FITNESS TRAINER APPLICATION USING ARTIFICIAL INTELLIGENCE

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ABSTRACT

In recent years, people moving towards online training. So, we are trying to get the fitness industry online. For that, we developed an application in which user will get artificial intelligence-based trainers with the help of image processing & video processing. This Application allow users to do their regular exercise with the help of an AI trainer at home. also, this application is beneficial to some Users to get solved their various health problems such as being overweight or any other health problems. Because of the lack of fitness trainers in India or the cost of the gym are not affordable to many peoples that's why we have decided to implement this Idea. by using this application Users will get their daily workout routines after calculating their BMI with the help of their Height & Weight. User will get their exercises according to BMI We Have divided BMI into five categories like Underweight, Normal, Overweight, Obese & Extremely Obese. So, users can build their muscles and keep fitness at home without going to the gym. and all exercises users perform which will be designed by experts. This project was performed with the help of the open cv Library which means Open-source computer vision library it is a software library of open-source machine learning and computer vision for image processing and video processing & also for CNN which means (Convolutional Neural Network) it is a deep learning algorithm which can take in an input picture, assign importance (learnable weights) to various aspects/items withinside the picture. According to a survey in 2021, it was found that almost 63% of the population is not interested to do exercises regularly. while nearly 45% of the population are said that they lead a healthy lifestyle is their top priority but only 37% of them exercise.

Keywords: Fitness Industry, Health, Exercise, Artificial Intelligence, Neural Network, Deep Learning, Computer Vision.

I.   INTRODUCTION

In the 21st-century people are moving towards an unhealthy nature and bad wealth. there are various reasons because the people are getting lazy in case of their physical fitness, for example, social media is there, then their workload, lack of motivation, and there are so many people, who things that physical fitness required a lot of investment in case of a gym or for fitness equipment but in fact, if you don't have any equipment, then also you can able to perform the exercise and became fit and healthy. according to the survey done by India news, it says that around 60% of people do not do regular exercise because they don't have that much time, it can be because of their family, work, and so on. but they are very interested in using smart technologies which makes their life easy, and because of these smart technologies people's life becomes lazy, and they want quick results, and it results in They don't feel the flow of life. So, to overcome this situation while considering all those problems, we are making an application which will become helpful for all people from all categories, for example,

1. People who have a very huge workload: From that people, we are going to take very less time around 20-25 min per day from there 24 hours to make their physical fitness and make them feel fresh.

2. People who feel gym fees are not Affordable to them: For that people, we are making an online AI-based trainer, which will help them to do correct exercise at a very cheap cost, and to make them live a comfortable life.

3. Lack of motivation: If we find out the reason why peoples feel very boring while doing exercise, then there are various reasons first is They don't feel it interesting as their minds are interesting towards the smartphone and its various technology & the second one They don't know the importance of exercise in their life.

So, we are trying to make them motivated with the help of our technology, we design such algorithms which will make or sustain their motivation

a. We can give rewards to them after completing their tasks.

b. We make our interface interesting, which will make it interesting.

c. Also our UI makes it easy to understand.

1.1 Why this application?

1. To overcome the Shortage of gym trainers in India.

2. Gym Fees are Ranges from 1000-3000 per month. So, many peoples can't afford gym costs.

3. Peoples are very busy with their daily schedule, so they don't have time to go to the gym. so, we are just trying to make it online.

4. In the gym Trainers have to manage many customers at a time.

5. User will get a proper diet plan according to her BMI.

II.   ARTIFICIAL INTELLIGENCE IN IMAGE PROCESSING
AND VIDEO PROCESSING

With the help of various methods in this application image processing & video processing will be done.

Image processing: It's used to identify object type & It's a method in which a user's image will be detected. also, by the help of these, you can calculate height.

Video Processing: In that real-time Analysis will be done in the human body will be detected. With the help of these, we have detected human body postures while workout. In that n number of images will be processed.

2.1 Open CV Library

Open CV it's an open-source package or a library which is aimed at real-time computer vision & ML it's a cross-platform which can support various languages. Originally Open CV is developed by Intel in the year 1998 & Its license is available Free of Cost and supports multiple languages like python, C++, java & MATLAB. Open CV is one of the most widely used applications of computer vision gesture recognition motion understanding object detection, segmentation, and recognition. It & also used for Human Face detection, Human Body detection, Landmark detection & much more. so, there are a lot of good use cases on an open CV library.

