

HOW COVID-19 mRNA VACCINE WORKS BY USING 3D MODELLING

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ABSTRACT

COVID-19 is a pandemic that currently have no cure but there is development to lessen the effect of the COVID-19 by producing vaccines. Vaccine has just recently rolled out and produced by pharmaceutical companies. Besides, many people unaware and want to know how vaccine works so that they are confident in accepting the vaccination program introduce by the government. With all the rumours and debating on the pro and con of injecting the vaccine, some people has doubt and still suspicious and does not want to follow the procedures given by the Malaysia Ministry of Health. Therefore, there is a need to instil awareness on how vaccine works and how it can lessen the effect of COVID-19. Hence, this study will develop a 3D modelling design and development representation on how the vaccine works using simple analogy which rendered and presented in a 3D animation story. It is hope the 3D animation could help people to understand more about the COVID-19 vaccines and willing to cooperate with the vaccinations program prepared by the government in achieving the herd immunity.

1. INTRODUCTION

1.1 Introduction

COVID-19 is a recent pandemic that infected globally. So far, COVID-19 has reduced in other countries such as New Zealand, and China because of vaccines but not yet in Malaysia although rolling out of vaccines is in progress. There are five types of vaccines developed by different pharmaceutical companies that are Pfitzer, Moderna, Johnson & Johnson, AstraZeneca and Novavax. The vaccine has been in development since COVID-19 began, but just recently it is completed can be safely can be injected globally to people.

How vaccines work is complex and includes many terms that only doctors, or scientist understand. So, we need to explain how vaccines work using simple example. Many people want to know how the vaccine works. However, the explanations that are given by professionals contains many medical terms that is harder for non-medical person to understand. Simple analogy on how the vaccine works has been created such as by TikTok user *hotvickkrishna* (<https://www.tiktok.com/@hotvickkrishna>). It has been successfully explained in simpler terms.

3D modelling is important and has been used by many to visualize explanation such as on COVID-19. Therefore, it is perfect to combining 3D modelling to show the analogy. For this project, I have use 3D modelling to explain the analogy.

1.2 Project Objective

The project aims to development 3D modelling animation story. The theme is COVID-19. The project objectives are:

- i. To model 3D object characters involved in the animated story.
- ii. To design storyboard on how the vaccine work using simple analogy.
- iii. To develop the 3D story animation and generate into a video as final product.

2. 3D TOOLS AND APPLICATIONS

There are many tools to develop 3D modelling. For this project, tool and software used are Maya, Clip Studio Paint, Mixamo and Shotcut.

2.1 Maya

Autodesk Maya, commonly shortened to just Maya, is a 3D computer graphics application used to create assets for interactive 3D applications (including video games), animated films, TV series, and visual effects. Maya is used to create characters, and to animate. Figure 1.0 show the interface of Maya

