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Badminton: To Promote Badminton Sport Using Virtual Reality among Younger Generations

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Abstract: Younger generation in Malaysia has been widely exposed by digital media entertainment. With the existence digital media, it will may keep them away from socialize real time and appreciate the values of a healthy lifestyle. Badminton has successfully promoted Malaysia all around the world because it is a way to become professional player and providing spirit to the younger generation. The purpose of this research is to develop Virtual Reality (VR) and to promote badminton sport to the younger generation using immersive visualization. Therefore, we hope that this research will provide knowledge and to increase public awareness about badminton games to match to current lifestyle for the user.

Key words: Badminton, digital media, immersive, virtual reality, visualization, badminton games

INTRODUCTION

Badminton is one of the most popular games in the world. Now a days, badminton is usually played for recreational activities with their family or some friendly competition with their friends. It attracts regardless of age, gender and skill and can be played inside and outside the hall. Badminton requires rackets, shuttlecock and some equipment such as proper badminton court, net and badminton shoes. People are recommended to use extra protection on them to prevent injuries. Badminton is a game that requires quick reaction and a good level of fitness from the players. Players can learn and appreciate social and psychological benefits.

According to Mohd Harun Taib, stated that the badminton game was introduced in the late 11th century in Europe. The badminton game known as "Battledore" and "Shuttlecock" was introduced in 1890. Then replace "Battledore" and "Shuttlecock' to badminton and it was first played at Badminton House in Gloucestershire, Europe. Europe started to introduce this game to public because they want to create awareness about badminton to the whole world. Based on "Entertainment and Sports Programming Networks", badminton ranks 30th in world. This means some country is lack of popularity and not enough to be qualified to enter badminton world championship.

In Malaysia, badminton games are under supervision of the "International Badminton Federation" (IBF); 9 member countries were founded by IBF in 1934. The main event for IBF is World Championships Men's Doubles for Thomas Cup, World Championships Women's Doubles for Uber Cup, World Singles Championships and World Grand Prix. The most popular or legend players for badminton games is Lin Dan from China, Lee Chong Wei from Malaysia, Zhao Jianhua, Hariyanto Arbi (Heryanto Arbi), Yang Yang, Misbun Haji Sidek, Poul-Erik Hoyer Larsen, Taufik Hidayat, Liem Swie King and Morten Frost Hansen.

From the famous quotes from professional players, Lin Dan says, "Badminton is not only about winning. What is important to me is about playing hard, doing my best and putting up a good show for the spectators". He tells us about important things in putting all his effort into the game, not just by winning but also have good result to show to the world.

The overview: This project will come out with interactive media through Oculus Rift about guidelines of rules for badminton. The application is accessible as people can access by using Oculus Rift and remote directly and play it. This project includes information and immersive VR that can be interact the game menu directly using controller support. The application includes listings of Malaysian badminton players situated in Malaysia. The application facilitates the user a better understanding of how the badminton is important towards healthy lifestyle. The virtual reality application is to create a badminton rules and guideline for my smash badminton VR. This is the actual VR application for guiding user about the

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interact rules of the game and compiling all the information about badminton into one application. The purpose of this project is to develop a VR application called smash badminton VR and to increase popularity of the badminton that our apps had provided for user.

Lack of popularity of badminton game in virtual reality?

- Problems start from primary school and their parents
- Sports activities among students are decreasing because some of them are paying attention to academic and less likely to exercise
- Not producing students who are eager to compete and compete healthily
- Not acquainted and communicate well

How the effectiveness of the badminton game among younger generation?

- Having enough financial support from private sector, NGO and the government
- Needs a lot of investment in financial and equipment

Research direction: The age range is from 12 and above. Based on Wesley Yin-Poole, stated that Sony, the maker of PlayStation® VR, children could hurt themselves, accidentally, damage the product or product may contain small parts with sharp edges that may cause an injury or which could become detached and create a choking hazard for young children. I'm targeting the users who are able to play the game from early child with supervision from parents. Parents must take precaution before using the VR on young children.

Both gender for the user. There is no target religion or cultural for this application. The user that I am target to use the application (Alpha Version) is our client WBF and some selected user to test our product from Selangor and Klang Valley and then beta tester is for selected zone or region in Malaysia. The primary language of the user is in English or Malay. Ethnic for the user is a Malaysian user. Nevertheless, they must be an Android type of user. This smash badminton VR will be providing with supported with keyboard and mouse. Which mean, player can be played in Personal Computer (PC) only. For VR motion and DualShock® controller currently not supported because of limitation in financial support. We are currently developing that controller support in next update of our badminton game. Next of our limitation is badminton game doesn't have any multiplayer and skill tree for players. This thing will be implement in the next our update too. The initial and important information were identified as the followed process. Younger generation need to be provided with many digital platforms on badminton game application. In helping them to play the game with VR supported in PC and consoles.

Literature review: When comes to badminton, first thing we will know its benefits while playing it. Based on (Merrill, 2002) badminton requires physical fitness to stay in shape or to keep up with opponent. The 450 calories will burn your fat per hour while running, lunging, diving and ball hitting. This workout is best practice or alternative of cross-training exercises. In addition, badminton games will put you in developing athleticism and will grow stronger to defeat the opponent. This fast-paced nature of the game increases your speed and improves your reflexes. Intelligence is the main factor to deceive opponents in every shot. Besides that, it helps build-up muscle quads, glutes, calves and hamstrings on every match. Another than that, it will help to loss few pounds of weight because its fat-burning and metabolism boosting qualities. Without proper diet, it will useless. In badminton, it is good for our health. As they can see and feel, badminton can reduce or eliminate any risk or health problem such as high blood pressure, diabetes and obesity. It can also reduce your risk for coronary heart disease by reducing your triglyceride levels and increasing your "good" cholesterol.

One of our Malaysia's famous of badminton players is Misbun Haji Sidek was the first badminton player in the country to achieve international standards at the age of 24 years. His real name is Mohamed Sidek Bin Misbun. Born in 17 February1960 in Banting, Selangor. Throughout his involvement in world badminton championship, he showed dedication and was awarded some medals. A position he already held during the participation in world badminton is as Head Coach Badminton Club Nusa Mahsuri and Head Coach Singles Badminton Association of Malaysia.

