,006 (eFOI - Electronic Freedom of Information - Request, 2021).

Road accidents ranked 8th as one of the main causes of death around the globe. As World Health Organizations (WHO) stated last 2018 in a global report, there were about 1.34 million deaths yearly from road accidents, and is the number 1 cause of deaths of people from ages 5-29 years old (Pino, 2019). The Philippine Statistics Authority (PSA) data, states that there were 194 deaths of young adults from ages 20-29 years old within 11,360 road-crash last 2017 (Pino, 2019). According to Center for Health Development Calabarzon (2019), last October 2019, CALABARZON (Cavite, Laguna, Batangas, Rizal, and Quezon) registered the highest transport vehicle crashes and road injury occurrences in the country with over 2,386 (16.5%) followed

by Central Visayas (Region VII) with 2,125 (14.7%) and the National Capital Region (NCR) with 1,556 (10.8%) as reported to the DOH.

According to Bacoor Traffic Management Department (2017), the main agencies reinforced by the government and is liable for maintaining peace and order are the Bacoor Traffic Management Department (BTMD) and the Bacoor Public and Safety Unit. Whilst BTMD as the highest local bureaucracy (department's status) has given the authority administer to the citywide implementation of ordinance especially about the implementation of traffic rules and regulations on the road. Additionally, securing a quality service in receiving and releasing Licenses, plate numbers, and traffic ordinance violation receipts are the goals of BTMD. They are also in charge to protect and secure the safety of motorists, pedestrians, and the public as a whole. Furthermore, the said department opts to constitute an equal ground of rights and duty with everyone (including Traffic Enforcers, Motorists, and Pedestrians) who are involved in the road in terms of rules and regulations implementation.

Statement of the Problem

General Problem

In particular, the study focuses on developing a Three-Dimensional Game Application about Driving Fundamentals and Road Courtesy and Safety of Gear-1 Driving School.

Specific Problem

In conjunction with the main problem, the following problems are expected to be given light throughout the study:

1. Learning in the current generation requires a new approach for the people to focus on, because of this, many people began to lose interest in the traditional way of learning and seeks an innovative platform to use.

    In our current generation, people are learning in a more "techy" and innovative style of learning. They are attracted to things that are

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appealing to the eyes, in which they find themselves engaged. Learning by reading tons of manuals and scripts might increase the boredom of the reader which can result in their loss of interest in the subject and poor absorption of the lessons.

2. The way of learning Traffic Rules and Regulations is through reading manuals and because of this, people get easily bored and tend to not absorb what they were reading.

   Nowadays, technology plays a big part in the education of the people. They seek a new approach to educate themselves using different devices or platforms. They prefer an innovative platform that will both educate and entertain them at the same time.

3. There is no existing game application in Gear-1 Driving School that promotes awareness to the people about Road Courtesy and Safety and Driving Fundamentals.

   Currently, Gear-1 Driving School has no existing platform or a game application that will educate people about Road Courtesy and Safety and Driving Fundamentals, because of this, their means of promoting awareness about Road Safety in a game will be enclosed to a narrow audience hence, people who are in-to-games are being left out the chance to learn in a gaming platform.

4. The lack of understanding of both Driver's and Pedestrian's Obligation on the Road causes misleading actions that result in unexpected risks or danger to them. Because of this, vehicular crashes happen frequently and endangers both the lives of drivers and pedestrians.

   Lack of understanding about Road Safety for the Drivers and Pedestrians will cause danger in their lives also, unawareness of traffic rules might result in frequent road crashes.

Objective of the Study

The overall objective of the study is to be able to develop a Three-Dimensional Game Application that will educate the citizens about Driving Fundamentals and Road Courtesy and Safety of Gear-1 Driving School.

The specific objectives of the system are listed as follows:

1. To develop a game application that will both entertain and educate the people in the current generation.

    The proponents created a game that is a visually appealing, educational yet entertaining platform that will challenge and gain the user's attention.

2. To develop a game application with Information Module that will convey Traffic Rules and Regulations effectively.

    This module will help the users to learn more about basic Traffic Rules and Regulations. The said module contains sets of Information about Rules and Regulations on the road.

3. To develop a game application for Gear-1 Driving School that will raise awareness about Road Courtesy and Safety and Driving Fundamentals.

    The proponents will develop a game application for Gear-1 Driving School that will help them to educate the people about Road Safety and Driving. Also, the application will help to broaden the range of audience for it will be a game application.

4. To identify possible reasons on how a game innovates the style of teaching Road Safety and Driving.

    This module will help the users to learn Road Safety and Driving and enjoy the application at the same time. The said module contains games that cover lessons about Road Courtesy and Safety and Driving Fundamentals that are both entertaining and educational.

Scope and Limitation

The Lakbay: A Three-Dimensional Game Application About Driving Fundamentals and Courtesy and Safety of Municipality of Gear-1 Driving School aims to provide a knowledgeable and useful application that can help and guide ordinary people of Bacoor about Road Safety and Driving.

Scope

The scope of the study revolves around the following:

Access Levels

User. The user is the one who controls the player in the game. The main goal of the game is for the player to complete every stage by meeting two conditions, the player must reach the target destination and meet the passing score of that level. Failing to do so, the player will have to redo the level. Upon finishing the stages, a Driver's License will be issued to the player as a prize for completing the game. Moreover, now that the stages are all unlocked, the player can choose freely on what stage he wants to play.

Functionalities

Below are the general functionalities that the system can offer. These enable the system to operate in different ways and communicate well with the users involved in the system.

Familiarization of Equipment. This refers to the review and familiarization of gears and accessories of the vehicle consisting of images with descriptions of certain equipment.

Introduction of Essentials. This refers to the presentation of the skills and tips on how to survive the game. Skills are assets possessed by the player that will help him/her in completing the game.

Tutorial Phase. This is intended for the new users of the game for them to be familiar with the flow. It is a simple instructional video tutorial on how to navigate and learn the basics of the game.