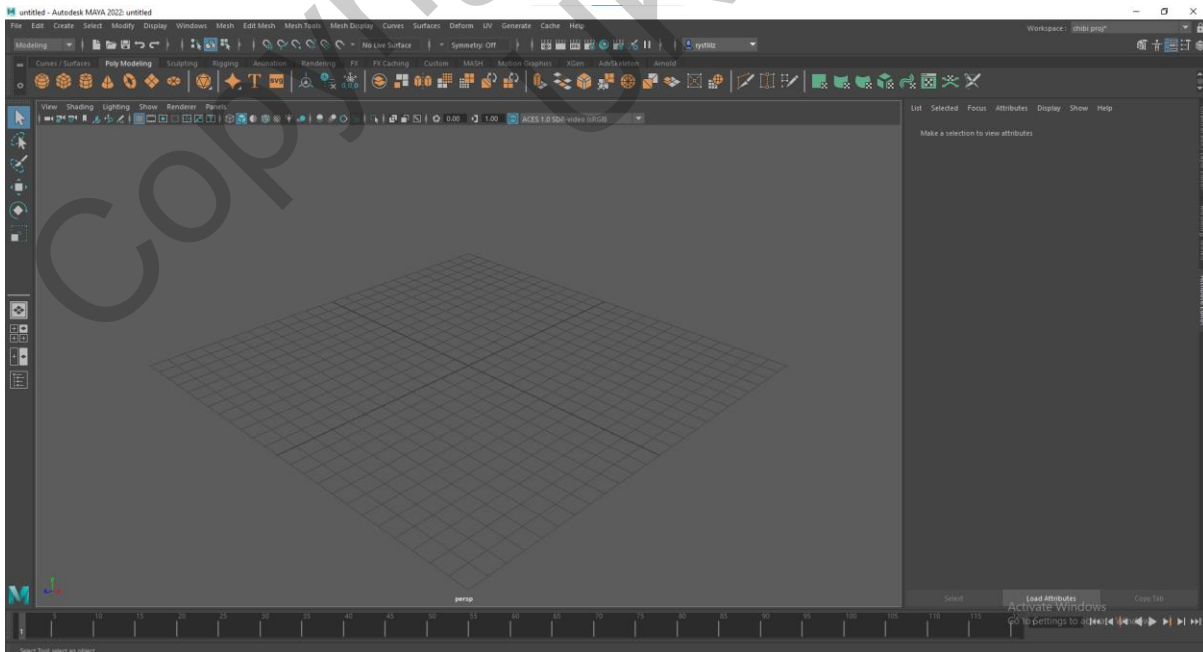


Figure 1.0 Maya interface

2.2 Clip Studio Paint

Clip Studio Paint is a family of software applications developed by Japanese graphics software company Celsys used for the digital creation of comics, general illustration, and 2D animation. Clip Studio Paint is used to draw textures based on UV texture of the characters. Figure 2.0 show the interface of Clip Studio Paint.

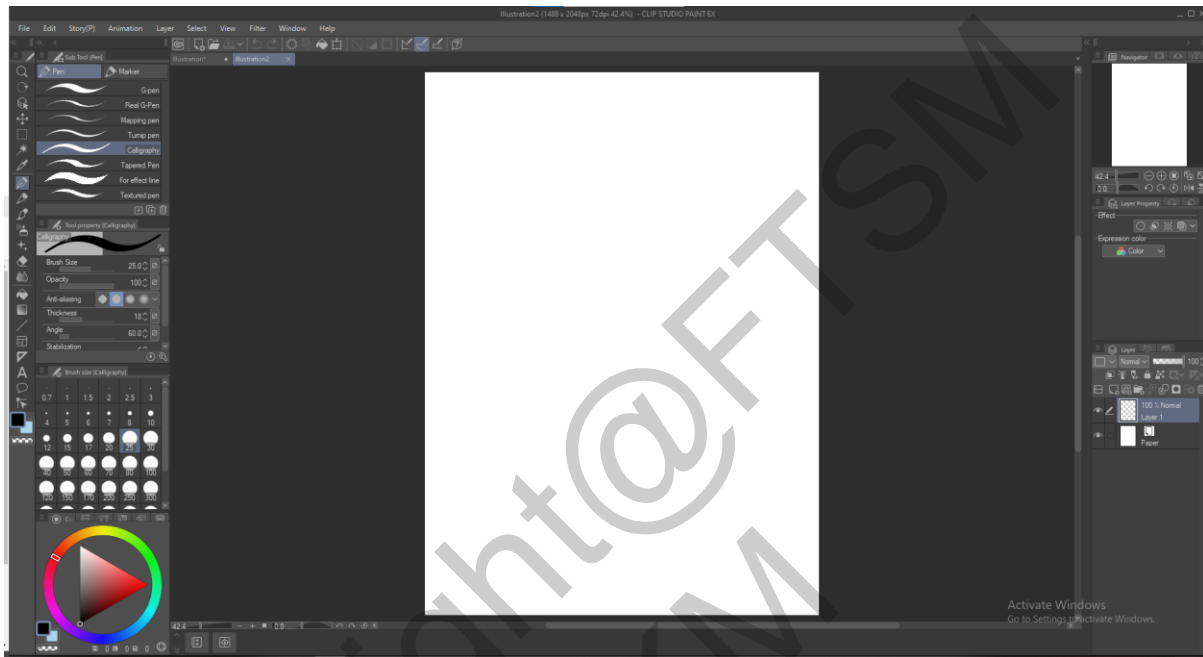


Figure 2.0 Clip Studio Paint interface

2.3 Mixamo

Mixamo is a 3D computer graphics technology company. Based in San Francisco, the company develops and sells web-based services for 3D character animation. Due to constraint of time, there is not enough time to fully practice animation and rigging as I do this project alone. Therefore, Mixamo is used to auto rig the characters. To use it, user just import the character model, select the animation from their library and done. Figure 3.0 show the interface of Mixamo.

