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A PROPSED AI BASED FITNESS INSTRUCTOR

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Abstract— This project discusses in detail about a proposed AI based instructor. Everyone benefits from exercise and physical activity.Staying active can benefit you in a variety of ways, regardless of your health or physical abilities. In reality, research shows that "taking it easy" is dangerous. When older adults lose their ability to perform activities on their own, inactivity is often to fault rather than ageing. Lack of physical activity can also contribute to additional doctor visits, hospitalizations, and medication use for a range of conditions. This idea of AI fitness instructor allows more people to get involved in the fitness field using this AI instructor makes sure everyone can perform exercises in correct way, minimizing the risk of injuries.

Keywords— Machine Learning, OpenCV, Gym Instructor, Mediapipe, Exercises.

I. INTRODUCTION

Lifting weights is a great way to develop muscles, protect bones, burn calories, and stay fit. Maybe you don't know where to start or how to perform the exercises. You may be tempted to just copy the exercises your others are doing, but they may be doing things the wrong way. This is where your personal AI trainer comes in handy. With your personal AI instructor, you have immediate access to a world of knowledge to help you develop a weight-training routine that's safe and effective. weight training and healthy diet is one of the best ways to get into shape and lead a healthy lifestyle. With each passing day people are getting conscious about their health. Many people today have a busy and hectic life and they cannot manage to go to the gym and take the guidance of any professional and during this pandemic many people started doing in home workouts and this they a have a big chance of getting injured. In this project, we will develop a personal AI fitness instructor which will help the user to do exercises in a correct form and posture.

II. LITERATURE SURVEY

Shwetank Kardam et al., To make their detections possible, firstly they recolored the images because OpenCV renders the RGB imageto BGR color format but for Media Pipe to work, they need to convert our BGR image back to RGB. Lastly, change the color format back to BGR format as OpenCV runs on BGR format, and then they started the detections. There are 33 landmarks in total, starting fromindex 0. These represent the different joints within the pose. For instance, if they want to calculate the angle for our Right hand's bicep curl, they will require the joints of shoulder, elbow and wrist which are 12, 14 and 16 respectively.
Initially, it started with body posture detection proposed by Jamie Shotton et al., [1] who used the Kinect Camera, which produces 640x480 images at a frame rate of 30 frames per second with a few centimeters of depth resolution. The depth image characteristics show that pixels are being identified. These characteristics work well together in a decision forest to distinguish all trained sections eventhough individually they merely provide a weak indication of which region of the body the pixel is located. However, the examples demonstrate a failure to recognize minute adjustments in the images, like crossed arms.
AI Fitness Trainer: In our project, we introduce AI Trainer, an application that detects the user's exercise pose and provides personalized, detailed recommendations on how the user can improve their form. Pose Trainer uses the state of the art in pose estimationmodule known as "BlazePose" tool from "MediaPipe" to detect a user's pose, then evaluates the pose of an exercise to provide useful feedback. We record a dataset of over 1000 keypoints coordinate of parts of body in correct and incorrect form,based on personal training guidelines, we build a machine learning algorithm for evaluation.
To improvise the system proposed previously, Steven Chen et al., used deep convoluted neural networks (CNNs) to label RGB images. They made advantage of the trained model, Open-Pose, for pose detection. The model consists of multiple-stage CNN with two branches: one branch is used to learn the part affinity fields, while the other branch is used to learn the confidence mapping of a key point on an image. But this model has its own drawbacks too, i.e it works only for pre-recorded videos.
In order to provide real-time detection CE ZHENG et al., suggested a model that is categorized into 3 different models, they are kinematic, planar, and volumetric. For 2d HPE, to ensure that there is only one person in each cropped area, the input image is first cropped. Regression approaches and heatmap-based methods are the two main categories for single-person pipelines that use deep learning techniques. Regression approaches use an endend framework to learn a mapping from the input image to body joints or characteristics of human body models. Predicting approximate positions of body parts and joints that are supervised by heatmap representation is the aim of heatmap-based algorithms.

III. METHODOLOGY

We are going to recognize the pose of the model using pose estimation running on CPU to find the correct points and using these points we will get the desired angles, and then based on these angles we can find many gestures including number of workouts such as bicep curls. We want to find the angle using minimum three points to create two lines to tell us how much angle we are at and based on that we can do some calculations for the gestures. Below are the detailed steps discussed for how the model works.

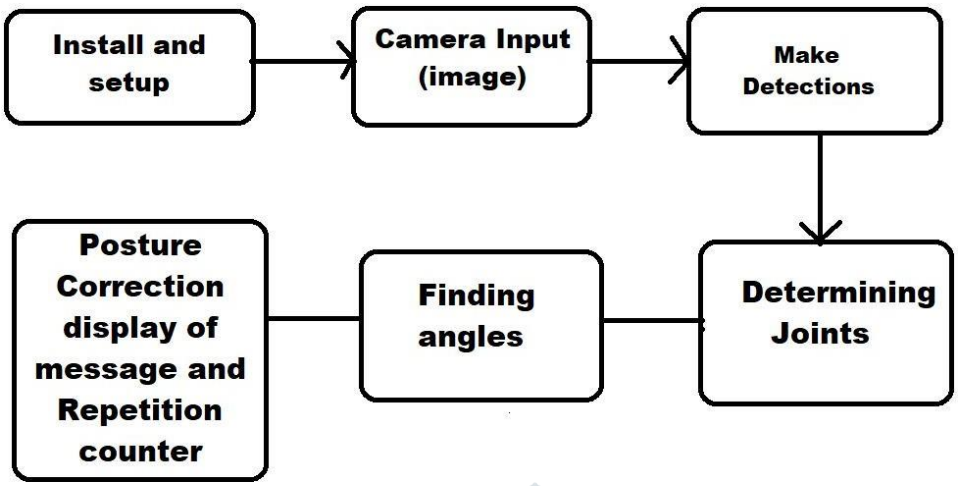


Fig. 1 Block Diagram of AI Fitness Instructor

1. Install and setup:

a) First up, we'll install and import our dependencies that we need which are MediaPipe and OpenCV. These two will help us gather data about the various joints in our body such as our wrists, shoulders, etc. for making our calculation with angles possible to count our repetitions with heavier weights. secondly we would want NumPy whichwould help us with our trigonometry to calculate the angles.