Scoring and Rating System. It is the numerical and graphical representation of the player's accomplishments in the game. The player will be rated and scored based on their score's percentage, number of correct answers, and how fast the questions are answered.

Leaderboard. This refers to the display of scores and rating of the player in every completion of a level from the late top scores to the recent ones. Each user has the ability to have their own playthrough in a game. The users' top scores will be displayed on the leaderboard in descending order.

Timer Per Question. This is a set timer per question of the game. It is another opportunity for the player to gain a higher score and ratings depending on how fast the question will be answered correctly. Additional coins as a reward will be sponsored to the player in every correct answer within the time limit. Failing to answer within the time frame will affect the score of the player if the questions will be answered correctly but not within the time frame.

Puzzle Fragments. This is a puzzle piece that will serve as a reward that the player will obtain after completing every mission. At the end part of the game, the collected pieces will assemble and portray a digital representation of a Driver's License template.

Driver's License. Upon finishing the phases, a Driver's License will be issued to the player as a prize for completing the game. It is a graphical representation of the player's license and reflects the information based on the user's inputted data at the last part of the game.

Linear Play. This is a standard gameplay phase consisting of levels wherein, the player must drive on the road and will need to answer every question that will pop up along the way.

Free-Roam Play. Is a new phase that will automatically unlock after finishing all the levels in Linear Play. In this phase, the player has the ability to roam on the map. It also includes the implementation of driving and parking simulation.

Head-Up Display. The User Interface elements are displayed on the screen. It includes the navigation and control buttons as well as other elements such as icons, indicators, main menu, etc.

Limitation

Putting aside the functionalities offered by the system, the following are the known limitations:

1. Lakbay is a free-to-play game application that can be used by anyone as long as they have installed the application on their mobile devices. This game has no age limit but is advised to be used by 18 years old and above.

2. The android application is strictly for only playing games. The hotline numbers of the national local government offices are provided in the game but it does not mean that it will call the agency directly. Gear-1 Driving School can not send notifications information to android users. Moreover, some part of the application needs an internet connection specifically to the social media accounts and official website of Gear-1 Driving School.

3. The application will only run on phones with an ARMv7 CPU with the minimum requirements: Android 5.1 Lollipop and higher versions, minimum memory(RAM) storage of 1GB, and storage of 300MB.

Methodology of the Study

RAD (Rapid Application Development) is a type of Agile software development model published in the 1980s. Its development was prompted by the shortcomings of regressive traditional development models such as the Waterfall Software Development Model. One major flaw in the waterfall model was that once the software

entered the testing phase, changing its core functions and features became extremely difficult (Deshpande, 2018).
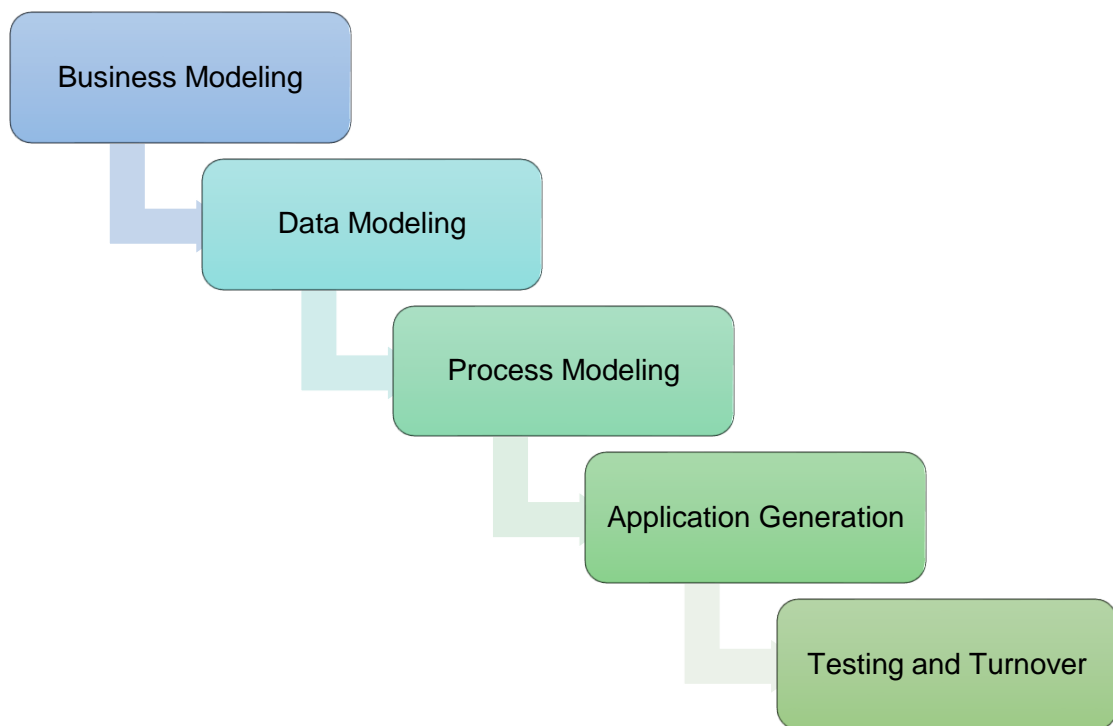
Figure 1: The RAD Model (Rungta, 2021)

The developers have chosen this methodology considering the evolving requirements of the software being developed. RAD or Rapid Application Development is the best solution to this issue, through rapidly developing prototypes for the testing of functions and features without affecting the result and providing functionalities such as change of design, adding/removing functionality, and cleaning by eliminating things you don't want to be included while keeping the result safe. It is an advanced developing model that provides more significance to rapid prototyping and quick feedback despite the length of its developing and testing cycle allowing the developer to create a quick software update and multiple iterations. RAD enables low-code rapid application development and yields a more convenient environment both in the competitive marketplace of technology and the lives of the developers.

