

Three Dimensional (3D) Medical Content Application: A Concept Paper for Stroke Disease

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Abstract—Simulation can be an extremely useful instructional aid. This paper presents the study on 3D simulation usage in deliver health information. The simulation can help in introducing components that are purely virtual, concepts that cannot be easily realized, but still useful for learning. The 3D simulation application is 3D Medical Content: Stroke Disease. This simulation can help people to know how the stroke occurs, the symptoms and prevention of stroke and improve their health.

Index Terms—Animations, Artificial, Augmented and Virtual Realities, Medical Information Systems.

1 INTRODUCTION

According to National Stroke Association of Malaysia, stroke is the fourth largest cause of death in Malaysia [2]. It is considered to be the single most common cause of severe disability, and every year, an estimated 40,000 people in Malaysia suffer from stroke. This means in every hour, there are six Malaysians hit by the stroke. Anyone can have a stroke, including children, but the vast majority of the cases affected adults.

A stroke is a condition where a blood clot or ruptured artery or blood vessel interrupts blood flow to an area of the brain. According to World Health Organization (WHO), stroke definition is “a focal (or at times global) neurological impairment of sudden onset, and lasting more than 24 hours (or leading to death) and of presumed vascular origin”.

A simulator is a collection of hardware and software systems which are used to mimic the behavior of some entity or phenomenon. Simulation may also be used to analyze and verify theoretical models which may be too difficult to grasp from a purely conceptual level.

The advantages of simulation are:

1. Explore new design options without disrupting existing systems.
2. Test new hardware, transportation systems, etc, without investing resources for their acquisition.
3. Time scale can be compressed (for slow moving systems) or expanded (for fast moving systems).
4. Internal variables can be made observable.

Sensitivity and interaction of variables can be studied to understand their impact on the system behavior.

2 LITERATURE REVIEW/EXISTING SYSTEM

There are three similar existing systems which are simulation programs founded to be very similar to the simulation that will be develop

2.1 What is a stroke? 2D animation

Figure 1 shows the system entitled What is stroke? Video by NeuroAidStroke and Transient Ischemic Attack (TIA). The system is the first cause of acquired disabilities in the world. This video shows what is a stroke, and what can be done to accompany the treatment and rehabilitation of stroke victims. This 2D video is being designed in order to explain to the viewers how the stroke occurred in 2D animation where it shows not much different than existing brochure. The simulation is not being designed to closely resemble its real-world human organ where the viewers can see through the organ without seeing the real human organ.

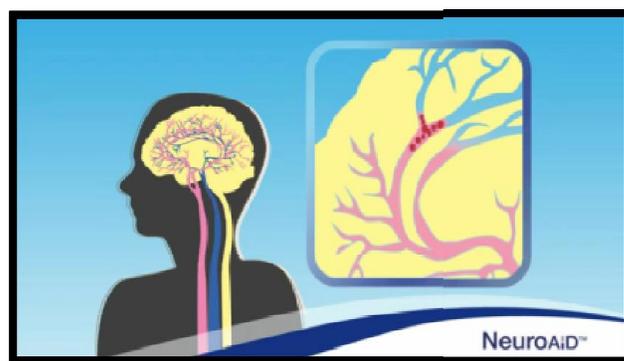


Fig. 1. What is stroke? Video by NeuroAid

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2.2 Stroke - 3D Medical Animation

The second existing system is Stroke – 3D Animation by Ammera. This simple 3D animation is used to educate medical students, professionals, and the general public about the dangers of stroke. The viewers can see only one type of stroke that occurred to human. It shows how normal blood flow had been blocked by clot in blood vessel. However, this simulation not giving information on how to prevent the stroke or the treatment

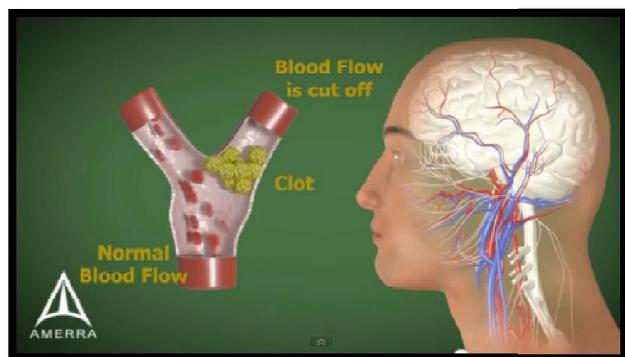


Fig. 2. Stroke – 3D Animation by Ammera

2.3 Stroke - Nucleus Media Animation

Figure 3 shows the third existing system which is Stroke – Nucleus Media Animation. This video simulation shows the three types of stroke that can occur to anybody which are Ischemic (Clots), Hemorrhagic (Bleed), Transient Ischemic Attack (TIA). Every type of stroke has its own surgery procedure to reduce the stroke long term effect to the patient.



Fig. 3. Stroke by Nucleus Media Animation

TABLE 1. COMPARISON OF EXISTING SYSTEMS

Example Criteria	What is a stroke? 2D animation	Stroke – 3D Medical Animation	Stroke – Nucleus Media Animation
Theory field	Medical	Medical	Medical
Content	2D animation video about stroke and the treatment	Simple 3D animation about one type of stroke	Detailed 3D animation about 3 types of stroke and surgery procedures
User Interaction	No	No	No
Integration	No	No	No
Type of Product	Linear video	Linear video	Linear video
Timing	2 minutes 30 sec.	1 minute	4 minutes 20 sec.
Multimedia Element	Yes -Text -Graphic -Audio -Video	Yes -Text -Graphic -Audio -Video	Yes -Text -Graphic -Audio -Video

3 PROJECT DESIGN

According to Prof Dr Tan Chong Tin, senior consultant at the Neurology Clinic of the University Malaya Medical Centre, it was proven that 70% of stroke cases were preventable [3]. The symptoms of stroke disease and how to prevent will be the main idea of this project. As for learning method, 3D modelling is the most suitable material to give an information more clearly. The target user for this animation application is all the viewers aged 16 to 50 years old focusingly patients at waiting area of clinics and hospital while waiting for their treatment.