2.4 Shotcut

Shotcut is a free and open-source cross-platform video editing application. Shotcut is used after rendering the animation to make a full video of the 3D story. Figure 4.0 show the interface of Shotcut.

All the tools used have helped to create this project. Different user may use different tools according to their preferable software.

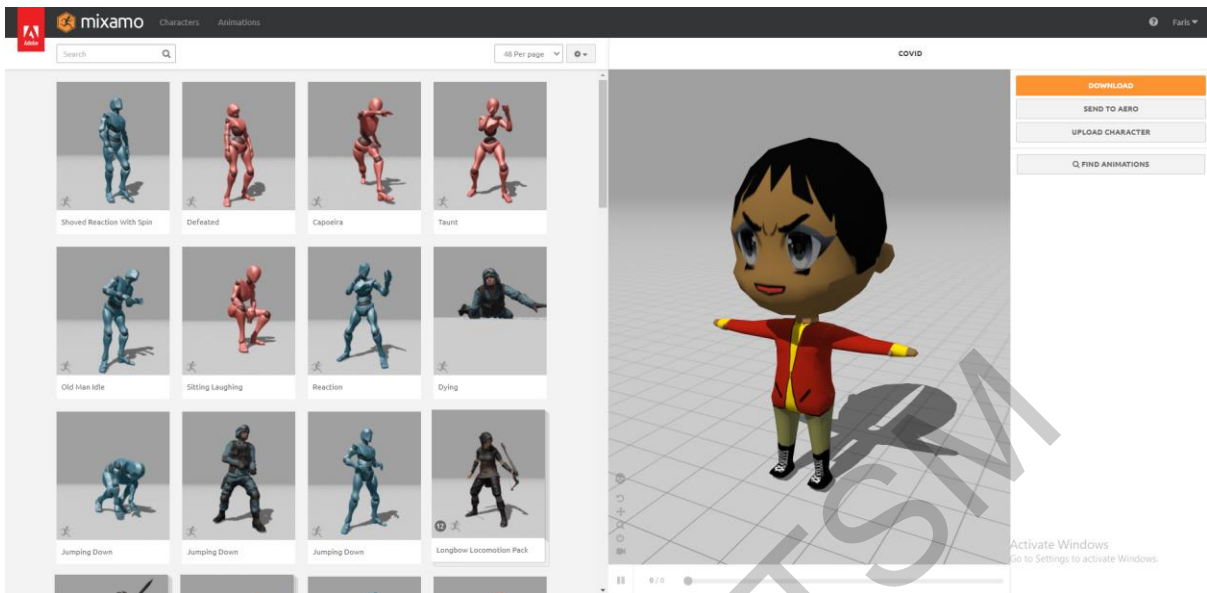


Figure 3.0 Mixamo interface

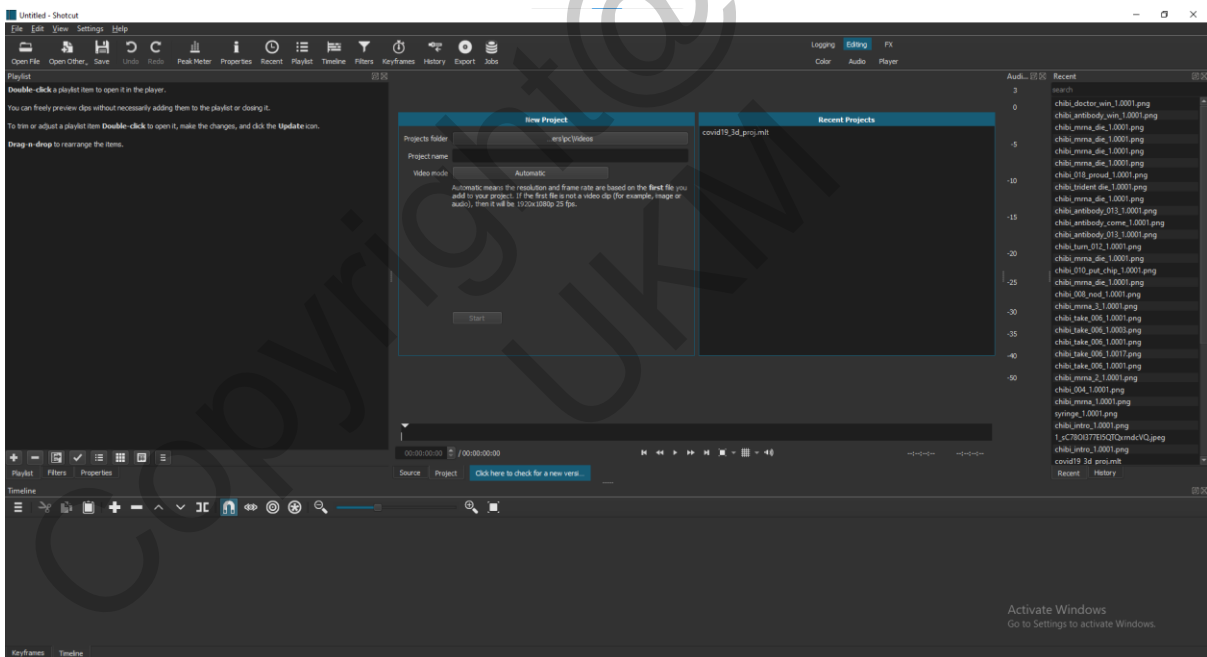


Figure 4.0 Shotcut interface

3. METHODOLOGY

The development process involved: storyboarding and designing characters, character modelling, UV texturing, rigging using Maximo, and lastly, importing image sequence to a video editor to create full 3D animation.

3.2 Design and Storyboard

The storyboard is adapted from the TikTok with slight differences. The characters created are in cute form of humans instead of realistic ones. Instead of using fork as adaptation of spike Protein from the COVID-10 virus, trident is use for this project. Figure 5.0 (a) and (b) consists of 8 storyboards of the project which show the flow of the 3D animation that going to be developed. The flow of the story following Six spline phases which involved exposition, inciting incident, progressive complication, crisis, climax and resolution.