The first country who dominates in the world of badminton is from China as China continued its dominance of Olympic Badminton in all five medal events during round of 16, quarterfinals and semifinals action (Buhler, 2016). Malaysia also has some domination from Lee Chong Wei. From the said that Lee Chong Wei continued his fine form to lead Malaysia into the Sudirman Cup mixed team quarter-finals. Chong Wei came out with guns blazing to shoot down K. Srikanth at the Dongfeng Nissan Sports Centre (Guan, 2015).

Virtual reality: Development of the game is being rapidly developed with existence of technology and its related to visual graphic. Therefore, the better quality visual graphic of a game gives more value to the game. With a new technology called virtual reality that allows the user to simulate on a real object using a computer that is able to evoke the atmosphere of the 3-Dimensional (3-D) that make the wearer as if physically involved.

Fig. 1: Head mounted displays such as "HTC Vive" (Taken from SlashGear website, https://www.slashgear.com/htc-vive-review-the-holodeck-you-always-wanted-05434792/)

For example, VR games are one of the interactive applications that involves the relationship between humans and computers or with humans and humans. Humans can communicate through a game if the games have multiplayer. With this technology, some people might want to try out virtual reality. Developers who create virtual reality games will give a demo based on peoples that interest in virtual reality. Developers need designing some frameworks or structure, full development environments and integrating every aspect before developing a VR. VR requires modeling, coding and execution into a single package (Bierbaum and Just, 1998).

Virtual reality requires a supporting device in order to run these technologies, one of which is the Oculus Rift. Oculus Rift is categorized as Head-Mounted Display (HMD) 3D; The device is worn on the head (such as glasses). However, inside there is a 7-inch widescreen. The screen gives users the experience of stereoscopic (3D), to give the impression of space. The left eye sees more area on the left and vice versa. As a result, both eyes are not overlapping each other, so that, the impact of vertigo, dizziness or nausea can be minimize. Virtual reality not only be implemented in the game this technology can be implemented in a variety of fields such as architects, medical workers, flight simulation pilots can even be used in the military field. VR is a set of interactive computer simulations that sense the user's position and augment the feedback to one or more senses, giving the feeling of being mentally immersed or present in the simulation (into virtual world). The scenarios described by the definition can be meet by modern computer systems through additional hardware devices to provide user position sensing, sensory display and programming of suitable interaction (Alan *et al*., 2015).

Immersive and VR: Immersion into the world of reality indirectly create a perception that to be physically present in the non-physical world. The perception is created by surrounding the user of the VR system in images, sound or other stimuli that provide an engrossing total environment. The virtual reality is used of the experience of submersion applied to representation, fiction or simulation. Immersion can also be defined as the state of consciousness where a "Visitor's" or "Immersion's" awareness of physical self is transformed by being surrounded in an artificial environment; Used for describing partial or complete suspension of disbelief, enabling action or reaction to stimulations encountered in a virtual or artistic environment. The degree to which the virtual or artistic environment faithfully reproduces reality determines the degree of suspension of disbelief. The greater the suspension of disbelief, the greater the degree of presence achieved (Malagaudanavar, 2014) (Fig. 1).

Advantage and disadvantage virtual reality: Some of VR can be actually good for health on someone who use it. Some of these are:

- Can be used as a simulation tool to train doctors
- Useful for the military to conduct a simulation test of war
- It was the technology of the future and will be able to continue to grow
- Able to provide for the development of the game industry

There is have some negative impact on VR. Some of these are:

- These devices are very expensive
- The new technology, so that not everyone can use it
- Vertigo/eye problems, some people have focused on issues of screens in virtual reality headsets and other suffering an eyestrain. Most people should be familiar with this from time to time

Application of VR

Training: Sport is one example in VR training. Virtual reality has to offer sports fans in to the game but it also gives them unprecedented control over how they see the game. What the public has come to expect from virtual reality is immersion and the sensation of being in an exciting far-away place while sitting in a recliner at home (Johnson, 2015). VR is an advance technology that tracks body movement and updates the sights, sounds and touch into computer generate movement and user feel like they mentally transported into a different place. Virtual reality replaces any senses with ones generated by a computer. When virtual reality is doing well they measure exactly how the body moves and replicate the senses for those movements (Zorowitz, 2015).

What was we seen as fantasy, virtual reality technology is quickly entering the sports world and it is revolutionizing the way coaches conduct practice and train both young and veteran players. Things that would only have lived in someone's imagination 20-25 years ago are now becoming realities.

Entertainment: With the number of virtual reality providers growing each year, the chances that there will soon be an affordable platform widely available for home users increases every day. The entertainment industry was one of the first to utilize virtual reality technology in real world applications and it has probably produced the most hype about the technology. The idea of entering an immersive virtual environment where anything is possible gives game designers a completely new dimension to work with (Darell, 2015). It can make games look and feel more like the "Real" thing which is for many gamers the ultimate goal.

Devices that will use in VR: The absolute minimum of information that immersive VR requires is the position and orientation of the viewer's head, needed for the proper rendering of images. Additionally, other parts of body may be tracked such as hands is used to allow interaction. The field of tracking device includes tracking of the movement made by the eye. Since, it is a bit more complicated as it involves the line of sight and field of vision, it requires different set of devices for tracking the movement (Fig. 2).

Fig. 2: Device controller such as "HTC Motion Controller" (Taken from Business Insider website, http://www.businessinsider.my/htc-vive-price-and-availability-2016-2/?r=US&IR=T#TUho6yw3yoEHFoMg.97)

Ethical code of conduct for VR: Based on Gutenberg theory which refers to concern for consumers of VR they call for long term studies into the psychological effects of immersion. They see a special danger with particular content such as violence and adult themes where the advanced technology increases the risk of psychological trauma. Users should be clearly informing of these dangers as well as risks of hallucinations, personality changes and the powerful unconscious influence of advertising in VR (Guarino, 2016).

Motion sickness: Now a days, VR companies and game designers are working on solution to settle stomachs using technology and visual tricks to override the human perceptual system. Developer's aim of VR is to immerse users in an experience so real and so, tangible they forget about the real world. However, there have some weaknesses, like motion sickness. It is unclear that how many people experience motion sicknesses from VR headsets. According to Tracy Moore says that, it's not a large percentage of users but it affects enough people that it can't be brushed off as an anomaly and Virtual Reality (VR) headsets aim to immerse users in an experience, so real and so tangible they forget about the real world. However, for those who experience VR motion sickness, nothing reminds them of reality more. Now, VR companies and game designers are working on a number of fresh approaches to settle stomachs, using technology and visual tricks to override the human perceptual system. Simulator sickness is not that different from seasickness in that it involves discrepancies in the vestibular system of fluid filled canals inside the inner ear, compared with what user's brain can see.