The project will cover three types of stroke which are Ischemic (Clots), Hemorrhagic (Bleed), Transient Ischemic Attack (TIA). The module of this project are statistic of stroke disease in Malaysia, process of stroke occurred, causes and symptoms of stroke and prevention ways. The main platform of this project uses Autodesk Maya 2012 to model the components involved in the stroke disease process and later was animate using the combination of sound and effect from Adobe After Effect software.

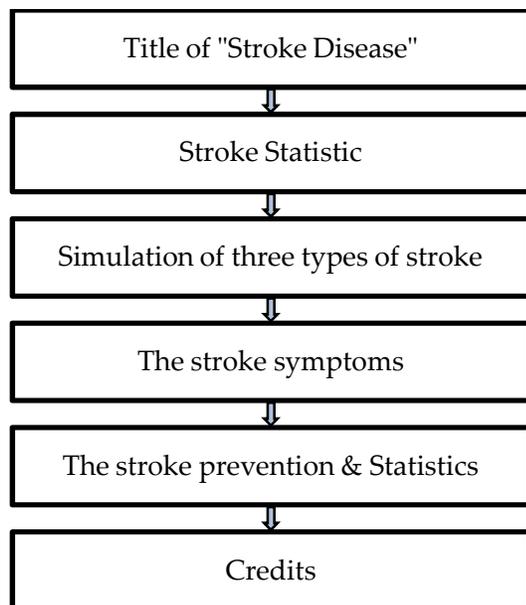


Fig. 4. Simulation Flow of 3D Medical Content: Stroke Disease

In the project requirement, the overall analysis of the system to be developed is explained

3.1 Frame Rate

Frame rate is the first aspect of animation. This simulation using 24 frame per second (fps). The length of this 3D simulation is 5 minutes that equal to 300 seconds. Total frames are 24fps times 300 seconds equal to 7200 frames

3.2 Animation Types

Keyframe animation is a technique for producing animations whereby important positions, sizes and orientations of objects at particular points in time are identified and everything else in-between is filled in by interpolation. The keyframe technique consists of identifying certain arrangements of objects, including the camera, which are to hold at certain times or frames. Then the rest of the frames in the animation are worked out by in-betweening or "tweening". This consists of interpolating appropriate transformation parameters between specified keyframes.

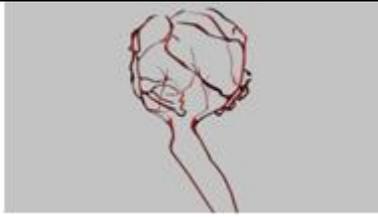
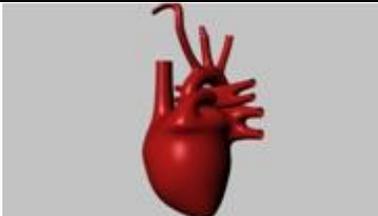
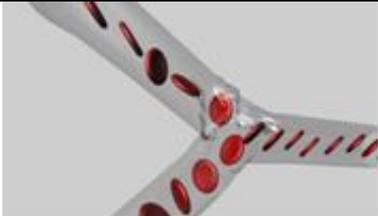
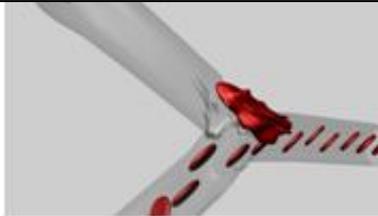
3.3 Text

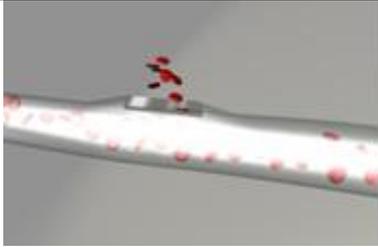
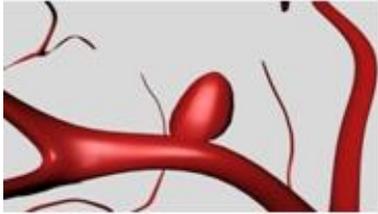
Text also will be used in this simulation to give explanation and description. Text also to support the graphics and also used for giving general information

3.4 Audio

Audio plays an important role in learning process. In this 3D simulation, voice over technique will be used in this project in order to give better explanation about stroke disease.

TABLE 2. CHARACTER PROFILE

NO	CHARACTER	DESCRIPTION
1		Human Model
2		Brain
3		Major Artery
4		Heart
5		Blood Cell and Vein
6		Thrombus/ Blood Clot

NO	CHARACTER	DESCRIPTION
7		Artery Burst
8		Aneurysm
9		Blocked Artery

4 CONCLUSIONS AND NEXT STEPS

Future work will mostly on development of this project. This paper covers analysis and design phase. This 3D Medical Content: Stroke Disease is going to be developed for viewers, especially for patients at waiting area to give awareness how to prevent stroke disease. The viewers can see how and what the causes to trigger stroke disease. The content also developed with 3D part of the human body makes the viewers get an information in attractive ways.

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