Personal fitness trainer powered by Augmented Reality (AR)

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Abstract - The paper demonstrates how we can use Augmented Reality to build our fitness trainer who holds the capability to teach different exercises, sports, dance steps and many more with a 3D demonstration. We will deeply focus only on the exercise demonstration. The prime benefit of the project is to learn from a personal trainer at the comfort of our houses and zero investment of money. One can get closely a real feel as they can see the character performing in the 360-degree view.

INTRODUCTION

"Health is wealth" is a very over-rated quote for ages but with increment in generations, the focus has been shifted to faster methods of life and good health is often compromised.
With changing work culture and increased screen time, it is very difficult for anyone to spare for exercise or work to be fit and healthy. Going to gyms is the first-day motivation everyone has but not everyone can afford a personal trainer or even spend time travelling. We in this paper are proposing a technological alternative to tackle these problems by making use of Augmented reality.

We will create a virtual character that will act as a trainer for us with certain animations i.e., exercise. Undertake conversion of the 3D character into AR Character. Then we just need to scan the ground followed by locating our AR character in real.

Methodology

This section is divided into three parts.
This section discusses:
1) Augmented Reality
2) Software Development
3) Working on the proposed system.

Augmented Reality
Augmented reality brings virtual things into the real world with the help of digital visual elements, sound, or other sensory stimuli delivered via technology. Our mobile device should have the necessary specifications:

Processor: The processor is very important it needs to handle heavy AR requirements.

Graphic Processing Unit (GPU): AR requires high-performance GPUs so that it can display and create digital content seamlessly.

Sensors: This component gives the ability to sense the environment and according to it only it adjusts itself.
E.g.: Depth sensor, Gyroscope, Proximity sensor, Light sensor.

Software Development
This section is again divided into 3 regions of work i.e., Creating a 3D model, creating animations for the model, and augmenting the model.

Creating a 3D model:
Creating a 3D model is one of the most challenging works to do. Software like AutoCAD, Autodesk, Blender can be used to use to build graphic characters. Blender is easy to learn the software to create your 3d character. In this project, we make use of Adobe's Mixamo which offers ready to use characters and animations.

Creating animations:
Creating an animation for our 3D model is one of the crucial parts of the project. Software like blender is usually used for creating animations. We can use a motion tracker to capture our movements and create actual animations. The accuracy might be high using this method but is expensive. We in this project, use Adobe's Mixamo to download freely available animations relevant to our character and exercise.

Augmenting the model:
Software available to shift the 3d model into the real world is Vuforia, AR Core, AR Kit, AR Foundation. ARCore is only for android users whereas ARKit is for IOS users. But AR Foundation is for both android and iOS users and has the power of both ARCore and ARKit which is backed by Unity. Vuforia is one of the easy-to-use software. Its image detection and ground detections are quick and accurate. One can use all this software with the help of software like Unity (game engine), Unreal Engine.

Working

The following is the flowchart to the process of building this project stage-wise, creating a 3D model to augmenting it.
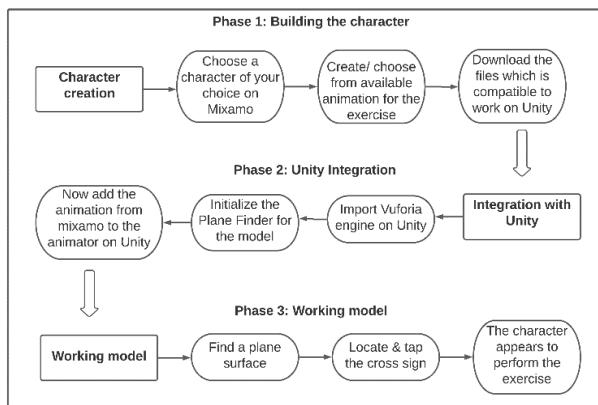
Figure 1: Project Flowchart
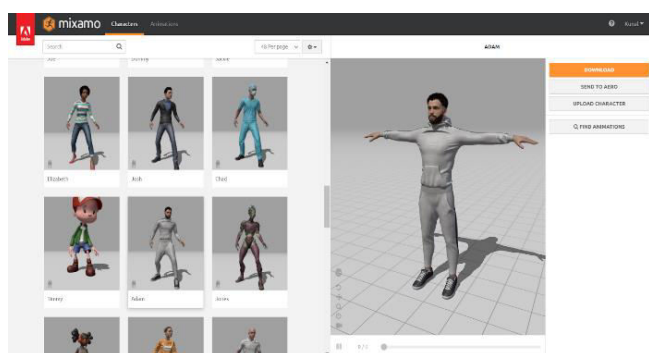
Creation of character and Animation

Figure 2.1

Figure 2.1 shows how to create a 3d model using Mixamo. This web software is backed by Adobe, so it is very easy to get a 3d model. You can customize it according to your needs.
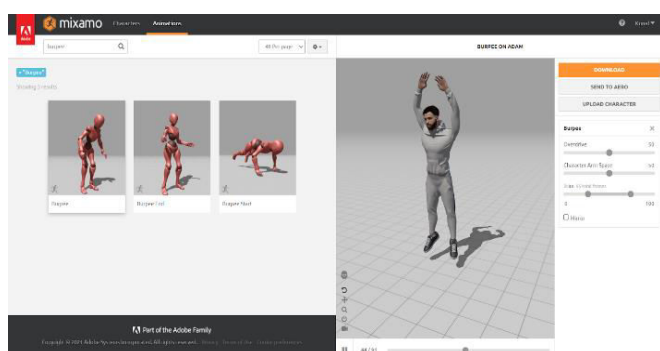