Overcome vr motion sickness: Oculus rift is a device that connected our vision and hearing into virtual world. Nevertheless, some users have motion sickness when using Oculus Rift. It must take very serious precaution to prevent this to happen while playing.

There are several ways to reduce Oculus Rift motion sickness (Brown, 2017). Firstly, use Q/E in games when available using joystick. Since, motion sickness is a major issue for the developers, Oculus Rift games have the enhanced feature that can quickly move your character while turning by pressing Q or E key. Next is reduce speed on user's character. This will help to reduce nausea by moving user's character at a low speed. Excitement increases the brain activity and thus increases the chance of feeling sick. In addition, user's must take a break while using Oculus Rift after 30 min or is about to feel dizziness. More exposure would tend to cause more sickness. It is suggesting that you take frequent breaks during your games and give your brain the time to relax.

Case studies

Space badminton steam VR: Space badminton is the world's first VR badminton simulation. It will test user's true badminton skills against a sophisticated and skilled artificially intelligent space robot. Users will fight against the AI robot to become the badminton champion.

Space badminton requires users to use Oculus Rift and joystick to control the movement in the game. Users are able to move freely in game before starting the match and have Ai Robot as opponent. Users can sharpen their skill and have immersive graphics (Fig. 3).

Strength:

- Ai seems like pretty advance in some movement and serve
- User can jump higher to serve the ball
- Nice graphic

Weakness:

- They not showing a tutorial before playing with AI robots
- No crowd is appeared
- Single match is available only
- Their points are not following standard points that sets from BWF
- There is no Fault system if user hit the net
- Hard to use without tutorial

Case study 2

Description: First person tennis is the first tennis simulator developed for HTC Vive and Oculus Rift (Fig. 4). Now, user can play on a real tennis court and face professional tennis players (Fig. 5). User will have to show all your technical and tactical skills. The game is designed for gamepad or keyboard to allow players to choose most suitable device.

Fig. 3: Space badminton steam VR

Fig. 4: Character selector using HTC Vive

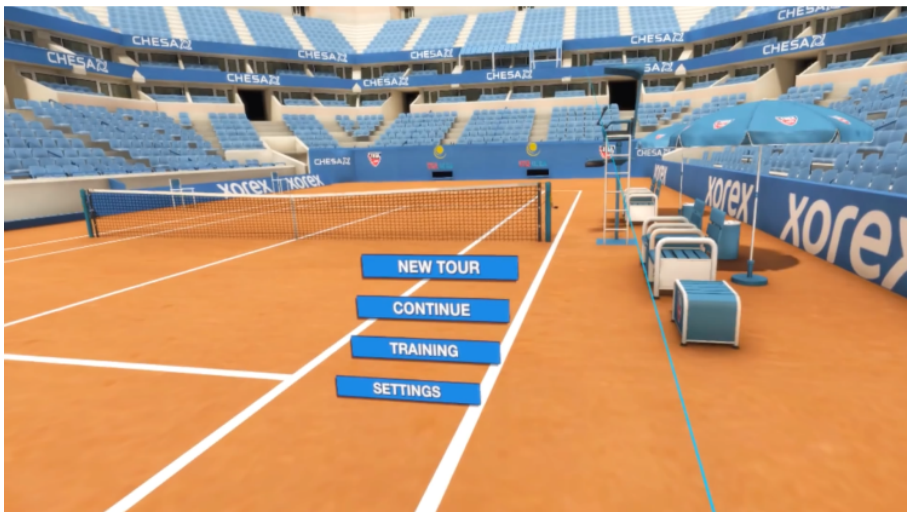

Fig. 5: Main menu in first person tennis

Fig. 6: VR tennis online gameplay serving the ball (Taken from Oculus website, https://www.oculus.com/experiences/rift/918077621641725/)

Strength:

- User feels like they are plays like professional player
- Feels like real situation where crowd shouting at the user if user or AI score the game
- User can serve the ball just like in real life
- The game use real scores that is set by International Tennis Federation (ITF)

Weakness:

- Too much crowd
- Level of detail or graphic is unsatisfactory
- Too hard to catch the ball when AI serve to user
- Another AI like standing outside the court isn't moving

Case study 3

Description: A new online multiplayer tennis game from COLOPL (developer's company). User can choose from eight unique players and enjoy a mix of realistic strategy and arcade thrills (Fig. 6-8). Simple controls include four base shots and an assortment of Killer techniques.

Strength:

- Impressive level of detail
- Have bigger scoreboard and in-game camera board
- User can have power up after swing the ball perfectly
- Crowd will support user if user making a good progress or after swing the ball
- AI outside the court will determine whether user making a false move after user serve the ball

Fig. 7: Green point mark perfect hit

Fig. 8: Scoreboard user

Weakness:

- Third person view only
- It is set up to 3-character selector
- Only English is supported
- Have too much bugs where user can become stuck after winning the game

The findings from case studies: Based on research of the case studies, the requirement of this research will be collected and gathered and finally to be analyze (Table 1).

Table 1: Analysis of case studies

Case study and data	VR badminton	First person tennis	VR tennis online
Graphics	3	4	5
Interactivity	2	3	4
Content	2	3	4
Typeface	3	4	3
Interface	4	3	4
Color	4	2	5

Range level: 1-5 (Not interesting to very interesting)

All of the case studies has been tested and the information collected will be used in the project.

Overall for this chapter, all of the information includes case studies were identified. Every data of the findings from case studies were collected and will be carefully improved to be used for this project. Based on the Table 1, we found out that VR tennis online is most suitable to use as our reference because no one making a good badminton VR in history. We will develop and implement some of VR tennis online into our VR projects and we will make sure that we are able to deliver a complete prototype based on our interest and objectives

MATERIALS AND METHODS

Research methodology are part important in research. Research methodology is a scientific and systematic search for pertinent information on a specific topic. In fact, research is an art of scientific investigation (Merrill, 2002). This section will cover about research methodology and how each phase is use according to propose VR based on finding information, designing, implementation, output and input specification and result just like techniques and method in ADDIE Model.