This methodology will aid the developers to identify the possible problems that may arise in the development process of the system. RAD is focused on prototyping

and is acting as a substitute to design specifications, this implies that RAD modeling is best at User interface programs because RAD includes the Agile method and Spiral model (The Economic Times, n.d.).

Below phases are in the Rapid Application Development (RAD) model:

Business Modeling. The information flow is identified between different business functions. On basis of the flow of information and distribution between various business channels, the product is designed.

Data Modeling. Information collected from business modeling is used to define data objects that are required for the business. The information collected from business modeling is refined into a set of data objects that are significant for the business.

Process Modeling. Data objects defined in data modeling are converted to establish the business information flow to achieve some specific business objective process descriptions for adding, deleting, modifying data objects that are given. The data object that is declared in the data modeling phase is transformed to achieve the information flow necessary to implement a business function.

Application Generation. The actual system is created and coding is done by using automation tools. This converts the overall concept, process, and related information into an actual desired output. This output is called a prototype as it's still half-baked. Automated tools are used for the construction of the software, to convert process and data models into prototypes.

Testing and Turnover. The overall testing cycle time is reduced in the RAD model as the prototypes are independently tested during every cycle. As prototypes are individually tested during every iteration, the overall testing time is reduced in RAD.

Significance of the Study

The development of a Three-Dimensional Game Application about Driving Fundamentals and Courtesy and Safety of Gear-1 Driving School is believed to be beneficial to a certain individual, group of individuals, or organizations.

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Gear-1 Driving School. This study is significant to Gear-1 Driving School as they are the client of the study and they will be able to utilize the game application in teaching effective road safety practices and protocols to the students of their school that aspires to drive.

Drivers. This study is significant for aspiring drivers for them to have a portable, useful yet entertaining source of knowledge about Road Safety and Driving. Furthermore, it will help them to familiarize themselves with Traffic Rules and Regulations.

Cavite State University – Bacoor City Campus. This study is significant to the university as it will be recognized to be a part of the development of having an application for Road Safety and Driving.

Driving Schools. This study is significant to schools that educate aspiring drivers. It can help them in introducing basic Traffic Rules to driving applicants with the use of an easy and entertaining platform.

Local Government Institutions. This study is also significant to other Local Government Units as an inspiration to develop their own application pertaining to Road Safety and Driving or the likes

Researchers. This study is important to the researchers as they will gain more knowledge about developing an android application and about Road Safety and Driving. Moreover, it will help them to enhance their skills in developing a game application and aid them in their professional career in the future.

Future Researchers. The study is also important to future researchers and developers as it can be of help to become a groundwork in developing a new application relevant to the concepts of the system or serve as a related study for their manuscript.

CHAPTER 2

REVIEW OF RELATED STUDIES

Foreign Literature

Foreign Studies

Training predictive L2 processing with a digital game: Prototype promotes acquisition of anticipatory use of tone-suffix associations

Abstract

This study presents an educational digital game application whose primary objective is to provide training in predictive second language (L2) processing. During two-week testing, the prototype of the application was tested with L2 learners who lacking with the targeted anticipatory linguistics cue. The game concept focuses on the Swedish tone-suffix association and has mechanics that built based on the core process of language comprehension. As reflected under the test conducted to the learners, the result indicates that the game successfully promoted the learning of a novel L2 processing strategy. The study also stated that the more time the user spent on the highest level of the game, the greater accuracy gains.

Synthesis

This study's relation to the current study is that it is an educational game application that consists of testing or prototypes to satisfy the needs of the client. Moreover, both the game application has game mechanics and focuses on a topic which aims to benefit learners.

Reference

Schremm, A., Hed, A., Horne, M., & Roll, M. (2017). Training predictive L2 processing with a digital game: Prototype promotes acquisition of anticipatory use of tone-

suffix associations. *Computers & Education*, *114*, 206–221. https://doi.org/10.1016/j.compedu.2017.07.006

An educational game on the theories of driver education curriculum: An evaluation

Abstract

This study aims to evaluate the effectiveness of using a game application for students from driving school about their understanding of driving rules and regulations. An Educational Game on the Theories of Driver Education Curriculum (DEC) was an application developed to improve the visualization, understanding, and memorization of students about the theories about driving rules and regulations. The application also is preparation before taking the driving theory test. To develop the DEC application, the Game Development Life Cycle (GDLC) was used as a methodology of the study and the Game-Based Learning Evaluation Model (GEM) for measuring the effectiveness of the said application. The DEC application consists of initiation, pre-production, production, testing, beta, and release phases. The results of the study indicated that educational game applications helped the students to easily visualize, understand and memorize the theories of driving.

Synthesis

This study is relevant to the current study because of the topic that has been discussed or evaluated. The topic is about the effectiveness of a game application for improving driving students' understanding of driving rules and regulations. The said topic is somewhat related to the current study as its primary objective is to develop a game application that will educate and spread awareness for the driving students about their understanding of driving rules and regulations.

Reference

Othman, Z., Zain, N. H. M., Ismail, I., Affandi, S., Noh, N. A. M., & Yasin, A. M. (2020). An educational game on the theories of driver education curriculum: An

evaluation. *International Journal of Evaluation and Research in Education (IJERE)*, *9*(4), 1088. https://doi.org/10.11591/ijere.v9i4.20659

Interactive educational game, an android mobile app for children learning alphabets

Abstract

This study aims to develop and evaluate a mobile educational game application that supports fun learning for children. Laut ABC is an Android-based educational application that was described by the study. The said application is composed of attractive designs that aim to be a learning tool to help the children in learning the alphabet. Data collection, design, and implementation were used as research methods of the study. In designing the application, Storyboard and Waterfall Model for Software Development Life Cycle were used for the study. The results of the study showed that the educational application Laut ABC is an effective learning tool and alternative application for children in learning the alphabet in an interesting and a fun-learning concept

Synthesis

The relationship of this study to the current study is its objective which is to develop a mobile game application for users. Also, the study is relevant to the current one as it aims to develop an android-based educational application that will both entertain and educate the users. Moreover, the methods mentioned above like data collection, design, implementation as well as storyboard will also be used in the current study.

