

Estimation of Stretching Fitness using Augmented Reality

Vrunda Gadesha¹, Dr. Kamaljit Laktaria², Shri. Kuntal Ghose³

^{*1,2}Department of Computer Science, Gujarat University, Ahmedabad, Gujarat, India

³Department of Animation, IT and Mobile Application, Gujarat University, Ahmedabad, Gujarat, India

ABSTRACT

Fitness is not about being better than someone else, it's about being better than you used to be. Everyone is looking for their fitness but it's quite difficult to find out time to practice appropriate stretching exercise or Yoga. Most of the people are not aware about the method of performing this kind of exercise or Yoga, thus the practice done in an incorrect method may harm the body muscles and even causes the side effects such as major drop in body energy, insomnia, body aches and pains, joint problems, female miss the period cycle or face the irregular periods, poor mental health and many more according to the capacity of human body^[5]. Obsession with fitness is connected to convenience and flexibility that has given birth to on-demand fitness or yoga classes. People are running on the thorns of the clock now days. Thus we need a 'home tutor in pocket' (a mobile application) which can teach the correct method of various stretching exercise and yoga asana at our convenience. This mobile application created with the help of augmented reality^[3] made the fitness routines more affordable and accessible, helps us to set the realistic fitness goal, monitor our workout routines and importantly teaches us the correct method of performing various stretching exercise and yoga asana. This research paper portrays the objective, conceptualize the exclusive character (who is performing various exercise and yoga asana) using Photoshop, creation of 3D model using Maya, methodology, SURF Algorithm implementation, character scaling according to the height, weight and age using Unity 3D with Augmented Reality^[2], technical aspects as well as social aspects.

Keywords : Augmented Reality, SURF Algorithm, 3D Modeling, Yoga asana, Stretching Fitness

I. INTRODUCTION

Extinction of physical work from daily routine life causes various health issues. Among them muscular pain is the most common issue found in all age groups^[7]. Performing different stretching and yoga asana helps from getting rid of certain muscular pain. This paper includes the implementation explanation of following phases for the concept of "home tutor in pocket" mobile application^[8] which help people learning the proper way of performing stretching exercises and yoga asana.

Phases of the concept: "Home tutor in pocket":

1. Creating Concept art of character
2. Creating the character model sheet
3. 3D Modeling
4. Un-wrapping
5. Texturing
6. Rigging
7. Animating the character
8. Scaling the model
9. Error Detection

- 1.1 **Creating Concept art of character:** According to the ‘Yoga Journal’ report, 72% women performing yoga and fitness exercise^[1]. The very first step of this research pipeline is conceptualized the character. This concept art is created on the basis of imagination such as “my trainer is female”, “my fitness trainer belongs to India”, “my trainer is wearing yoga costume”, “and my trainer is having medium length hair” etc...
- 1.2 **Creating the character model sheet:** During this phase the designs of the character are finalized and the full character sketch is made in major 3 views. (a) Front View (b) Side view and (c) Back view. Model sheet is created to maintain micro-detailing in the character and to keep the designs of the character uniform during the complete production process.
- 1.3 **3D Modeling:** The process of creating 3D mesh according to the concept character is 3D modeling. This phase includes the process of taking a shape and molding it into 3D mesh. There are two types of models. (a) Organic Model and (b) Hard surface model. In this research the character is molded into organic model.
- 1.4 **Un-wrapping:** Unfolding the 3D mesh is known as un-wrapping. Creation of 2D texture which fits on 3D model can be performed only after un-wrapping the mesh.
- 1.5 **Texturing:** Textures are basically 2D images created according to the character requirement using programs like Photoshop or Illustrator. These images can be overlaid over 3D model to add colors, designs and textures.
- 1.6 **Rigging:** This is the process to setting up a controllable skeleton for the character that is intended for animation.
- 1.7 **Animating the character:** This is a final phase to make the character alive. The various body moments includes hand moments, lag moments, twisting, stretching, and performing yoga asana

falls under this phase. Thus this phase is the heart of the research!

- 1.8 **Scaling the model:** Using the ‘SURF Algorithm implementation^[9]’ this imaginary character can be resized according to the height and weight of the native user.
- 1.9 **Error Detection:** This final phase shows the warning for the user if the user is practicing wrong posture and it also warn user if the user is not eligible to perform certain exercise or yoga asana.

II. IMPLEMENTATION OF PHASES

- 2.1 **Creating Concept art of character:** The concept art is completely depends on thought cloud and imagination towards the character requirement. Following image explain the brain storming process before creating the concept art of required character