The main objective of this study was to educate user on how to play badminton properly and to increase Badminton popularity among younger generation. This research highlight the research and client answered the questionnaires. The questionnaires are design to meet the objective of this study. The qualitative data for research come from interviews and observation. In addition, it's include flowchart, character design, questionnaire and costing for the project.

ADDIE Model: ADDIE is referring to Analysis, Design, Development, Implementation and Evaluation. ADDIE model delivers procedures that will manipulate the whole project development. The ADDIE design model breaks into 5 phases:

This ADDIE Model in our VR research with some challenges VR in education. The ADDIE Model describes the perspective on design-based theory, process and procedure and one recommended approach when considering the design for VR. When first designing an instructional project with VR, most educators might consider traditional design models and principles and this consideration might include the ADDIE approach or Merrill's first principles of instruction (Fig. 9).

Analysis: In analysis phase, the developers make a list of potential client for the project and make first appointment with BWF. We make random question to client that

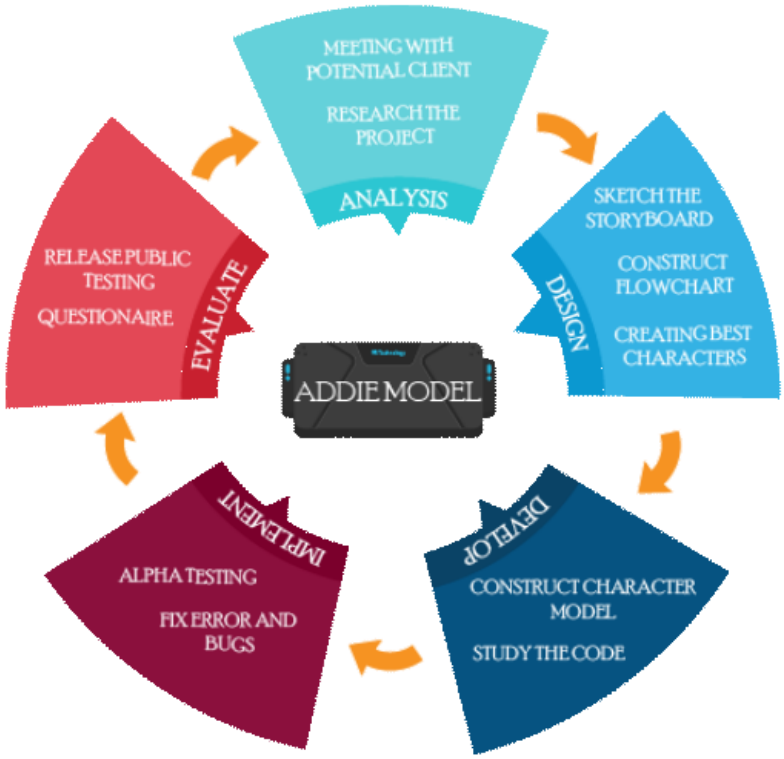

Fig. 9: ADDIE Model for VR badminton application

Fig. 10: This is Mr. Danial Johan and Mr. Amer (Cameraman) attending motion capture class in UPSI

related to our VR. After meeting with potential client, we should do some research about the badminton how to play badminton and increase badminton popularity based on practices, player's biodata and introduce BWF. After all research and survey are completed, we could analyze and understand what clients wants in our VR. This analysis will make us save huge amount of courses, effort and time. Another method is by seeking help from UPSI with their motion capture. We will collect information as much as possible.

Design: With our client's objective and product outcome that related to their condition, we come to the design phase. We begin to sketch some storyboard design. We would construct flowchart which is the main structure for our product outcome. Then we make a second appointment for our client to choose best character design that is required by their condition, so, we can move to development process of our project.

Development: In development process, we could study the codes that can be run on unity 3D to make sure it related to our client's condition and objective. The design was implement into our project software called unity 3D with the navigation by using controller. Once we enter development stage, we must concentrate and very carefully with our project, so that, we cannot do any mistake that could take more time and we are behind schedule if we are late. After our client is satisfied with our designing and developing, we can now move on to the next stage.

Implementation and evaluation: Our client has decided to do full implementation with our project on specified date and time. After doing, so, we can make a closed test called alpha testing. Only the developer has the right to do alpha testing with limited number of person. In this test, we are able to carry out the error and apply a patch. It will make our system stable for future releases. Next, after identify several difficulties and error; We will publish to public with tag Beta release. This will ensure that our customer is satisfy enough or not for our VR. We will start give a questionnaire about 10-20 person to test and evaluate our mobile application.

Collaboration with Universiti Pendidikan Sultan Idris (UPSI): Universiti Pendidikan Sultan Idris (UPSI) was established on May 1, 1997 under the Universiti Pendidikan Sultan Idris (Incorporation) Act 1997. Universiti Pendidikan Sultan Idris (UPSI) is located at Tanjung Malim, Perak Darul Ridzuan. UPSI has two campuses Campus Sultan Abdul Jalil Shah (KSAJS) and Campus Sultan Azlan Shah (SAH) is incomparable in educational leadership based glorious history and lead the global change.

Motion capture: Motion capture and computer animation techniques have made significant progress in game and film industry. Detecting movements of people in 3D and displaying it in a 3D virtual scene is a research problem. In motion capture, we always use marker based motion capture. This will make computer generate bone looks smooth and not facing any 3D Model skin stretch or broken.

In UPSI, myself (Fig. 10) learn a lot from Dr Nizam that guided us to explore and understanding motion capture. His classroom located at Dewan Rahman Talib.

Fig. 11: Dr. Nizam classroom in motion capture courses

Fig. 12: Dr. Nizam (left) and his assistant Mr. Nazri (right) guiding about motion capture

Total about 33 students (Fig. 11) from UPSI were among the selected respondent related to motion capture course under the supervision of Dr Nizam.

Before using motion capture, there have step by step. Step 1 is we need an actor and wearing complete black suit/green suit. Actor playing an important part to do movement in motion capture. If not, the smoothness of the computer generate bone will not achieve satisfied result. Step 2 is wearing small strap marker on each bicep point. This will have allowed motion camera to capture any movement from small marker that attach to actor body (Fig. 12).