Reference

Salman, A. G., & Antonius, C. (2017). Interactive educational game, an android mobile app for children learning alphabets. *Library Hi Tech News*, *34*(5), 20–22. https://doi.org/10.1108/lhtn-04-2017-0021

Educational Game Application Development on Classification of Diseases and Related Health Problems Treatment in Android Platform

Abstract

This study aims to design an android based Klasifikasi dan Kodifikasi Penyakit dan Masalah Terkait (KKPMT) educational application to improved the students understanding about KKPMT course. The study stated the problem about the lack of reference exercise in learning KKPMT. Furthermore, the classification and codification of diseases and related problems is one of the competencies of a medical recorder. The study uses a pre-experiment, pretest, and posttest with the waterfall model as their methodology. The participants of the study were students in the medical field and as stated in the result of the study, it showed that after using the KKPMT educational game, the android game software helped the students in understanding the KKPMT subject matter.

Synthesis

This study's relation to the current study is that it also aims to design an android game application that will benefit certain users. It is an educational yet entertaining game application that will educate the learners about their understanding of a specific topic, for the current study the topic of study focuses on driving rules and regulations.

Reference

Rudy, B., & Hasti, N. (2017). Educational Game Application Development on Classification of Diseases and Related Health Problems Treatment in Android Platform. *International Journal of Advanced Computer Science and Applications*, *8*(9). https://doi.org/10.14569/ijacsa.2017.080919

The Application Of Cooperative Learning Methods In The Developing And Analyzing The Quality Of An Educational Game

Abstract

This study aims to develop an educational game application and show the quality of the developed application. Research and development was the methodology used in the study. The results of the study stated that the educational game application was developed using the CodeIgniter framework and consists of features mainly to assessed the students' learning cooperatively through playing games into teams category. Also, the test results showed that the developed education game application met the ISO/IEC standards in. functional suitability, performance efficiency, usability, security, reliability, and maintainability.

Synthesis

This study is relevant to the current study as it also aims to develop an educational game application for the students. Likewise presented in the study, the current study also aims to develop a game application that will help students to engage themselves in a platform that will both educate and entertain the users.

Reference

Novian, D., Dwinanto, A., & Mulyanto, A. (2019). The Application Of Cooperative Learning Methods In The Developing And Analyzing The Quality Of An Educational Game. *Journal of Physics: Conference Series*, *1387*, 012122. https://doi.org/10.1088/1742-6596/1387/1/012122

Improvement of student mathematics learning outcomes through Kahoot learning games application at elementary school

Abstract

This study aims to improve the students learning outcomes in mathematics through the use of Kahoot learning games application at elementary school. This study adopted from Kemmis and MF Taggart Model were conducted in three cycles for the fourth grade with 22 students at Public Elementary School in Tomohon, North Sulawesi, Indonesia. The results of the study stated that there is an improvement in students learning outcomes from cycles one to three. Moreover, it concluded that

Kahoot learning games helped improved the students' mathematics learning outcomes.

Synthesis

The relationship of this study to the current study is that it also involves the use of a game application for learning of the students about certain topics. As stated in the study above, it aims to improve the learning outcomes of students for their mathematics through the use of a game application. On the other hand, the current study aims to develop a game application in which will educate students about driving rules and regulations.

Reference

Umboh, D., Tarusu, D., Marini, A., & Sumantri, M. S. (2021). Improvement of student mathematics learning outcomes through Kahoot learning games application at elementary school. *Journal of Physics: Conference Series*, *1869*(1), 012124. https://doi.org/10.1088/1742-6596/1869/1/012124

Computer gaming and driving education

Abstract

This study investigates the learning effects of playing computer games such as racing, action, and other sports-category games. Specifically, the study focused on traffic school students driving behavior. Surveys were conducted at three driving schools and students were questioned about their gaming habits. The result of the study stated that experiencing computer games can have a positive effect on the driving performance of the students. It also indicated that experienced gamers were ranked higher with regards to overall driving skills compared to students with low experienced in computer games. Nonetheless, no evidence was found indicating that experienced gamers have a worse attitude towards other road users. Experiments done using a driving simulator reveals that it is possible to provide an entertaining game with serious content. Overall, the study needs further review into the

development and utilization of using computer games for education and traffic safety purposes.

Synthesis

This study's relation to the current study is that it also involves games and their effects on the driving behavior of the students of a driving school. As presented in the study, the current study aims to develop a game application that will both educate and entertain driving students about driving rules and regulations.

Reference

Backlund, P., Engström, H., & Johannesson, M. (2006, January). *Computer gaming and driving education.* Retrieved from https://www.researchgate.net/publication/228987973_Computer_gaming_and _driving_education

Games for traffic education: An experimental study of a game-based driving simulator

Abstract

This study aims to construct and evaluate a game-based driving simulator using a real car as a joystick. The feasibility of using a simulator as a learning tool has been evaluated. The results of the study were from an experimental study of games and traffic safety which was performed in an advanced gaming environment. During the car simulation sessions, data were collected and analyzed to investigate the possible individual and groupings learning effects and their differences. Overall, the study showed that a game-based simulation can be used to enhance learning about driving education.

Synthesis

This study is relevant to the current study because they both aim to construct a game-based driving simulator. Also, the study evaluated the use of a game simulator

as a learning tool for enhancing learning about driving education which is also present in the current study.

Reference

Backlund, P., Engström, H., Johannesson, M., & Lebram, M. (2008). Games for traffic education: An experimental study of a game-based driving simulator. *Simulation & Gaming*, *41*(2), 145–169. https://doi.org/10.1177/1046878107311455

CARLA: An Open Urban Driving Simulator

Abstract

This study introduces CARLA - an open-source simulator about autonomous driving. It has been developed to support the development, training, and validation of the autonomous urban driving system. CARLA provides open digital assets such as urban layouts, buildings, and vehicles. CARLA was used to study the performance of a classic modular pipeline, an end-to-end model trained via imitation learning, and an end-to-end model trained via reinforcement learning. The environment of the said driving simulator is composed of 3D objects such as static and dynamic objects as buildings, traffics signs, infrastructures as well as vehicles, and pedestrians.

