

Augmented Reality Based Fitness Website: ProFIT-AR

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Abstract - The novel coronavirus (COVID-19) outbreak was declared as a global pandemic by the World Health Organization on 11th March 2020. COVID-19 spread has its origin from the wet markets of Wuhan city of China. With corona virus spreading in the world, everything has changed its track and went online, whether it is work or fun. So in this race, how can the fitness industry be left alone in the market? Workout from home started trending on every social media platform and people started performing exercises at home. Often, it happens that when someone starts something new without any proper guidance, then there are high chances of getting backfalls. Hence, so is the case with working out from home. Workout from home can lead to many dangerous injuries if not done under the proper guidance and safety measures. But this is just not one problem of concern. Another point to be noted is that users tend to leave workout at their home due to lack-lustered interaction with the website. We have fulfilled this gap by introducing the technology of Augmented reality in the picture

Key Words: Posture detection, Rep counts, Augmented reality, Workout from Home

1. INTRODUCTION

Augmented reality (AR) is an enhanced version of the real physical world that is achieved through the use of digital visual elements, sound, or other sensory stimuli delivered via technology. It is a growing trend among companies involved in mobile computing and business applications in particular. There is not going to be any application in the decade of 2030, where AR is not introduced. This makes it crucial to be acquainted with the tech as soon as possible.

The COVID-19 pandemic has insignificantly affected the whole life order of the world. Now, being an introvert is no longer considered as a social retard. Once that was considered an ineffable lifestyle i.e., Staying home, is now rather looked as a healthy and safe routine.

At these times, when some part of the general population is willing to do everything "from home", wouldn't that be really overwhelming if your health is delivered at the doorsteps? Come on, who doesn't want this?

In this project, we are promising to bring health to your doorstep with a website that will be an amalgamation of the two latest and booming technologies of the 21st century viz., Machine learning and Augmented Reality.

1.1 Project Importance

With so many lockdowns imposed across the various countries in the world, everyone is aware about at least two things now and those are (a) Anytime there can be a widespread of fatal disease, and (b) Health is, after all, the real wealth.

ProFIT-AR will be one of those websites that would push people to continue with their workout because of the technology that's been introduced in making the website. It also completely demolishes the gap between rich and poor people as it is free of cost and anyone can use it from anywhere.

1.2 Scope of Project Work

The following problem scope for this project was arrived at after reviewing the literature on people using fitness apps/fitness websites for exercise and calculating all the possible outcomes. The following scope(s) were identified:

Home: The proposed System can be of great importance at home to help people in building a routine for their exercise and do the needful to stand with the routine

Schools: The proposed system can be integrated with school curriculum for the students to follow a healthy time table with their personal devices turned on, and enjoying the AR stickers

Offices: The proposed system can be used in offices in such a way that the employees can do their exercise during some break in their office itself. This will increase the productivity of the organization as well as the person themselves will be motivated towards meeting their end goal.

The choice of a system must be based on the best performance. Hence the above performance metrics may be considered for coming out with the best system so that it can be implemented at large scale.

1.3 Survey of Existing System

From the survey paper published by the team, paper deduces the following:

In making the website work, the first step is to be able to determine the exercise and adding some decorative stuff over them, for example: Count the number of repetitions performed by the user. To make this thing possible we are going to use the technology of mediapipe pose estimation.

Human pose estimation from video plays a critical role in various applications like quantifying physical exercises, signing recognition, and full-body gesture control. For instance, it can form the premise for yoga, dance, and fitness applications. It may enable the overlay of digital content and data on top of the physical world in augmented reality.

MediaPipe Pose is a machine learning solution for high-fidelity body pose tracking, inferring thirty three 3D landmarks and background segmentation masks on the full body from RGB video frames utilizing the BlazePose research that also powers the Machine learning Kit Pose Detection API. Current state-of-the-art approaches rely totally on powerful desktop environments for inference, whereas MediaPipe method achieves real-time performance on newest mobile phones, desktops/laptops, in python and even on the website. It takes various points on the body to perform intense learning of movements between them.

1.4 Limitations in existing system

As the technology that we are using is still in the development stage, there exists some limitations to the project.

First is the unavailability of augmented reality models that could be used for the project. There exist very little 3D models that could be exported to AR format and hence extra efforts are required

Another limitation could be that less effective detection of points on the user's body.

Hardware limitations such as unavailability of webcam on users device. There can be some users that do not have a properly functioning webcam on their device, then this could also cause a limitation to our project.