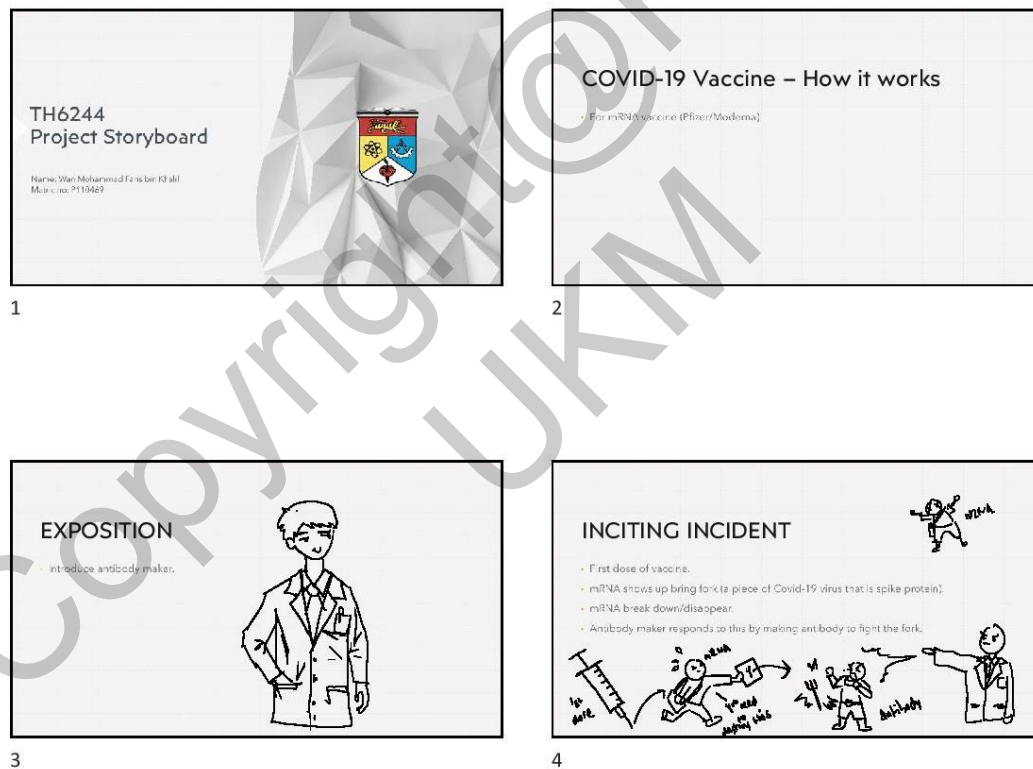


Figure 5.0 (a) Project's animation storyboards

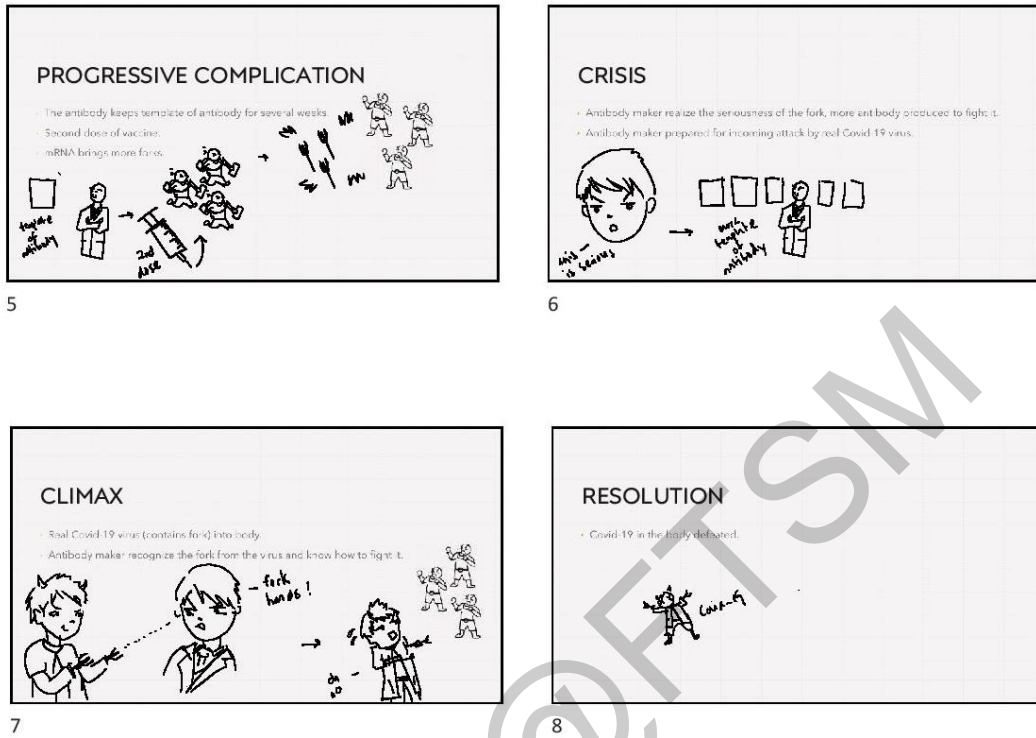


Figure 5.0 (b) Project's animation storyboards

3.3 Modelling

Four characters have been modelled to represent different types of cells or system organisms that involve in vaccine that is immune system, mRNA, antibody, and COVID-19 virus. For other props such as computers and trident, they are imported from Sketchfab.com. Figure 6.0 show 4 models design as character in the 3D animation story developed. Figure 7.0 show the prop used in the project.