Synthesis

The relationship of this study to the current study they are both games that support the learning about driving. Also, as stated in the study above, the game uses three-dimensional static and dynamic objects and assets that are also present in the current study.

Reference

Dosovitskiy, A., Ros, G., Codevilla, F., Lopez, A., & Koltun, V. (2017, November). *CARLA: An Open Urban Driving Simulator*. Retrieved from http://proceedings.mlr.press/v78/dosovitskiy17a.html

3D Racing Car Game

Abstract

This study describes a case study that focuses on developing a 3D racing car game based on Agile development methodology. It covers the implementation of real-time graphics, physics engine as well as background music and sound effects. Game designs and concepts in this study are developed and modified as the development of the game progresses. During the development process, the game concept evolved, as more and more features were added to the game. It is composed of initial concept and second iteration which varies and modified until a final concept was produced for the development.

Synthesis

This study's relation to the current study is that it also aims to develop a three-dimensional game. Also, as stated above, it uses Agile development methodology in which the current study uses RAD model which is a part of the Agile methodology and it covers the implementation of real-time graphics, physics engine and music and sound effects which are as well present to the current study. The present study's game concept also changes and modified until a final concept was produced for the game application development.

Reference

Runing, S. A., Hallman, M., Anderson, N., Andersson, S., Toft, F., & Nilsson, R. (2009, May). *3D Racing Car Game*. Chalmers. Retrieved from http://www.cse.chalmers.se/~uffe/bachelor/kandidatarbetestartpaket/3D%20Racing%20Car%20Game%20-%20Project%20Lloyd.pdf

Local Literature

Local Studies

Road Safety and Traffic Education (RoSTed): The Institutionalization, Certification, and Standardization of Road Safety and Traffic Education in the Philippines

Abstract

This paper is a part of a three-fold system for an orderly regulation of traffic situations in EDSA and is focused on the distribution of the driving laws, road safety, traffic education, institutionalization of Road Safety and Traffic Education (RoSTed) in Philippine schools and local communities including the professionalization of Public Utility Vehicles driver and issuance of Driver's license. Ensuring that everyone in EDSA the pedestrians and drivers will be aware of their rights and obligations is the goal of this paper by professionalizing the driving services provided by the drivers a Public Utility Vehicle building institutionalized training centers and driving schools in our country.

Synthesis

This is related to the study because the objective of the research is to educate the people about traffic laws and regulations and road safety by conducting the study.

Reference

Quito, B., & Quebral, V. (2016, March). *Road Safety and Traffic Education (RoSTed): The Institutionalization, Certification, and Standardization of Road Safety and Traffic Education in the Philippines*. Retrieved from https://www.researchgate.net/profile/Benjamin-Quito/publication/297715282_Road_Safety_and_Traffic_Education_RoSTed_The_Institutionalization_Certification_and_Standardization_of_Road_Safety_and_Traffic_Education_in_the_Philippines/links/56e1349108ae9b93f79c46d1/Road-Safety-and-Traffic-Education-RoSTed-The-Institutionalization-Certification-and-Standardization-of-Road-Safety-and-Traffic-Education-in-the-Philippines.pdf

The State of Road Safety in the Philippines

Abstract

The major causes of road crashes are human error (the drivers themselves and their vehicles), the road itself may also be the cause of the crashes. While high-income countries' road accident statistics are improving, the majority of developing countries' statistics are deteriorating. Most countries face the same transportation and traffic issues in terms of mobility, environment, safety, public transportation, and energy while developing countries suffer the most. Accident rates remain untreated in developing countries. In these countries, the focus on safety is overshadowed by other objectives such as infrastructure development for improved efficiency and acknowledging the need for a higher quality public transportation system. The recurrence of accidents is commonly used to assess a country's or region's level of road safety. The number of accidents (fatal, injured, or property damage) and accident rates are key aspects. The majority of accidents (72.44%) took place in the National Capital Region (NCR) or Metro Manila. In terms of rates per population, Metro Manila continues to have the highest rates, followed by Region 10. (Northern Mindanao). In terms of rates per registered vehicle, however, Region 10 ranks first, followed by Metro Manila. Traffic safety is a measure of how the road system is performing, given in terms of deaths per unit of travel, per registered vehicle, or unit of length of the road system. Because summaries and totals do not develop the relative degree for different sets of conditions, these rates are used.

Synthesis

This is related to the study because it is educational and it promotes awareness about road safety and its consequences if not observed.

Reference

Sigua, R. (2000, December). *The State of Road Safety in the Philippines*. Retrieved from https://cids.up.edu.ph/wp-content/uploads/The-State-of-Road-Safety-in-the-Philippines-vol.4-no.2-July-Dec-2000-5.pdf

LOGIT MODEL OF MOTORCYCLE ACCIDENTS IN THE PHILIPPINES CONSIDERING PERSONAL AND ENVIRONMENTAL FACTORS

Abstract

The aim of the study is to identify key personal and environmental variables in detecting motorcycle accidents in the Philippines, discuss the results to those in other countries, and suggest potential government interference. A total of 177 people were polled for information by the use of a survey in a licensing center in Metro Manila's largest city.

The model's variables were used to estimate the probability of an accident using logistic regression. Age, driving activity, and gender were found to be major determinants of motorcycle accidents. and the form of intersection. Accidents are more likely to occur in younger motorists. The Relevance of Age Similar models considered this to be trivial, which was surprising. The probability of an accident is predicted by driving conduct, specifically undertaking violations. Motorcycle accidents are also predicted by driving at t- and y-intersections. A special set of variables was discovered in the Philippines to determine motorcycle accidents. While previous research had demonstrated the impact of these variables on the risk of an accident, the combination was unexpected. Interventions aimed at these three factors may be prioritized by government agencies.