There are two ways for motion capture, marker based motion capture and marker less motion capture (Fig. 13). The marker based motion capture has many drawbacks, the major drawback is that the performer has to wear a suit that consists of sensor or markers on it and the process consist of handling multiple cameras placed in a room, hence, marker less motion capture has become a major area of research. In marker less motion, capture the performer does not have to wear a suit but still marker less motion capture is a challenging task (Fig. 14).

Software: Motion capture use motion builder, vicon blade and 3D Max 2017.

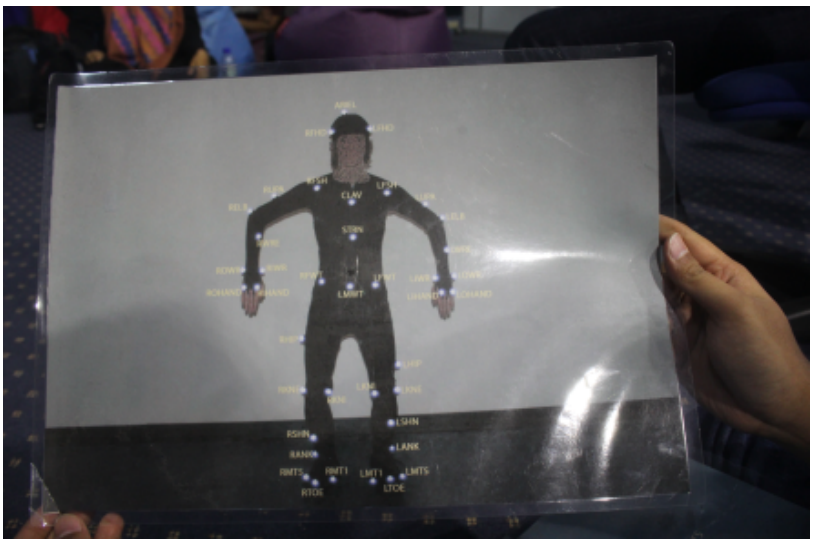

Fig. 13: Small marker that attach on the actor body

Fig. 14: Mr. Nazri explaining about motion builder

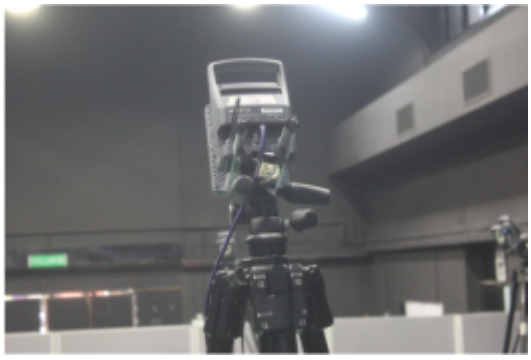

Fig. 15: Motion capture camera

Hardware

Motion capture camera, visor converter: Figure 15-17 are discussed in hardware.

Fig. 16: 12 motion capture camera on stage

Fig. 17: Visor converter

Prototype development This study discusses on prototype of the mobile application development process in this research. This chapter will also, focus on interface design process of the mobile application.

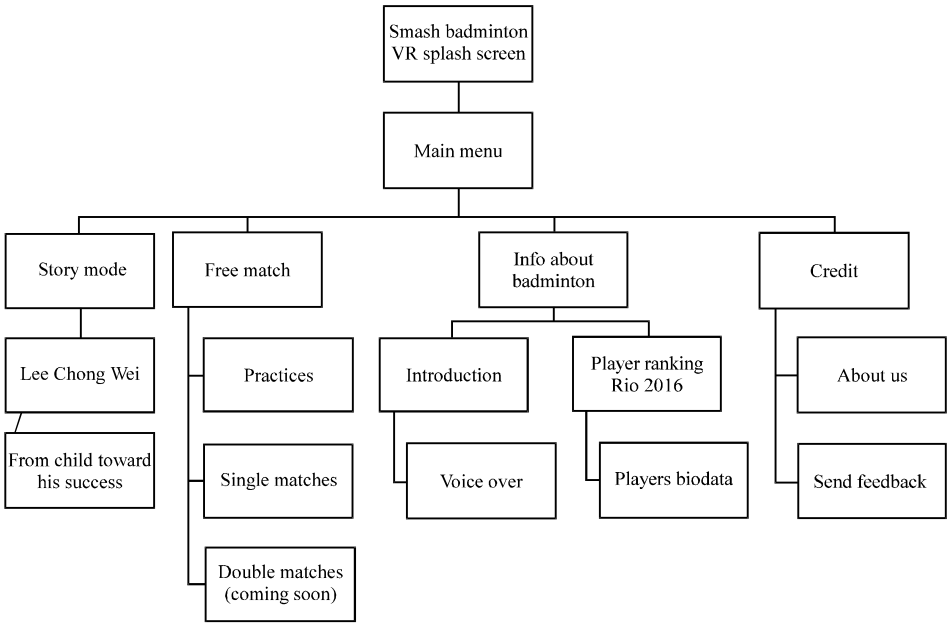

Fig. 18: Flowchart for smash badminton VR

Fig. 19: Smash badminton VR logo design

Flowchart: Figure 18 shows the flowchart for smash badminton.

Storyboard: By brainstorming, the complete concept, theme also, idea is selected and created for whole application interface design. Then the logo, interface and promotional items are designed according to the concept chosen (Fig. 18).

Coding in unity 3D: Throughout this project, programming language C# was used for encoding the data from site map information, database, Artificial Intelligent (AI) and project scoring.

Logo design: Smash badminton VR has been chosen for this project and the shuttlecock image is put at the top of the "V". For the font, the selection is chosen carefully to show the concept very well. The font type used for 'Smash badminton' word is CGF Locust Resistance while 'V and R' font is Queen of Camelot 2.0 (Fig. 19).

Fig. 20: Smash badminton splash screen

Development for final interface design

Splash screen: Start page is using default unity splash screen but the user is not needed to press anything. Just wait it to load the game and it will go straight to the main menu (Fig. 20).

Main menu: This page interface design uses a "Dressing room" as the background for the main menu. Dressing room not meant to use only in football but it can use widely for other sports. The intention of this page is to introduce how the player will start a game to get the user first impression next to build their excitement to play the badminton game (Fig. 21).