Open CV Library is used for user image processing modules of detecting bodies. some of the functions in Open cv are amazing & it used in almost every computer vision Task. Image processing is a set-in which input is Users image & Output is image related set of characteristics & In Video Processing Real-time Analysis will be done in the human body will be detected.
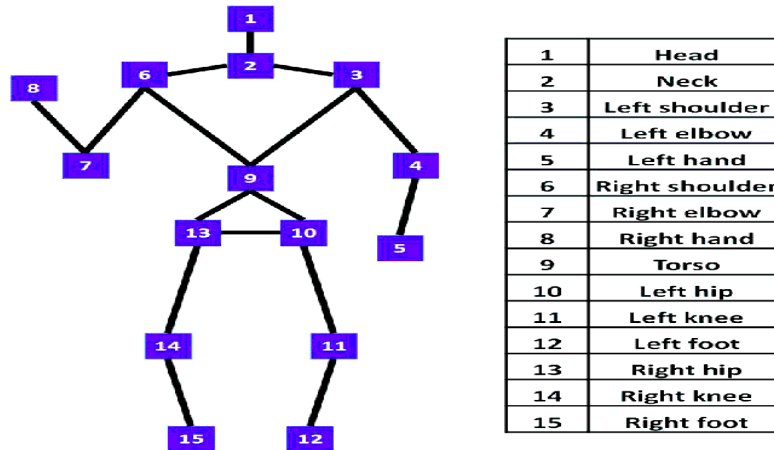
2.2 Human Body Detection

Human detection is a subset of Object Detection. Essentially, an Object Detection system that can detect the "Human" can be considered a Human Detection System. Human body detection is a popular solution that Artificial intelligence offers, it is used to determine the position of the human body by the image of a person captured by a camera. The natural language computer vision process algorithms. This technology goes through a various number of workouts in real-time.
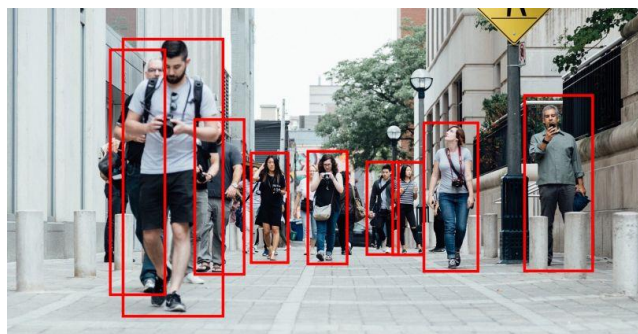
In the body detection module, we are going to create a skeleton of the human body by using various algorithms. here we used the (Viola-Jones) algorithm which is used to drive the detection of human body joints. In body detection first, we detect the joints of the human body, there are 15 joints in the human body, our target is to detect that and make their points for each joint, for the study of human body parts and their motions, because if

it is possible to understand the motion of body parts, then we can able to detect it in the video as well. After detecting the human body joints, we join them using lines that result in the human body. if it detects in live camera mode then the body can be in a moving state. then we can measure the angle between the body parts as well.

|	
1	Head
2	Neck
3	Left shoulder
4	Left elbow
5	Left hand
6	Right shoulder
7	Right elbow
8	Right hand
9	Torso
10	Left hip
11	Left knee
12	Left foot
13	Right hip
14	Right knee
15	Right foot

When talking about fitness applications it involves human pose detection, it's good to use estimation. It analyzes human body poses during physical activities more Accurately.

Talking about AI fitness apps, the process is as follows:

1. First we Capture the user's movements while doing an exercise.

2. Detecting 2D and 3D points on the human body

3. Decomposing of the exercise phases

4. Count Exercise.

5. Searching for common mistakes

6. Analyze the correctness of an exercise and Yoga poses performance

7. Display the results and generate a recommendation for a human user

## DECOMPOSITION OF THE EXERCISE INTO PHASES
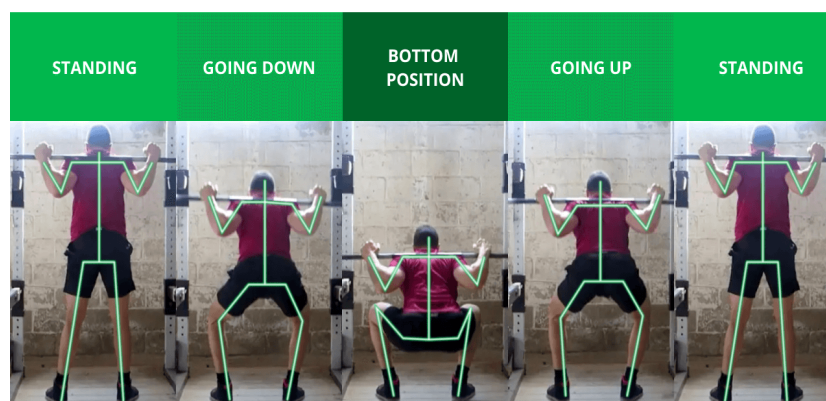
2.3 Human face Detection

There are various techniques using which we can detect human faces from various objects in a particular image or video, for face Detection these techniques have almost the identical manner. so, for achieving high accuracy, we used open cv & Neural Networks.

1. First the image is imported to the required location for face detection as an input. Then that image is going to be transferred to Grayscale from RGB. because it gets easier to detect a face in grayscale.

2. In the second step image manipulation is there, In which the cropping, resizing, and blurring of the picture is done if it is required, after that the manipulated image is gone for segmentation. which is used for detecting multiple objects in an image, and hence to detect the object and faces get in a faster mode.