Synthesis

This is related to the study because the research discusses the road signs its functions and the road crashes themselves, this is also educating the people of the pros and cons of our actions on the road.

Reference

R. Seva, R., T. Flores, G. M., T. Gotohio, M. P., & C. Paras, N. G. (2013). LOGIT MODEL OF MOTORCYCLE ACCIDENTS IN THE PHILIPPINES CONSIDERING PERSONAL AND ENVIRONMENTAL FACTORS.

International Journal for Traffic and Transport Engineering, *3*(2), 173–184. https://doi.org/10.7708/ijtte.2013.3(2).06

A study on the road accidents using data investigation and visualization in Los Baños, Laguna, Philippines

Abstract

Road safety is one of the most important aspects of any country's daily economic development. It has a significant impact on public health, particularly in the Philippines. Safeguarding its protection would be extremely beneficial to a country's economic development. In Los Baños, Laguna, predictive algorithms such as Decision Tree, Nave Bayes, and Rule induction have been used to recognize factors causing accidents. The proponents acquired significant findings using these three classifiers: Decision Tree achieved 92.84 percent accuracy with 0.797 kappa, Nave Bayes achieved 91.50 percent accuracy with 0.741 kappa, and Rule Induction achieved 92.50 percent accuracy with 0.783 kappa. The researchers found that the accident's location has no bearing on the victim's casualty. Contrastingly, researchers discovered that the time and day of a road accident, especially a car crash, has a significant impact on the casualty and extremity of the accident.

Synthesis

This is related to the study because this research tackles road crashes, the time when crashes frequently happen, and the liability of everyone involved in the scene also it is promoting awareness for road safety and safe driving.

Reference

Asor, J. R., Catedrilla, G. M. B., & Estrada, J. E. (2018). A study on the road accidents using data investigation and visualization in Los Baños, Laguna, Philippines. *2018 International Conference on Information and Communications Technology (ICOIACT).* Published. https://doi.org/10.1109/icoiact.2018.8350662

Occurrence of Traffic Accidents in the Philippines: An Application of Poisson Regression Analysis

Abstract

A road accident is described as a collision between vehicles, pedestrians, or an object that results in death, injury, or property damage. Driver error (26%) was the leading cause of road accidents, followed by mechanical failure (12%), overspeeding (18%), a drunken binge before driving (1%), and damaged roads (5%). The number of traffic incidents during the day was found to be higher than at night.

The research looked at the number of traffic incidents from 2001 to 2006, and events were analyzed using the causes that predispose accidents. Using the factors of accidents and the time span of occurrence, an analytical model was developed to predict the number of accidents. Since a road accident is a rare incident with a positive integer number of occurrences, using Poisson Regression analysis to analyze the number of incidents with the factors of traffic accidents and the time of the incident.

Synthesis

This is related to the study because it is educational and it promotes awareness of road accidents and the most common factors of its occurrence.

Reference

Tamayo, A. M. (2009). Occurrence of Traffic Accidents in the Philippines: An Application of Poisson Regression Analysis. *SSRN Electronic Journal*. Published. https://doi.org/10.2139/ssrn.1438478

Understanding of traffic signs by drivers in the city of Manila, Philippines

Abstract

One of the most reliable control systems for guiding the safe and orderly movement of vehicles and pedestrians is by using traffic signs. These are required to provide drivers with route information, directions, and warnings. To express the

intended message, these should be explicit. This is a warning that all road users should be aware of. Road signals are often disregarded by drivers, and officials choose not to administer them. Correspondingly, the majority of Filipino drivers lack discipline, and traffic signs are given less weight. Furthermore, a large number of Filipino motorists were not able to receive adequate instruction, with a lack of understanding of various road signs as a result. Thereafter, a survey was conducted to determine drivers' awareness of such traffic signals. The objective of this study is to figure out what makes drivers different when it comes to reading traffic signs. The role of drivers' characteristics in understanding traffic signs in Manila is crucial to preventing the rising accidents in the city. In Manila city, 535 drivers were polled for the study. The findings revealed that there are a lot of drivers having a poor understanding of what traffic signals meant. 76.25 percent is the average comprehension of degree in terms of percentage right answers. The respondent's familiarity with traffic signs is largely determined by its abundance in the area where the respondent often travels and the simplicity of its nature, which allows the road user to quickly evaluate its purpose. The analysis also establishes the impact of socio-economic status and driving behaviors.

Synthesis

This is related to the study because this research is educational and is promoting awareness of road safety, the factors of road crashes, the importance of road knowledge, and the application of road laws and regulations.

Reference

Fernandez, J. J., Paringit, M. C., Salvador, J. R., Lucero, P. I., & Galupino, J. G. (2020). Understanding of traffic signs by drivers in the city of Manila, Philippines. *Transportation Research Procedia*, *48*, 3037–3048. https://doi.org/10.1016/j.trpro.2020.08.183

Larong Pinoy: An Android Game Application

Abstract

"Larong Pinoy: An Android Game Application" is a game developed in Unity 3D, designed in Adobe Photoshop and CrazyTalk Animator 2 for creating the characters. This game was intended to teach the younger generations of the different Filipino Traditional Games which are slowly fading in our era. The game was tested and evaluated by ten (10) IT Experts and Thirty (30) mobile users while the improvement and performance of the application were tested in conformance and compatibility test and was evaluated in Android Core App Quality (developer.android.com) with the criteria of functionality, performance and stability, and Google Play. The result of the evaluation was fair enough to tell that the applied mechanics and guidelines were met and it proved the game's purpose and capacity. The game was able to be recognized as fairly acceptable garnering an average score of 2.87 with a Standard Deviation of 0.09 and what's good about this game is that it can be played offline.