Storymode: This page is a short animation movie that tells about a young Lee Chong Wei catches his dream to become a professional player. In this prototype,

Fig. 21: Main menu

Fig. 22: Storymode

we use only the storyboard and make it a short movie. In later version, it will be a short animation movie (Fig. 22).

Player data: Next, player data gives you latest information about current professional badminton player. There is have their name, date of birth, their favourite hands while having the match. At the right of the picture shows the picture of the player and below that is the current status for their own strength like shooting (smash), defensive, control (when controlling the ball) and their physic (Fig. 23).

Practice mode: Practice mode is available for the user having a match against Artificial Intelligent (AI) by scoring about 21 score to win the game. There is no specific task or player skills yet in this page. Graphics will be upgraded in the next release (Fig. 24). Scoreboard will count on how many players earn without the shuttlecock falls to ground. This page has 3 different databases. Three of them are player, AI and Collision scoring system. Collision scoring system is a main part where if the ball hit any ground or wall, the scoreboard will count it.

Setting in storymode: This page is where a user can scroll up and down to control the music in the game (Fig. 25).

Developer has created the whole prototype interface design step by step by following the flowchart and Gantt chart process. The editing process was quiet tough

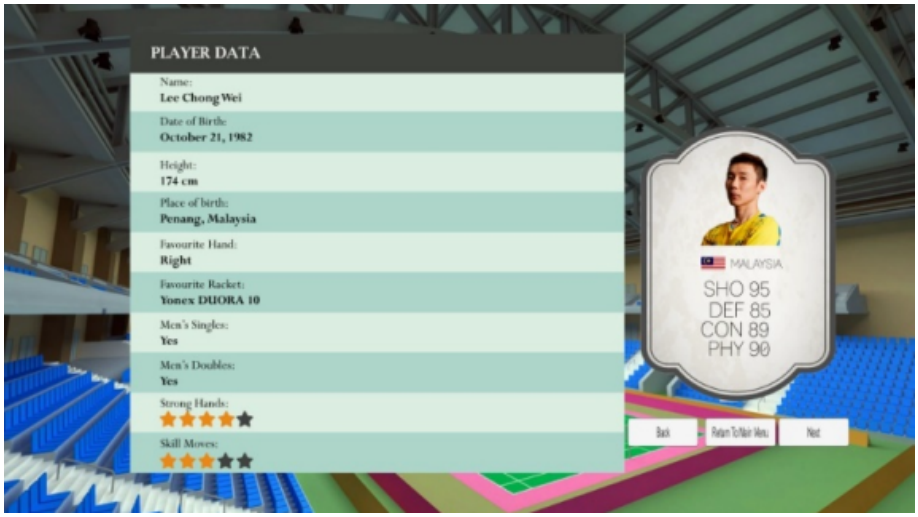

Fig. 23: Player data

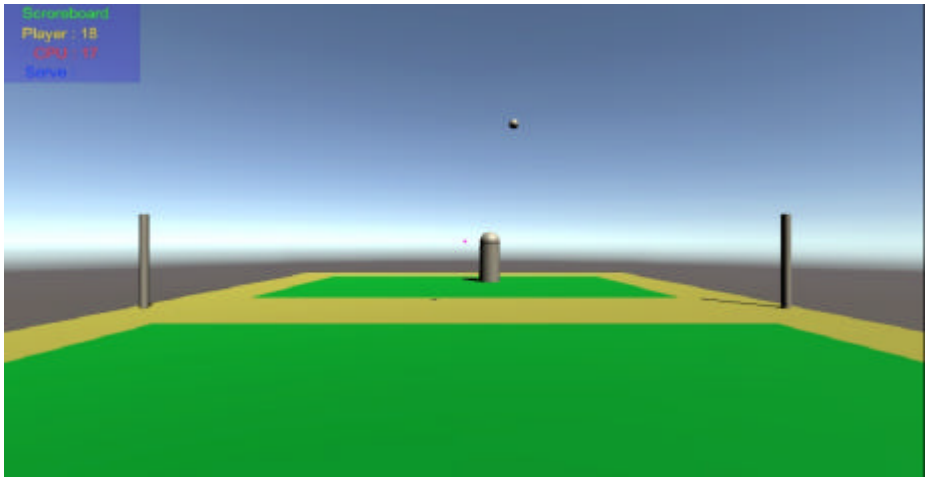

Fig. 24: Practice mode

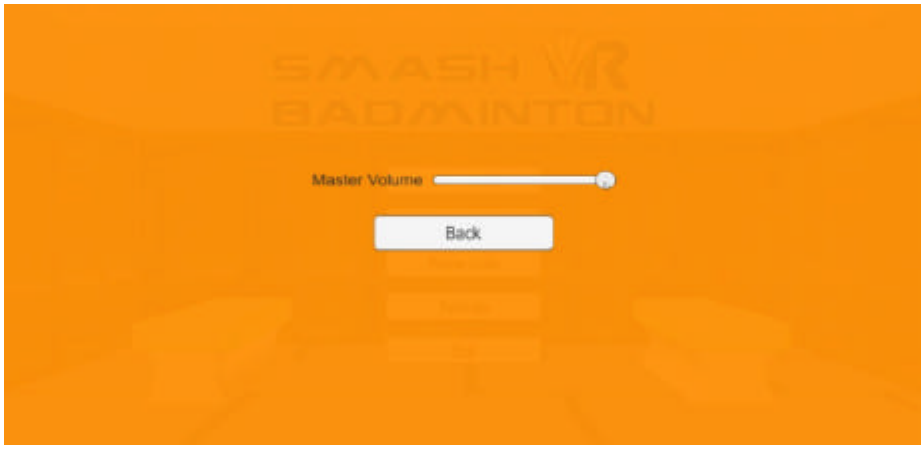

Fig. 25: Setting in storymode

because the developer had some difficulty while encoding to develop the app. Fortunately, all of the important data has been done by the developer on time to reach the project objectives.

RESULTS AND DISCUSSION

This study will discuss the explanation of testing and results. The method of testing that include in this website is alpha testing and beta testing. The testing was done after completed on the design and development phase by distribute a set of the questionnaire. The questionnaire will be given to the users for the feedback, comments and suggestions towards this project.