There might be some inaccuracy in counting the number of repetitions done by the user. For example, if a user is doing biceps curl, then mediapipe algorithm might sometime lose the count of one or two curl, this could then create a chaos.

2. Proposed System

When people try to workout at home, they might or might not perform their workout in the right posture that is needed. Calorie's count, respiration and measurement of

intensity is good, but still if a rookie is about to perform an exercise, and does it in a wrong manner that it might lead to muscle injuries.

Muscle injuries are not just any normal injuries, it can be chronic and its reflection could be easily seen in our daily life.

That's why, we are purposely making a fitness app which will not only correct the posture of the exercise, but it will also have an Augmented reality based setup which will show how to perform the exercise with improvements and will create an exciting user interface.

The entire system would be deployed and this would help the fitness freak lover to enjoy the healthy life more effectively.

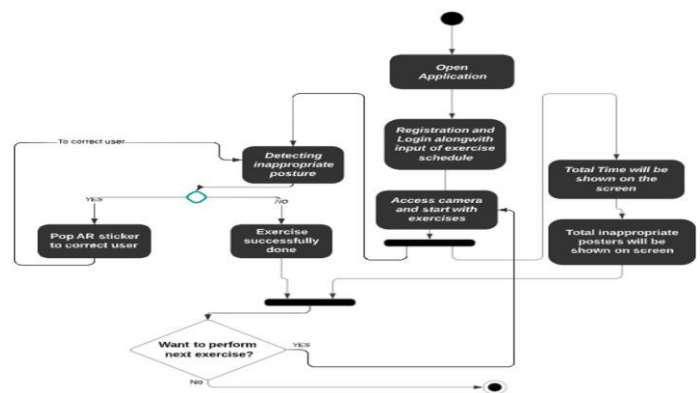


Fig 1:- Activity Diagram

2.1 Details of Requirements

We will require the following Hardware

- 1) Camera-480p / 720p
- 2) Any OS
- 3) 4GB RAM or above
- 4) Any screen device to view AR

Software that we are using to develop:-

- 1) Python 3.8.0
- 2) GIT
- 3) webAR
- 4) Javascript
- 5) ReactJS
- 6) AWS

2.3 Details of Design

Our website will have the following design specification:-

- 1) Impressive website for user

- 2) Sections for specific website
- 3) AR viewing portion
- 4) Start exercise module where the ML will count the repetitions only if right posture is achieved
- 5) About the developer section

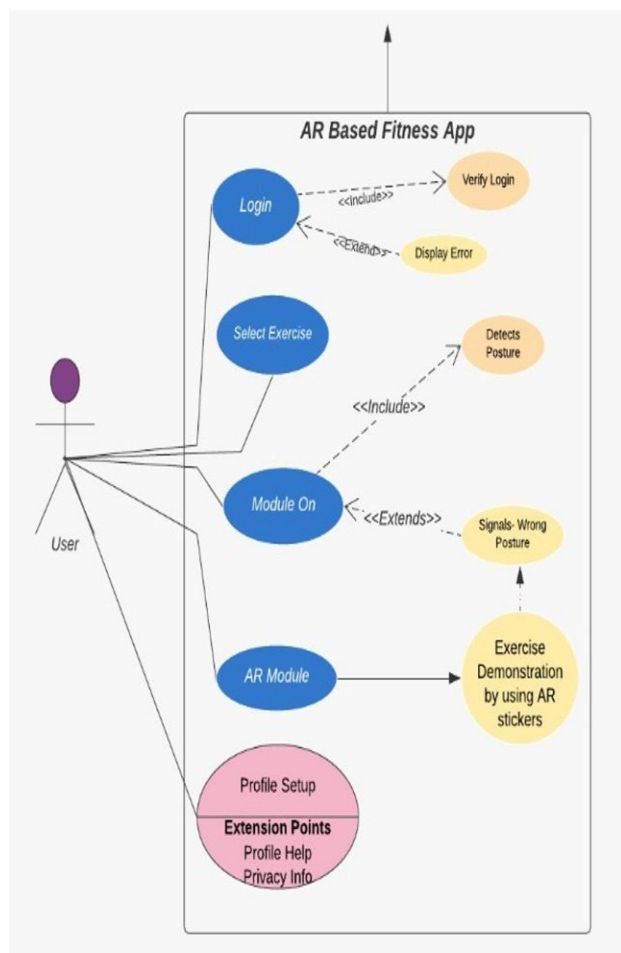
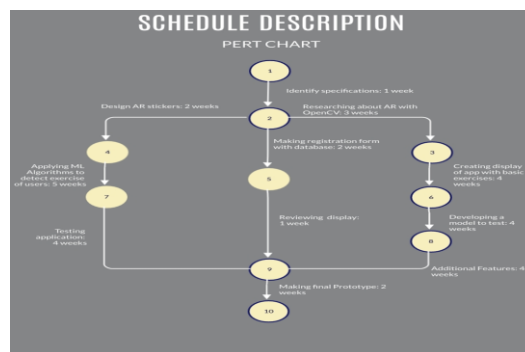