Figure 2.2

Figure 2.2 shows how to get specific animation for exercise using Mixamo. The platform has few free animations available.
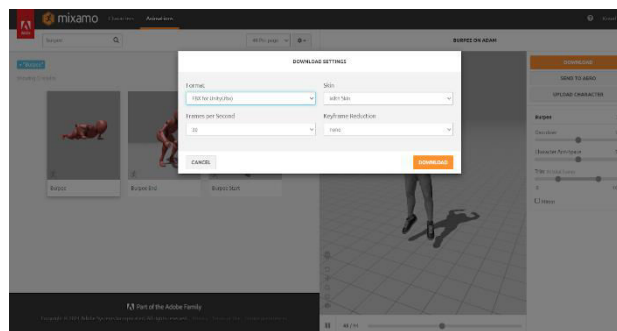

Figure 2.3

Figure 2.3 shows how one can download a character and animation specific to Unity. The 3D model and the animations are required to be used on Unity to build the character in reality.
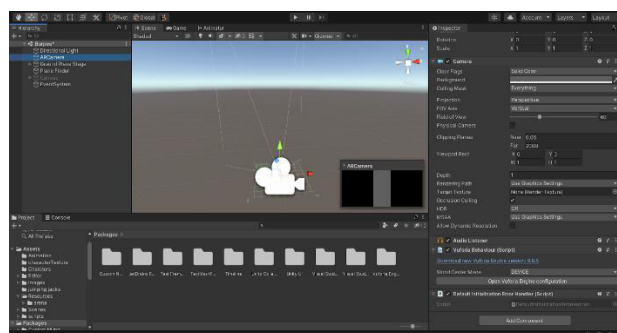
Integration with Unity

Figure 3.1

Figure 3.1 shows how to integrate Vuforia in Unity. One needs to import specific Vuforia settings in Unity and then add the relevant app license key in the AR camera option.
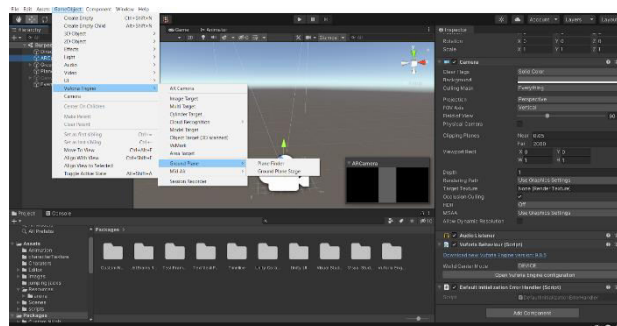

Figure 3.2

In figure 3.2, it is shown how to add Vuforia ground plane stage and plane finder. To add them go to Game Object > Vuforia Engine > Ground Plane > On both Plane Finder and ground plane stage. Ground Plane Stage is a virtual stage on which our 3d object will stand. The plane finder places a

marker that is visible when the device detects the plane and after clicking on it a 3d model will be placed on the plane.
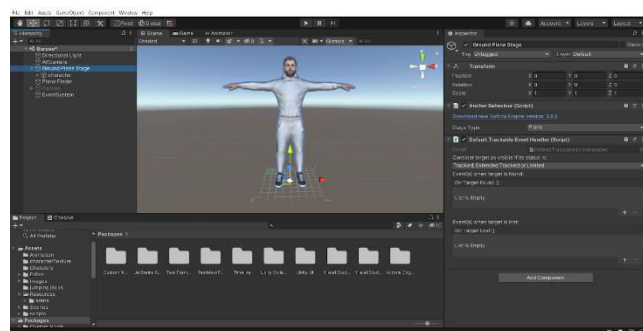

Figure 3.3

In figure 3.3, it is shown how to add a character. The character which we have built is made the child of the ground plane stage so that our character gets a stage to stand in the real view.
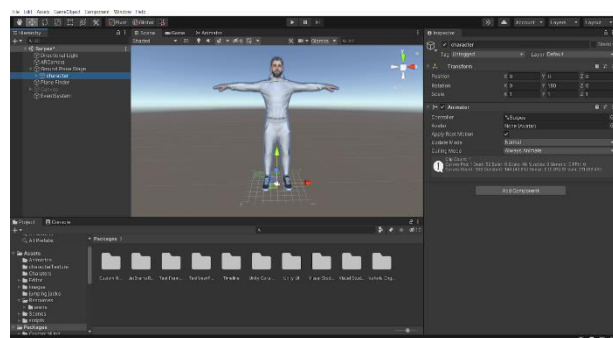

Figure 3.4

Figure 3.4 shows how we can add animation to a character. To add animation at the inspector of character, we need to add an animator in the control area followed by adding the correct animation which we acquired from Mixamo. The author has used the exercise named 'Burpee' for demonstration.

Figure 4.1

Finally, this is the final interface of the .apk file run on a smartphone with the required specifications as mentioned

above. The procedural steps are simple i.e., Open Camera> Find a plane surface > Locate the cross > Tap on the cross to enable the character > Character appears and performs the animation we used in front of us. By moving the camera around the character, one can get a 360-degree view as desired.

The is the complete implementation of the project where we make use of the power of Augmented Reality in the fitness industry. This is a small step towards the bigger picture and will try to build it even better.

3. CONCLUSION

Our main goal behind this is to make our nation healthy and fit. With changing lifestyle and work culture we must realize the importance to be fit and healthy. But at the same time, the alternative produced should be cost-effective and feasible in all aspects. These points were kept in mind by the authors of this paper while creating this AR-based personal trainer. The application of this system brings in two of the most crucial benefits of all. The first benefit is one is getting a personal trainer at their home at their convenient time and a very affordable price. The second benefit being, we can see the same exercise as many times as we want and from 360 degrees. So, that it helps us to replicate the same exercise very easily.

ACKNOWLEDGEMENT

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