Figure 6.0 Four models of 3D characters

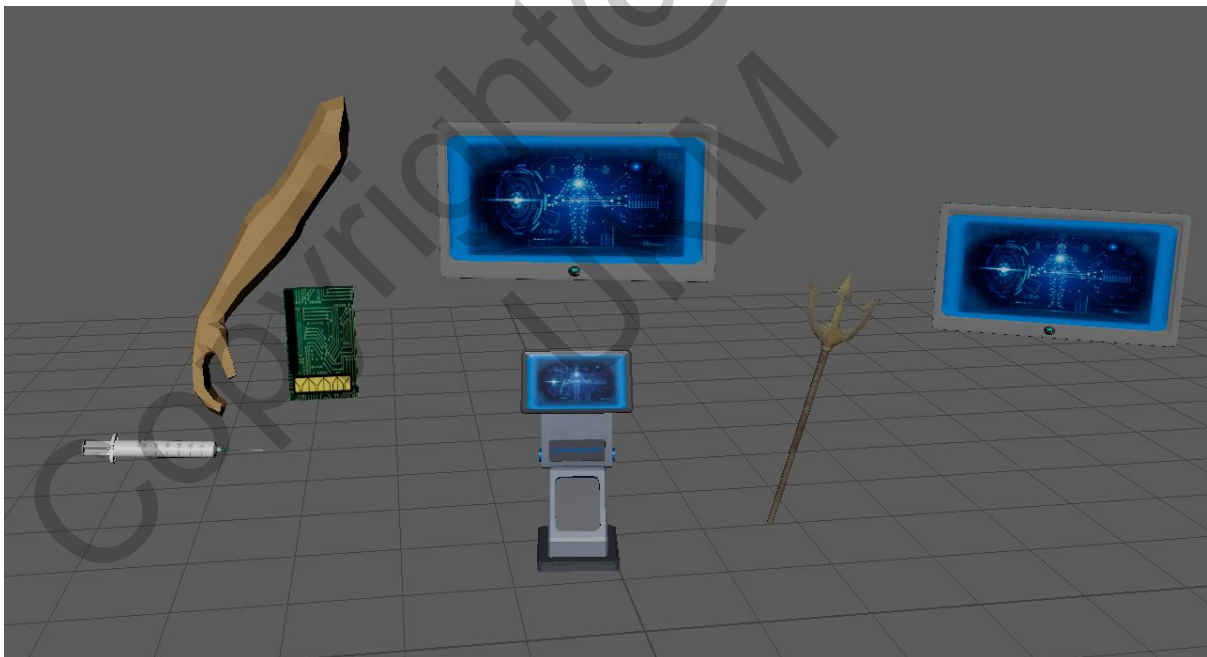


Figure 7.0 Project's prop

3.4 UV texture

From the character model, UV unwrap is used to export the character's UV texture. After that, their details are drawn such as clothing design, and face. A model is used as a basic polygon for all other characters, with different textures to differentiate. Figure 8.0 show the process of applying texture to the 3D objects model.

3.5 Rigging and Animation

Once the UV texture is done, it is time to animate. In order to animate, we need to do rigging to the models. Maximo is used to import many animations to the model according to the scenes from the storyboard.

3.6 Rendering and creating the full 3D animation

After that, the scene is rendered using Arnold renderer into png images. The sequence of images is then imported to Shotcut to create a clip of a video that can be playback. Many rendered scenes is then combined to create a full 3D animation.

The integration of all the above steps have help the making and producing of the 3D animation smoothly and the output is acceptable for delivering the information of the COVID-19 to public.



Figure 8.0 The process of applying texture to the 3D model

4. RESULT

Starting from the design phase to full completion, the 3D modelling story successfully developed as planned. The result is a 3D animation that tells the story of how vaccine works in a simple analogy. Overall, the project has successfully applied all the steps from the lecture and lab session.

5. CONCLUSIONS

This project is a very useful guideline and give experience in developing 3D animation from start to finish. By developing this project, it is hope the 3D animation could help people to understand more on how vaccines work using the analogy adapted. COVID-19 vaccine is really important for many people to participate as it will increase herd immunity from the virus and COVID-19 is real.

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