The project is a 3D game application developed in Unity Game Engine for the functions, Adobe Photoshop for the logos and designs, and CrazyTalkAnimator 2 for the creation of the characters and animations. The game was created to give information about the different Filipino Traditional games and can be played on android phones, also, this game contains history and mechanics on how to play and it makes things easier for the players.

Synthesis

This study is related to the game because it has the same objectives which are to provide information and leisure to the users. It also used Unity 3D for game development and Adobe Photoshop for the design.

Reference

Autriz, R. J., Casitas, M., Enriquez, G., & Nocon, K. N. (2016). Larong Pinoy: An Android Game Application. *International Journal of Computer Science and Information Technology Research*, *4*(2), 127–141. Retrieved from https://researchpublish.com//upload/book/Larong%20Pinoy-3123.pdf

CREATING A COMMUNITY BASED DISASTER RISK MANAGEMENT SYSTEM THAT HIGHLIGHTS RESPONSE METHODS AND RESOURCE ALLOCATION

Abstract

This study will help the community in dealing with disasters with the use of information technology. BDRMS or Community-Based Disaster Response System was given the name of Pandora 2 and it highlights the resource allocation and disaster response of Barangay Banaba in San Mateo Rizal together with Buklod Tao Inc. - a non-government organization. The purpose of this project is to assist the disaster response by supervising their present disaster resource allocation during flood and storm disasters and to provide post-disaster assessments and enhanced disaster preparedness with mapping as its concept using Google Maps Technology to carry on relief distribution in different evacuation centers and plot emergency exit routes, and the use of push and pull SMS Technology to enhance the existing process of the missing person's monitoring at the rivers water level and releasing of evacuation warning levels.

Another set for the business process for disaster response was proposed to be used in the CBDRMS and the findings of other standard Community-based IT solutions and research said that an improvement is needed with the current disaster response processes. This project is a continuation of Pandora 1 which is focused on disaster alleviation and preparedness phase of the cycle to Barangay Banaba with the intervention of the Buklod Tao Inc. and this project will serve as a model to local and national government units and non-governmental organizations to support the communities in response to disaster with the aid of ICT.

The proponents used RAD methodology for faster and quality development of the system. Considering that RAD depends on heavy prototyping and user-engagement resulting in modification of the system.

Synthesis

This is related to the game because it has the same objectives which are to enhance cognitive skills by providing educational materials in the game and the study also used RAD Methodology.

Reference

Tan, D. V., Reyes, E. L., Ricasio, J. C., Uy, J. V., & Pineda, V. (2013, March). *CREATING A COMMUNITY BASED DISASTER RISK MANAGEMENT SYSTEM THAT HIGHLIGHTS RESPONSE METHODS AND RESOURCE ALLOCATION.* De La Salle University Manila. Retrieved from https://www.dlsu.edu.ph/wp-content/uploads/pdf/conferences/research-congress-proceedings/2013/SEE/SEE-I-001.pdf

HiStorya: A Mobile Game for Araling Panlipunan

Abstract

The purpose of this research was to design and develop a game-based mobile learning system for the Araling Panlipunan (AP) subject to be used as a supplement for Grade 8 students. Its specific goal was to: 1. consolidate relevant information and knowledge about the K-12 curriculum in AP, specifically the a) topics discussed, b) teaching strategies/methods used, and c) teacher evaluation techniques. 2. To learn the students' game preferences; 3. Design and build an interactive learning application based on the a) AP curriculum of Grade 8; b) the students' game preferences. Figure 2 depicts the Android application's main menu. Play Games, Instructions, Sync, Update, Quit, Music Control, Stats, and About are among the menu items. The game categories are displayed in the Play Game menu. The player's game statistics are displayed in the stats. The player may upload his stats to an online database and this is allowed by the Sync feature, which the teacher can access for evaluation purposes. It also includes an update feature, which allows the player to download updated questions from the online database. Figure 5 illustrates the four levels of each game category. These levels correspond to the four AP curriculum units. To play the next

level, the player must first unlock it. The player must correctly answer the required number of questions to unlock a level. This feature is intended to make learners feel immersed and absorbed while playing the game, as well as to uplift them to continue playing and overcoming the challenges of each game level. The Quiz game consists of multiple-choice questions, and when the player correctly answers the question, a Trivia associated with the answer is displayed.

The Analogy Game allows the player to analyze how the images are related and choose the best word to describe the four images. The Memory Game category seeks to assess students' ability to acknowledge significant images related to Asia. An image is shown, and the player must identify what is being displayed.

Synthesis

This is related to the study because the objective of this research is to develop an android application game that promotes awareness of a certain subject also to build an interactive phase of learning with the users which will enhance their cognitive and locomotor skills by playing the game.

Reference

Nisperos, S. F., Miguel, Z. G. P., & Salvador, R. (2014). HiStorya: A Mobile Game for Araling Panlipunan. *International Journal on Open and Distance E-Learning*, *1*(2). https://doi.org/10.13140/RG.2.1.2759.4000

Quizzes: Quiz Application Development Using Android-Based MIT APP Inventor Platform

Abstract

This project focuses on the creation of an Android-based multiple-choice question examination system known as Quizzes. This application was created for educational purposes, letting the users practice multiple-choice questions for provincial and national examinations. The application's objective is to allow the users to practice for subjective assessments used for admissions and recruitment, focusing on the

Computer Science field. This quiz app has three main modules: (i) computer science, (ii) verbal, and (iii) analytical. There are several sub-categories within the computer science and verbal modules. This quiz has three functions: I hinting, (ii) skipping, and (iii) pausing/lifelines. A user can only use these functions once. During quiz play, it displays progress feedback, and at the end, the app displays the result. Students and learners are required to prepare for various examinations directly through the use of Smart-Phones and tablets in their hands. The primary goal of this project is to help students learn, gain, and improve their knowledge skills. Meanwhile, our application entertains them so that they can prepare for interviews, entrance exams, or any other corresponding purposes in a good mood and are not bored or frustrated by the dullness of the application. We created the application to allow users to take short quizzes using portable devices such as smartphones and tablets. The goal of this project is to create an Android-based system that includes the following features: I a question bank, (ii) a timer, (iii) lifelines, (iv) data storage, and (v) multimedia support (pictures, snapshots, tables). The goal of developing this Quiz app is to assist users in preparing for necessary educational purposes in the Computer Science and IT fields by making it accessible directly on their Android phones. Users can use our app to learn and prepare for interviews, tests, and exams on Android phones, as well as to increase their general knowledge of Computer Science, Verbal, and Analytical, anywhere and at any time.

