THE DEVELOPMENT OF 3D-ANIMATION MODEL AND
APPLICATION INTERFACE FOR MOBILE-APPLICATION LEARNING SYSTEM

Muhammad Aiman Bin Ahmad Sukri , Nurul Huda Binti Mohamd Saleh
Polytechnic Sultan Salahuddin Abdul Aziz Shah

ABSTRACT

The use of mobile application in an education are proved by the researcher as the method convey with a more diverse form of information. Learning in medical electronic field require students to understand specific terms and definitions concerned with the lessons that sometimes are confusing and need another approach in order to make them understand regarding the lessons. Medical Electronic students who are basically learning the medical equipment need to understand these terms and interpretation as preparation for their industrial training and work environment. There are several medical equipment that are provided for students to familiarize them with the real equipment. However, some equipment are very expensive and rarely found in school or university. The purpose of this study is to design and develop a mobile application that is supported by a learning system that uses 3D animation video for medical equipment to give students the opportunity to learn about it without need it physically. The method used to develop this application is by using Autodesk Inventor Professional 2016 software to create 3D animation and Appy Pie to create mobile application software. The use of 3D animation are a huge help in presenting the information in a form that is easy to understand and way more clear. Apart from its easy-to-understand features, it is also attractive form of presentation information which can encourage students to learn more about the lessons. Hence, the use of technology in delivering the information and lessons are helping students and also helps boost their achievement in their studies.

Keywords: Mobile Application, 3D Model, Mobile Learning, Application Interface

1. INTRODUCTION

The potential benefits of using 3D content in supporting students to understand difficult concepts have not yet been fully realized across all subject disciplines, although there are some which are actively engaging their students in 3D content and it is certainly a growing interest area. Now imagine, if this learning is applied for the medical field. For instance, take a look at medical devices such as Defibrillator and Non-Invasive Blood Pressure, these devices probably easy to find and most of the educational institutes in Malaysia might have it. However, some machines that are expensive are rarely found in school or university. So, the idea of making these machines and devices in 3D model animation is to give an opportunity for students to learn about it without having it.

Furthermore, the first step in understanding on how students learn is to agreed that every human being are born with different ability to receive and express the information and how do they prefer on learning new information. The term "learning styles" speaks to the understanding that every student learns differently (V. Aravinthan & J. Worden, 2010). An individual learning styles depend on cognitive, emotional and environmental factors, as well as one's prior experience. 3D modeling is the process of creating a 3D representation of any surface or object by manipulating polygons, edges, and vertices in simulated 3D space. Modern technologies and computer programs allow creating the models of varying complexity and size, testing the created prototypes and making both technical and design changes in the model. The use of the 3D modelling is almost everywhere (H. Matsuda & Y. Shindo, 2016). Moreover, 3D models are used in medical field to create human organs such as heart and lungs. This is to be used for educational purpose which helps in understand clearly how human organs function. Besides that, they also used the function of 3D to create interactive representations of human anatomy. A wide number of 3D software are also used in constructing digital representation of mechanical models or parts before they are actually manufactured. CAD/CAM related software are used in such fields, and with these software, not only can you construct the parts, but also assemble them, and observe their functionality (M. F. Daud, J. M. Taib, & R. S. Sharifudin, 2012).

Just as medical animations are effective tools for educating patients, they can also play a role in the education of medical professionals at all levels as well as the training of new employees. Educators can use this tool to explain a broad range of topics to students (A. Çalışkan & U. Çevik, 2017). It's useful for explaining medical equipment such as the right way of using the medical equipment, the processes on how to maintain the equipment based on the error, and the effects to humans if the equipment is wrongly used. It can also

provide a visual demonstration of an equipment mechanism of action, or how it affects the body and produces a response, so that they can better understand how the equipment works (Denis Bobylev, 2017). This is important because, with many procedures, medical professionals need to have an in-depth understanding of them before they perform them. As compared with standard operation videos, dynamic 3D videos are way better in explaining the processes and operation of the medical equipment.

As the popularity of the 3D animation model increases, the mobile application also contributing as a way of delivering as information due to its portability and easy to handle. However, creating a mobile application requires software of application maker, or a web-based software. There are many method and options of software to create mobile application. There are software which need developer to create mobile application by writing codes in certain language while there are also software which allow beginner to create mobile application with just using simple drag-and-drop concept (B. Jalender, 2010).