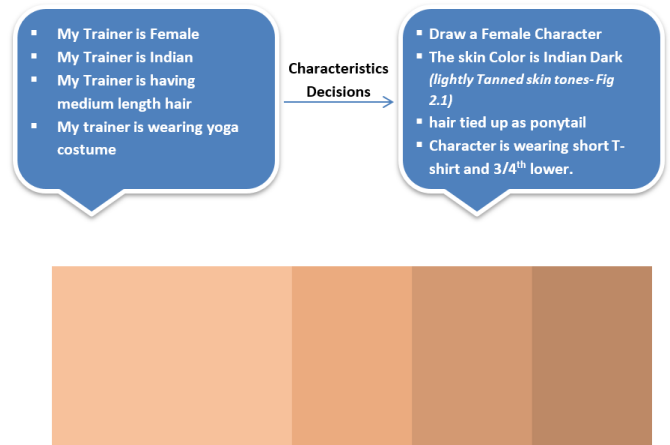


Fig 2.1 – Lightly Tanned skin tones

- 2.2 **Creating the character model sheet:** Before Creating the Character model sheet digitally, the imagination is sketched on paper as shown in below figure-2.2.1



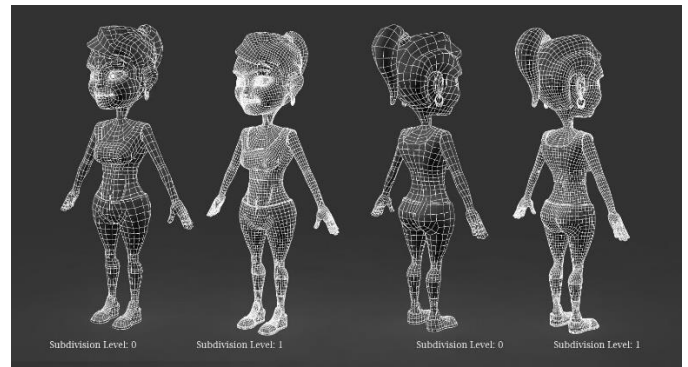
Fig 2.2.1 – character Sketch

According to the reference sketch, following model sheet [fig 2.2.2] is showing the final outlook of the character with required characteristics.



Fig 2.2.2 – character modal sheet

2.3 3D Modeling: This Phase is initiated with the use of software Autodesk Maya, in which the process of creating 3D mesh as per the model sheet has been completed. The character will be in T-pose with basic gray shade. 3D mesh is created with minimum subdivisions – 41,797. Then we added smooth to the mesh to provide the appropriate curve to the model but not to increase the subdivisions. The full character subdivisions are shown in figure 2.3(a) and the face subdivisions are shown in figure 2.3(b)



[Figure 2.3(a) – Full character Subdivisions]

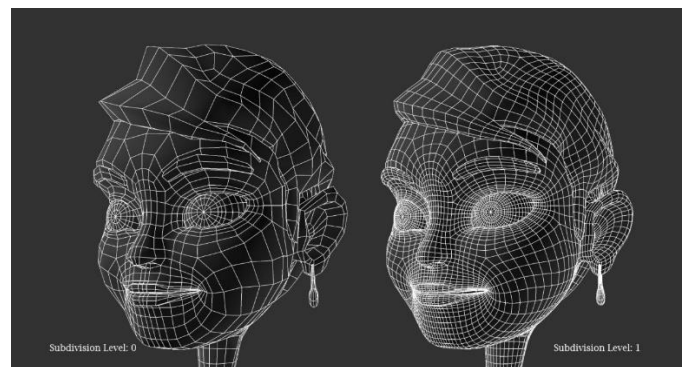


Fig 2.3(b) – Face Subdivisions

2.4 Un-wrapping and Texturing: When a 3D model is created, 2D images can be overlaid on it to add colors, designs, and textures. This is called mapping, and often the entirety of a model's color comes from this. These images can be created in programs like Photoshop. These images or textures are created in the form of maps which are then assigned to the model.

2.5 Rigging: Setting up a character to walk and talk is the last stage before the process of character animation can begin. This stage is called 'rigging and skinning' and is the underlying system that drives the movement of a character to bring it to life. Rigging, in simple words is the process to setting up a controllable skeleton for the character that is intended for animation.

Skinning is the process of attaching the 3D model (skin) to the rigged skeleton so that the 3D model can be manipulated by the controls of the rig.

2.6 Implementing the SURF Algorithm: This Algorithm is based on major steps – (a) Feature Detection and (b) Feature Description. This algorithm is robust image detector & descriptor that can be used in our definition where initially we resize the 3D character according to the native user’s height and weight and age.

- (a) **Resizing/Scaling in Unity:** ^[6]the ‘Texture2D.resize’ function is used with the user input values, after resizing the texture pixels will be undefined and this works on existing texture object. The texture has to have read/write enabled flag set in the texture import settings. It can be represented as “public bool resize(int height, int width)”
- (b) **Performing the native user selected yoga asana:** ^[4]User can select any of the yoga asana which will be performed by the character with appropriate human body scale and angles. The basic objective is shown in below figure.



Fig 2.6 – Basic implementation of SURF which can show the appropriate way of performing stretching exercise and yoga asana

III. CONCLUSION & FUTURE SCOPE

After the creation of mobile application with the concept of ‘home tutor in pocket’ which can guide people for their daily routine stretching fitness and practicing various yoga asana, we are trying to achieve the “upload Video” feature in which native user can upload their own video and user can compare his/her performance with the 3D

character’s performance. This method can directly show the difference between the actual method and the incorrect method of performing stretching exercises and various yoga asana.

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