Research method

Alpha testing: The alpha testing is to improves of the product and ensures beta readiness. The main purpose of alpha testing is to refine game product by finding bugs, crashes and missing features. Usually alpha testing is very long and see many iterations. Mostly performed at the developer's site. Alpha testing happens toward the end of a development process when the product is in a near fully usable state. Alpha testing will be focuses on close session such as friends and family and to get all feedback from them to develop a good game software.

Beta testing: Beta testing is to improve our game software based on feedback from individuals or public testing who try our unreleased game app. This should be done before going for commercial release. It is important to pass through the first level which is alpha testing. Hence, the questionnaire was prepared for the user give feedback in order to make some improvement for this project.

Beta testing is done by distributed a set of questionnaire to the respondents. The respondents for the testing may include all or one of the criteria as stated: UniKL MIIT students.

During the testing, the respondents are given the questions that need to be done. The testing was conducted to cover these three usability issues according to, the objectives which are the application development (the multimedia element), functionality and effectiveness.

Questionnaire: After the developer introduced and show the app to the selected respondents, the developer has been conducted and gave the questionnaire to 23 random peoples nearest to UniKL MIIT students and within Klang Valley area to answer for the feedback.

Pie chart for the questionnaire: Based on question 1, the purpose is to know whether the users are aware about badminton sports game. Therefore, the developer is informed that how many respondents that aware of the

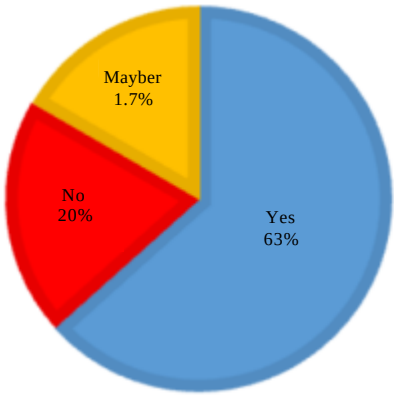

Fig. 26: The existence of badminton game; Are you aware of the existence of batminton game

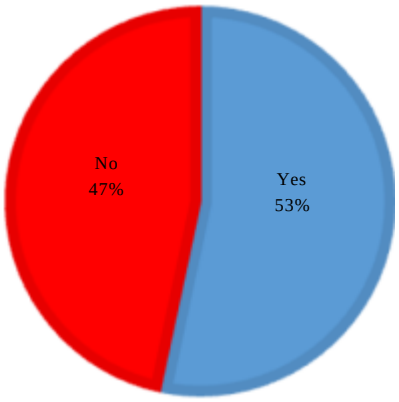

Fig. 27: Responses about playing badminton sports game; Have you played any badminton gane before?

existence about badminton sports game. From analysis, about 19 respondents said they are well known about the badminton game. Meanwhile only 6 respondents do not know about it. Other is 5 respondents might know about the existence of badminton game (Fig. 26).

In question 2, developer need to know on how many respondents has played the badminton game to develop a good virtual reality application. Throughout, the evaluation, 16 respondents say they played badminton game before but in real life situation. Meaning that they are ready to tryout the VR. Only 14 respondents never played badminton sports game before.

Next, developer has gained the information about user isn't giving enough opportunity to played badminton game on virtual reality to prove the problem statement of this research. The evaluation has shown that a total of 28 respondents has never played badminton game on virtual reality. Meanwhile, another 2 respondents ever tried in virtual reality (Fig. 27 and 28).

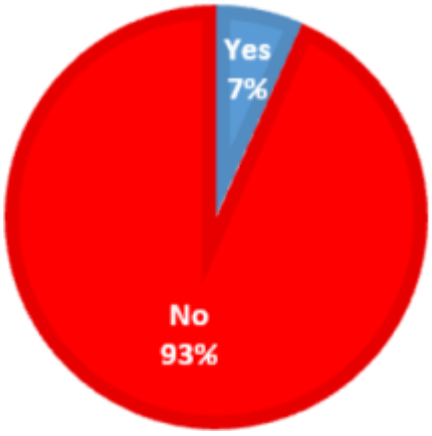

Fig. 28: Responses about playing badminton sports game; Have you tried playing any badminton game in virtual reality

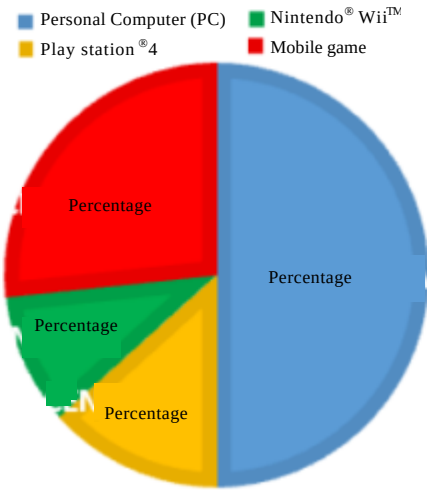

Fig. 29: Responses about which platform they usually used; On which platform do you prefer to play badminton game

Based on question 4, 15 respondents agreed that a PC Version is much more compatible to play badminton game. Another 8 respondents agreed to use mobile as a platform and only 4 respondent agreed to use PlayStation®. Meanwhile, only 3 respondents agreed that Nintendo™ Wii (console) as a platform to develop our game.

Based on question 5, developer has found out that 27 respondents agreed that our badminton could create an opportunity to younger generation to achieve higher status up to national level. Meanwhile 3 of them did not accept it because this game should be like for fun or for killing time only (Fig. 29 and 30).

Fig. 30: Responses about giving advantage to younger generation; Do you think this badminton game give advantage to younger generation?

From the evaluation of this question, developer was able to achieve the objective of this research whereby developer need to develop a game software about on badminton game with tutorials. Other than that this data is important to know because the developer mission is not to have a similar game software with other developers.

Mostly, 20 respondents did not agree that other badminton game could give a better information on badminton tutorials followed with 10 respondents are agree that other badminton game gives a better tutorial than our badminton game.