3. In the next step we are using a Haar-like feature algorithm. This algorithm is used to detect the human faces in a particular image from the various objects. all the human faces have a lot of similar properties, which will make them different from other objects. for example, a human face contains an eye region which is mostly darker in every case.
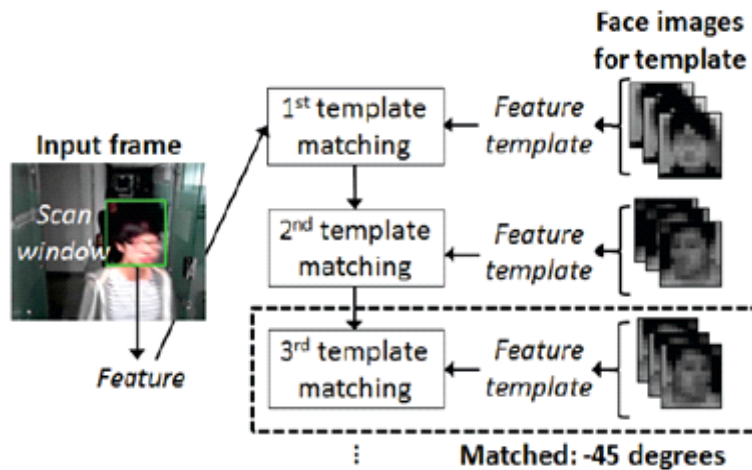

4. After detecting the human faces from the objects, we have to show where it is exactly in the image, so for that, we give some coordinates to these points and make a rectangle over them. There are various techniques by using which we can detect the human faces in a particular image, for example with the help of detecting the human mass or eye detection.

2.4 Design Best Exercises

While designing the exercise we are going to make a separate model for each exercise. and it contains various algorithms, which will provide the correct exercise to the user. and all will be going to happen on live mode, which means a user has to open the camera and set it to a location from where his whole body is completely visible. and start their exercise by following instructions of our AI Model.

In that model, we trace the movements of the particular user and compare them with the standard movements, based on the angles between their joints. we are designing all exercises with the help of various trainers, which are experts in the fitness Industry.
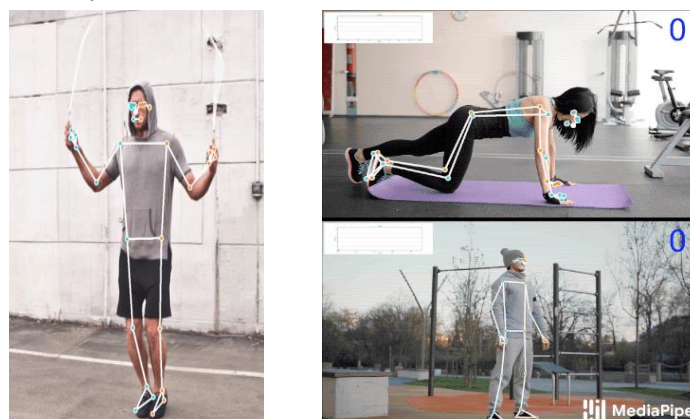
III.   APPLICATIONS

We can design different exercises for different age groups of users. No need to go anywhere out of your home for any fitness club or any gym, as the trainer will going available on your mobile at a very less cost. there are lots of health benefits are there it protects you from diseases like Back Pain, high blood pressure, heart stroke. People who are doing regular exercise. They have low chances for acidity, diabetes, cancer, joint pains & heart disease. Regular exercise is a very important thing, but people do not give that much importance to it, so that is why a lot of people are not serious about it, if you do it on regular basis then it pays off in the form of a better feeling and fresh day. We are trying to fulfill the need of every age group of people in fitness and exercise with the help of AI technologies. There are three types of exercise and the AI model can be implemented in all three.

1. Cardio- It is the exercise which helps you in increasing heart rate, you can do it at home, it includes Jumping jacks, Burpees, jumping squats, Stair Climbs, Jumping ropes and so on. so, these exercise does not require that much accuracy, but with the help of the AI model, we maintain the accuracy.

2. Flexibility- These are the exercises that help you in increasing your muscle strength and improve the motion of your joints.it includes Shoulder Stretch, The Forward Hang, Backstretch, Butterfly Groin Stretch, Split Squat, Modified Cobra, and so on, which you can do at home as it does not require any equipment. these exercises required a proper trainer, as it belongs to flexibility. so our model can work fine while handling the body motions.

3. Strength -These are used to improve the strength of our body, most of the strength exercises required equipment. while performing the strength exercise there are chances of getting injured, so if there is any trainer who can be able to avoid your injuries and our model can fulfill this requirement.

IV.   CONCLUSION

We have developed Artificial Intelligence based application that worked as a fitness trainer which will help users to live healthier & fit life. In our Application to calculate height we have used image processing & to detect exercises done by a user we have used video processing with the help of Open CV Library. User will get their exercises according to BMI by their height & weight. Also, We Have divided BMI into five categories like Underweight, Normal, Overweight, Obese & Extremely Obese.

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