2 METHODOLOGY

The method used to develop this application is by using several software to create 3D model design, android application etc. The software that has been used is Autodesk Inventor Professional 2016, which is used to create the 3D model design for medical devices. Appy Pie is the website-based software used for creating an Android application without the unnecessary use of coding. The concept of 3D modelling is used to visualize the medical equipment graphically. The 3D model then is made into video as an animation whether to show the procedure of using an equipment or an instruction on how to do maintenances based on Standard Operation Procedure (SOP) that has been set. Other than that, the application also provides Plan Preventive Maintenance (PPM) procedure for the devices. The applications also contain the procedures in text form to provide a user with an alternative option other than the videos itself.

Figure 1: Process of creating a model
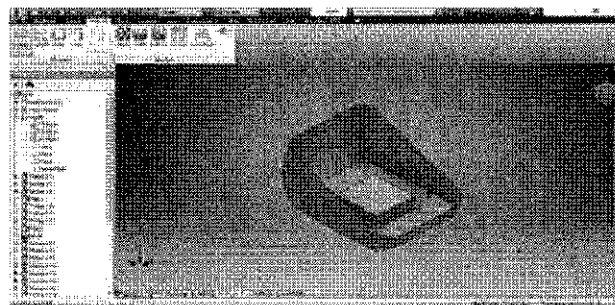
There are several steps in developing the 3D model. These steps are to ensure that the finished model is in good shape. The 3D model starts with the sketch of the desired model. There are eight steps in creating a perfect 3D animation model and skipping any of these steps causing the final result of the model is not in excellent form. The sketch is the initial description of the model and it is to create the first shape of the model. Then, the sketches are added with dimensions and constraints to get a good outline and shape (R. H. Shih, 2016)8. After that, the sketch then can be turned in to 3D form. The feature referring to the action that can be performed in the workspace. The process then goes to bodies joining steps which allow the 3D parts to be merged together to form one bodies or a complete model. This process will add all related part of the model that has been created in the early steps from the sketch.

Next, some 3D CAD software will allow the user to naturally form and sculpt models in a much more natural way. With forming features, basic 3D objects, like a sphere, cube, or prism, can be shaped by dragging and sculpting the shape's faces, edges and vertices instead of editing and manipulating precise dimensions for shapes drawn in a sketch. This allows for the creation of much more natural objects; using forming tools making realistic looking faces, animals, and smooth, curved surfaces. Then, the process of assemblies took part. Assemblies are 3D files that contain multiple parts or other assemblies. In assemblies, all parts can be connected together with mates or constraints to build up a 3D model of an entire system. Assemblies allow designers to visualize how the entire product will fit together once it is fully assembled.

Finally, the appearance and rendering process is the final process in designing the 3D model. The aim of this process is to change the appearance and material properties of the model to simulate a specific material. Besides, it is also to generate a high quality, good looking image of the designed model, complete with adjustable lighting, backdrops, and views.

Figure 2: The Appy Pie
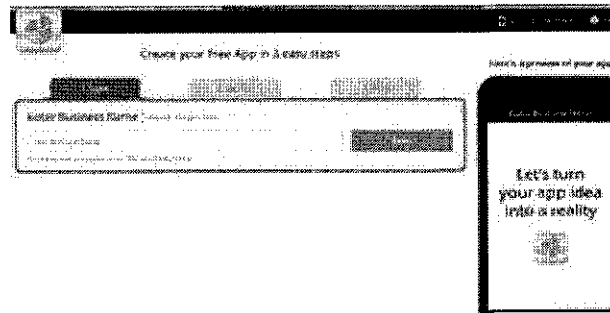
The first step in creating an android application is to have a name for the application. The first layout of the application maker shows the blank space for the creator to enter the name or title of the application. The name then will be displayed in the user interface of the application. However, the creator still can make an adjustment to the title if it there is any change throughout the project.

The next step is to set the categories of the application. There are many categories provided by software such as fashion, education, health, and information. The categories then will suggest the next user interface of the application. For instance, the "health" category has been chosen because the application is made to fill information related to medical field. This layout also can be change later if the creator want to choose other categories, the categories can be match with the type of application that are developed.

After that is the customization features of the application. There are many features provided and the software itself recommended the creator depending on the chosen category on the earlier step. As for this project, there are 3 features that are planned to be inserted in the application which is about, video and text-based SOP. All the information that has been created such as 3D model animation, videos, SOP of the maintenance and guidelines on how to use the equipment are inserted into each feature.

After all the process in customizing the application finished, the application is finally done and the application is compiled which then sent to the email of the creator. The application is then can be tested to see in the application fulfills the feature characteristics desired by the creator. If the application is good to go, it is then going through post-data evaluation to see if the application really helps the industrial students and educators in improving the students' understanding.