Fig 2: Use Case

2.4 Implementation

The entire project is developed, maintained using GIT. To ensure that the team can work smoothly and efficiently each module was classified into different files with their own classnames.

We followed the following PERT chart for the development of our project:



Everyone in the group sincerely adhered to the work given to them.

First we started by making a detection model using MediaPipe. The landmark model in MediaPipe Pose predicts the location of 33 pose landmarks (see figure below).

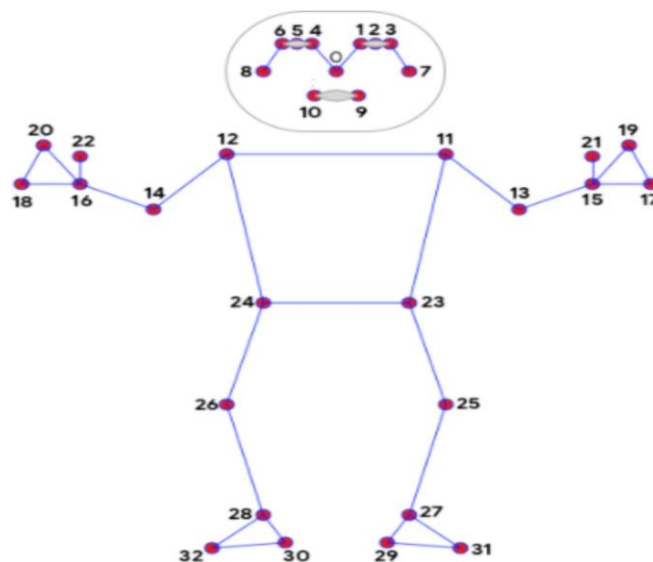


Fig 3: Pose Landmarks

After successfully generating a model that counts the biceps curls done by user, we moved on to our next step

For building AR, we used the help of webAR and started developing our model. In making an AR model, we first made a marker that would host our model once it is executed by the user. After selecting a marker, an AR is made by using gltf file format.

In the third phase, we developed our frontend by using JavaScript and decorated it using tailwindCSS

After completing the above three phases, we moved on to research work. I would also like to thank all the faculty from start integrating the above all three into one. On the sidekick the computer engineering department, for their advice and process, we were developing a database to store users information on the server using MongoDB.

After completing all the three phases, our application is now ready to be hosted using any cloud server.

2.5 Results

In our project we have successfully implemented a fitness based application that empowers Machine learning technique along with Augmented reality touch to make it the most interactive and exciting experience given by any fitness website out there in the web world.

ProFIT-AR is till now a success based upon the reviews received from all the test cases that it was run on. Various surveys were conducted to test the durability of the website and out of them, the application received 98% vote for being feasible.

The model that we created using MediaPipe is easily able to achieve north of 97% success rate when it is detecting points on the body. For the biceps curl, we are taking 160 degrees as an angle for one full curl, after which our app will automatically calculate the repetition; the program was successful in every milestone and it is counting as well detecting with very high accuracy of around 98%.

3. CONCLUSIONS

In this paper, we have discussed how dangerous, boring and tedious can be trying to work out from home without having any proper guidance, and let's not forget the fact of losing your money to gym subscriptions if any sudden lockdown is imposed. Our augmented reality based fitness website, ProFIT-AR could be an easy solution for all the above problems.

With everything going “-from home”, like work from home, study from home, etc. workout from home has also generated a good fanbase. Working out from home may be exciting and fruitful but it has some serious cons as well. While working out one might perform exercise with incorrect postures. These incorrect forms are dangerous and a sure route to injury. Although exercise is good for you, working out with bad form can do more damage than good. Hence, we produced an idea of making a very creative and user-friendly Augmented reality based fitness app viz ProFIT-AR.

With great Augmented reality integrated features, users will be bound to use the app again and again thus it will benefit them to correct their posture.

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