From the result, the respondents were satisfied on the interface design where it takes 17 from all of them and 5 respondents were very satisfied. Only 7 respondents think it is just ordinary and the another is 1 that unsatisfied with the interface design. The content in the application were very satisfied about 4 of the respondents while 14 of them were satisfied with it. Ordinary and unsatisfied from the respondents were 12. Meanwhile, the music playing in our application were very satisfied about 7 respondents and 11 of them is satisfied with the music. In additionally, the arrangement of the content was very satisfying about 3 respondents and the other is 12 were satisfied. The 14 respondents think it just an ordinary or good enough while 1 is unsatisfied. Other than that, the interactivity result shows 2 respondents were very satisfied, 18 respondents were satisfied while 10 were think it is ordinary. After that 5 respondents very satisfied with the user friendly, 15 respondents were satisfied, 9 respondents think it is just ordinary and the other 1 respondent were unsatisfied.

In the other hand, the result of functionality that applied the app was taken and 5 of the respondents

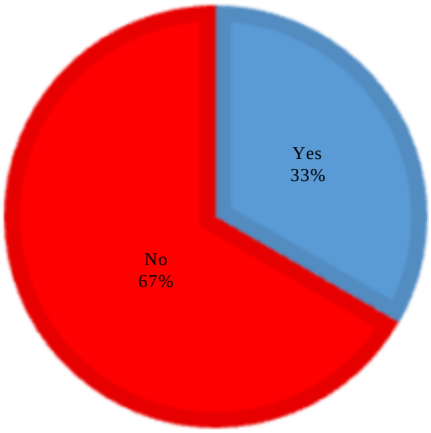

Fig. 31: Responses about providing enough information on other badminton game; Is any other badminton game provide enough information on badminton tutorials?

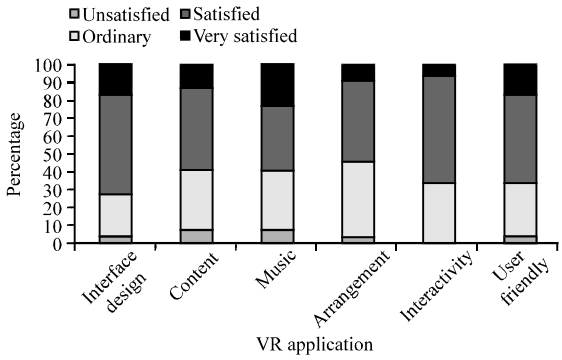

Fig. 32: Opinion about smash badminton VR; Which of the following do you think about smash badminton VR application?

responded that its work in excellent condition. While, 13 of them responded that is work in good condition and the rest of 12 responded it is normal.

The result for question 9 shows 4 respondents thought that this app is very interesting and 2 and 6 left thought it is interesting for them to play. This result shows this app are might need some improvement to let user able to enjoy more.

At the last result, user would recommend and user able to promote our application to their friends. This mean, our application will become well known someday (Fig. 31-35).

As for the conclusion from the survey, the developer gets to evaluate the feedback from the respondents on how the application can convey information and deliver the objectives to the user. The main point of the

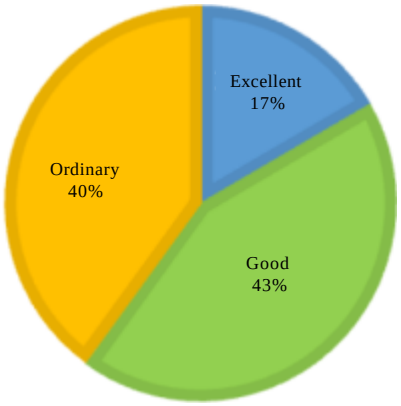

Fig. 33: Functionality of the multimedia element; What do you think about functionality of multimedia element that applied in smash badminton VR?

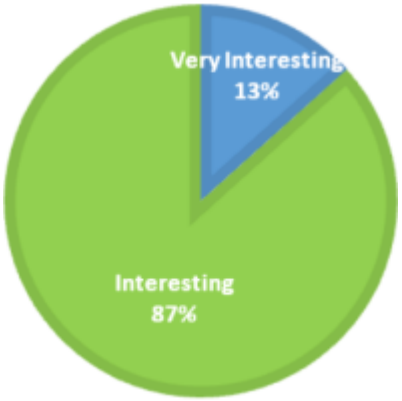

Fig. 34: User opinion about the application; After plying smash badminton VR, do you think this application is interesting?

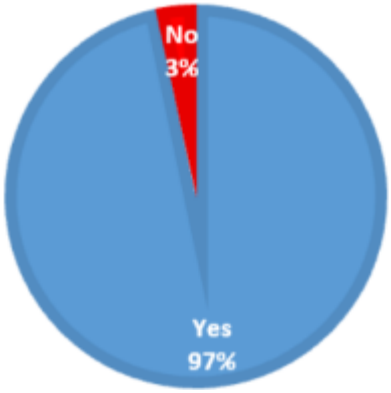

Fig. 35: Recommendation to other users; Would you recommend it to your friends?

questions is to define how the development of the application works how the navigation process

functionality with the user and how the application can give the effectiveness to the user. Therefore, the developer will do the debugging process from the collected survey before published to the market.

CONCLUSION

By developing the game application based on unity 3D there are a lot of lesson learned. First of all, time management is the important role to success. Without time management, our project will be not completed in time and will not runs very smooth at the end of the presentation. Next is a patience. Patience will be worst we lost consciousness when the project is not reach the objective yet. Overall for this project, we have successful completing the whole chapters for our report and the project of smash badminton game. We develop game application based on Personal Computer (PC) to play smash badminton with tutorials, to test the Artificial Intelligent (AI) that runs smooth when catching the ball from the user to test whether scoring system is functional or not and to identify the effectiveness of the game application among the targeted user. With the project we build we hope we achieve our project objectives with success. As for future release of our application, can be improved by adding multiplayer system where user can play with other user in online mode. User can play a match against the other players up to four users at the same time. This mode is called "Doubles Match". Next is, we are going to release a new character selection for multiplayer and storymode. This will let user enjoy more with the character given. In addition, we will try to update all controller support for our "Smash badminton VR" game. This will ensure that user can use any kind of controller, plug and play it and then can use it without any additional driver or installation. By creating this game application, user can adapt badminton playing style if the user uses our game for the first time. it is a good approach to give the opportunity for people or next generation to try out the badminton game. By doing this, there will have a standalone platform for only badminton game in the market.

On the whole, the objectives for this project have been achieved. This is due to the support from the supervisor and friends who has encouraged us to complete this project to the end. Not forget also to the parties involved, since, the beginning of this project and allow the project information data completed.

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