Synthesis

This is related to the study because the objective of this research is to develop an android application game that promotes awareness of a certain subject also to build an interactive phase of learning with the users which will enhance their cognitive and locomotor skills by playing the game.

Reference

Zubair, M., Sana, I., Nasir, K., Iqbal, H., Masud, F., & Ismail, S. (2016). Quizzes: Quiz Application Development Using Android-Based MIT APP Inventor Platform.

International Journal of Advanced Computer Science and Applications, 7(5).

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CHAPTER 3

THEORETICAL FRAMEWORK

The theoretical framework of the study contains information about the existing theories and ideas that are used within the development of the study. It explains and gives elaboration to these concepts in order to facilitate a better understanding of the core concepts that build the game application.

Road Safety

Road crashes play a quite large percentage in injury and death tolls globally. For injuries, road crashes cause 20 to 50 million injuries every year. While the fatality that it inflicts reaches up to 1.3 million per year. These numbers alone are already daunting on many levels, but to simplify things, road crashes are the major cause of death among all age groups and are said to be the leading cause for the death of children and young adults from age brackets of 5 to 29 years old. Additionally, when it comes to economic status, countries with low-income have a higher risk of death rate when it comes to road crashes. Almost three times larger than high-income countries.

The number of people that can be affected by road crashes can be greatly alleviated by implementing road safety protocols and guidelines. Protocols that will mostly focus on aspects that are vital in roads such as drinking, driving, use of seatbelts, child restraints, and motorcycle helmets. On the other hand, for the government, plotting of right road signs, improvement in vehicle standards, as well as serving better emergency response can also save many lives (World Health Organization, 2018).

Driving Simulation

The prevailing technologies nowadays help in different endeavors and researches. One thing to consider as part of this is the advent of the development of

driving simulators. Driving simulators can be considered a sophisticated application since they can be used in different disciplines. Advanced driving simulators are used by engineers and experts in improving vehicle design. One of the other perks that a driving simulation can give is the ability to provide a safe testing environment that the user can interact. This prepares the drivers themselves before engaging in real-life driving. Thus, reducing the chance of causing accidents and road violations (Chang, 2015).

C# Programming Language

The C# programming language is what powers the development of the game. C# is a modern, type-safe, and object-oriented programming language. Modern because even though its roots came from the C language itself, the syntaxes that it incorporates are comparable to the known and popular programming languages nowadays, such as Java. The language allows developers to build applications that are robust and secure. This is because the language runs on the .NET ecosystem. The .NET ecosystem is the framework and runtime where the C# programming language is built. It contains several languages as well, and C# is one of them.

Another features why the C# programming language is considered an ideal language because of its Garbage Collection. This alone can make the application run efficiently while saving tons of resources. Lastly, the language is compiled first before it gets run. This ensures that applications built around C# are less prone to errors (Microsoft, 2021).

Adobe Photoshop

Assets and resources were used in making the game. Things such as images and icons and other graphic assets were made possible by using a multimedia application such as Adobe Photoshop.

Adobe Photoshop is a very popular raster image editing software application. It enables users and enthusiasts to complexly edit or manipulate images through the use of layers and numerous tools that are essential in the editing process. It was created by brothers Thomas and John Knoll in 1988. Later on, it was sold to Adobe Systems and was named "Photoshop." Adobe Photoshop now became the defacto standard when it comes to image manipulation and raster-based editing of images as it is packed with different comprehensive tools that can make anything possible through editing (Techopedia, 2017).

Visual Studio Code

Visual Studio Code or also known as VSC served as the game's Integrated Development Environment (IDE). Although VSC is not entirely an IDE it is capable of operating under such conditions.

Visual Studio Code source code editor or text editor that comes with developer tools such as IntelliSense code completion and debugging. It is a lightweight and fast cross-platform editor that allows developers to quickly edit and amend their codes. It supports various languages from plain text files to the known programming languages. It offers syntax highlighting, bracket-matching, auto-indentation, and more. It is also fully customizable aesthetically and operationally. Keyboard shortcuts can be utilized for faster workflow and development (Microsoft, 2016).

Android Operating System

The Android OS is a popular operating system that is mainly used in smartphone devices. It was written using the Java programming language and is based on Linux operating system, thus making it an open-source operating system that is contributed by different developers all over the world. It is now acquired and maintained by Google. The Android OS allows users to run different applications on their smartphone devices. This includes games as well since the operating system can

support both 2D and 3D rendering of graphics. Which makes the operating system suitable for running portable games on the fly (Techopedia, 2018).

Android Software Development Kit

The Unity Game Engine is integrated with Android SDK which is used for developing android applications.

Android SDK allows developers to develop and run applications on android devices. Android development now supports different programming languages in developing applications that can run under the Android operating system. Nevertheless, despite the preferred language, Android SDK is a prerequisite that is necessary for developing any kind of Android application. The Android SDK also provides tools that are required to emulate Android applications on other devices such as personal computers and laptops (Vaishnavi, 2019).

Unity

Unity is a game engine used by developers globally. It is a game engine that supports both 2D and 3D game development across different platforms. With Unity, one can develop a single code-based game using the C# programming language then run and build it into different platforms such as Android, iOS, Windows, Mac, Linux, and more. Unity comes with comprehensive tools that are necessary for developing games, so it also acts as an Integrated Development Environment. Additionally, Unity also allows quick prototyping through its built-in tools and free assets that can be downloaded from Unity's official Assets Store (Sinicki, 2021).

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