3 RESULTS AND DISCUSSIONS

A. 3D Model Design

The 3D model design is created using Autodesk Inventor Professional 2016. The model of medical equipment is first created using the same dimension of the real device. The processes are slow because the model cannot be created as the whole object but it one part after another. The parts then are combined or called assemble which put together all created parts to form one solid object.

Figure 3: Completed 3D model of the NIBP
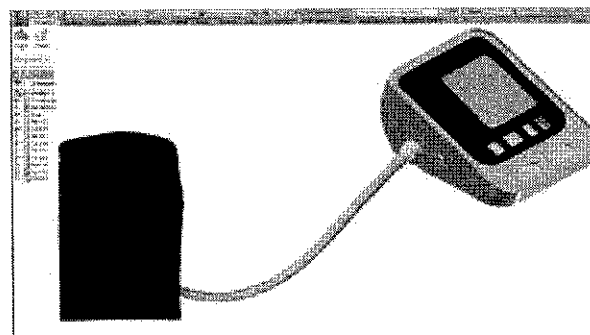
This is an example of the complete 3D model design after going through the eight steps of creating the model. All the parts are drawn separately and follow the precise dimensions as the real product. These parts are then assembled on another page and the new process took part. The next process is .the model checked again to make sure the joining of the model parts are fit together and no miscalculated happen. The process of creating an animated video took place after the model is completely correct and in the right position. So, the process of creating a 3D model takes quite some time to complete it and to get a perfect model of the created model. However, the existing of such software as Autodesk Inventor is a huge help as it provides many features to ease the creation of a model.

B.   The Application Interface

The application is consists of two components which are the videos on how to use and how to do the maintenance for the medical equipment and text-based information of Standard Procedure Operation (SOP) on how to do maintenance based on the problem/error of the equipment. There are 6 content sections of the application which are the Introduction, SOP, Maintenance, Error Code, Picture, and Video. These sections contain different content for example the SOP, Maintenance, and Error Code shows the text-based information in written format while the Video displays the videos of the equipment and the Picture section displaying the pictures of several models of the equipment.

Figure 4: . Layout of the Application

4. CONCLUSIONS

In conclusion, this development of 3D animation model and application interface is to complete the mobile application learning system for the use of biomedical students particularly. The discussed method of creating the 3D animation model and the development of the application interface going through several important steps and processes to get the completed final outcome for the project later on. Significantly, the combination of 3D animation model and mobile application is mainly to help in creating a better understanding of biomedical students regarding the medical equipment in terms of how to use and doing maintenance. The method of delivery medium such as text- based information, 3D animation model and videos are combined together to maximize the delivery of knowledge more effectively. From the result, the figure of the equipment is clear and also precise which means that the detail of the project is taken into account to ensure that the objectives of the project are achieved. The results of the pre-questionnaire survey are also taken into consideration as the respondents are the user-to-be for the final product later.

ACKNOWLEDGEMENT

REFERENCES

V. Aravinthan and J. Worden. (2010). Animations as a tool for enhancing teaching and learning outcomes in civil engineering courses. Proc. - Front. Educ. Conf. FIE.

H. Matsuda and Y. Shindo. (2006). Education system using interactive 3D computer graphics (3DCG) animation and scenario language for teaching materials. Innov. Educ. Teach. Int.

M. F. Daud, J. M. Taib, and R. S. Sharifudin. (2012). Conceptual Knowledge in Three Dimensional Computer Aided Design (3D CAD) modeling : A literature review and conceptual framework.

A. Çalışkan and U. Çevik. (2017). Three-Dimensional Modeling in Medical Image Processing by Using Fractal Geometry.

Denis Bobylev. (2017). Comparison of 3d modeling software.

B. Jalender. (2010). Drag and Drop : Influences on the Design of Reusable Software Components Department of Information Technology. Int. J.

R. H. Shih. (2016). Tools for Design Using AutoCAD 2016 and Autotesk Inventor 2016.

U. Cakiroglu and H. Yilmaz. (2017). Using Videos and 3D Animations for Conceptual Learning in Basic Computer Units. Contemp. Educ. Technol.

S. Noor-Ul-Amin. (2013). An Effective use of ICT for Education and Learning by Drawing on Worldwide Knowledge, Research, and Experience : ICT as a Change Agent for Education. Dep. Educ. Univ. Kashmir.

N. Ganesan. (2016). Rapid Development of Multimedia Instructional Modules for Information Technology Education.