2. Make Detections:

a) To make our detections possible, firstly we need to recolor our image because OpenCV renders the RGB image to BGR color format but for MediaPipe to work, we need to convert our BGR image back to RGB. Print the detections of our model. Lastly change the color format back to BGR format as OpenCV runs on BGR format, and then we can start rendering our detections.

3. Determining Joints:

a) There are 33 landmarks in total, starting from index 0. These represent the different joints within the pose. For instance, if we want to calculate the angle for our Right hand's bicep curl, we would require the joints of shoulder, elbow and wrist which are 12, 14 and 16 respectively as referred in Figure 2.

4. Finding Angles:

a) First we get the coordinates of the 3 joints which we require to get the angle calculated. Then we can calculate the slopes of the joints using NumPy. Angles are calculated in radians which then can be converted into degrees.

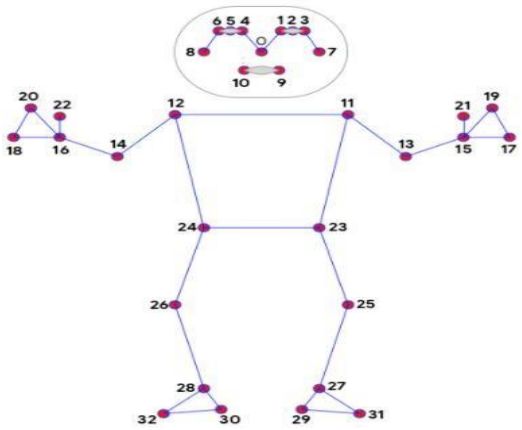


Fig. 2 Determining Joints

IV. MODELING AND ANALYSIS

We'll utilise the CPU's posture estimate to get the proper points, and we'll use these points to acquire the angles we want. Many motions, like the amount of biceps curls, are then discovered based on these angles. With only a single line of code, we'll be able to determine angles between any three locations.

1. OpenCV:

a) OpenCV is a programming library geared mostly at real-time computer vision. It was created by Intel and then sponsored byWillow Garage and Itseez. Under the open-source BSD licence, the library is cross-platform and free to use

2. Python

Python is a high-level, interpreted programming language that may be used for a variety of tasks. Python is garbage-collected and dynamically typed. It supports a variety of programming paradigms, including structured (especially procedural) programming,object-oriented programming, and functional programming. Python programming has a number of frameworks and capabilities that may be used in web application development, graphical user interfaces, data analysis, data visualisation, machine learning, and other areas. Although the Python programming language is not perfect for web application development, it is widely utilised by many businesses for assessing massive datasets, data visualisation, data analysis, and prototyping. Programming in Python programming language is gaining traction amongst users for data science whilst being outmoded as a web programming language.

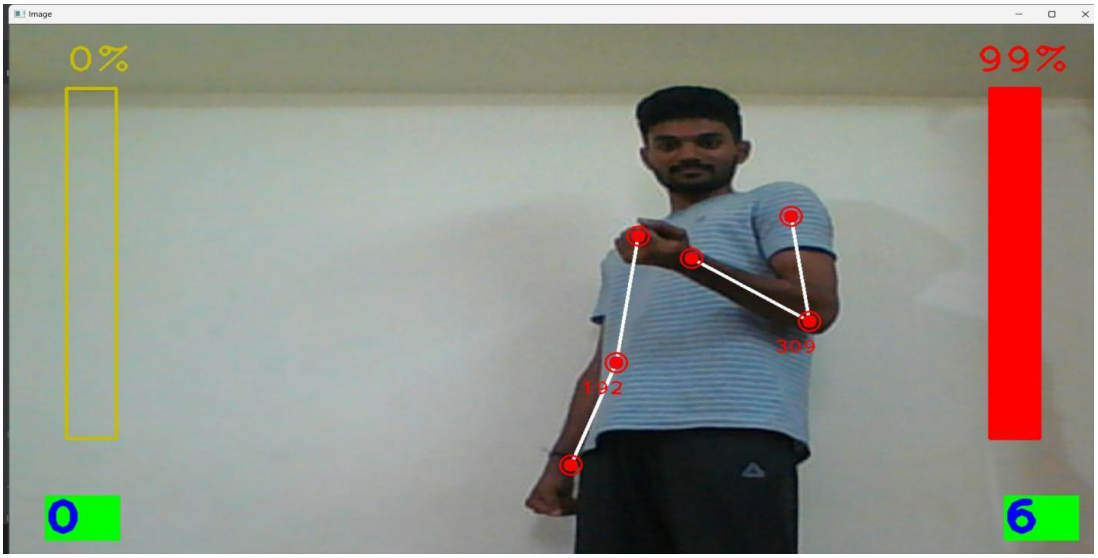
3. Artificial Intelligence:

a) Artificial intelligence (AI) is a branch of computer science that focuses on the development of intelligent computers that function and behave similarly to humans. Artificial intelligence-enabled computers are capable of doing the following tasks: Speech recognition is a technology that allows you to 980ecognize what someone Learning.

4. Media Pipe

MediaPipe has made developing our 3D human pose reconstruction demo app relatively simple, allowing for fasterneural network inference on the device and synchronisation of our result display with the video capture stream

V. RESULT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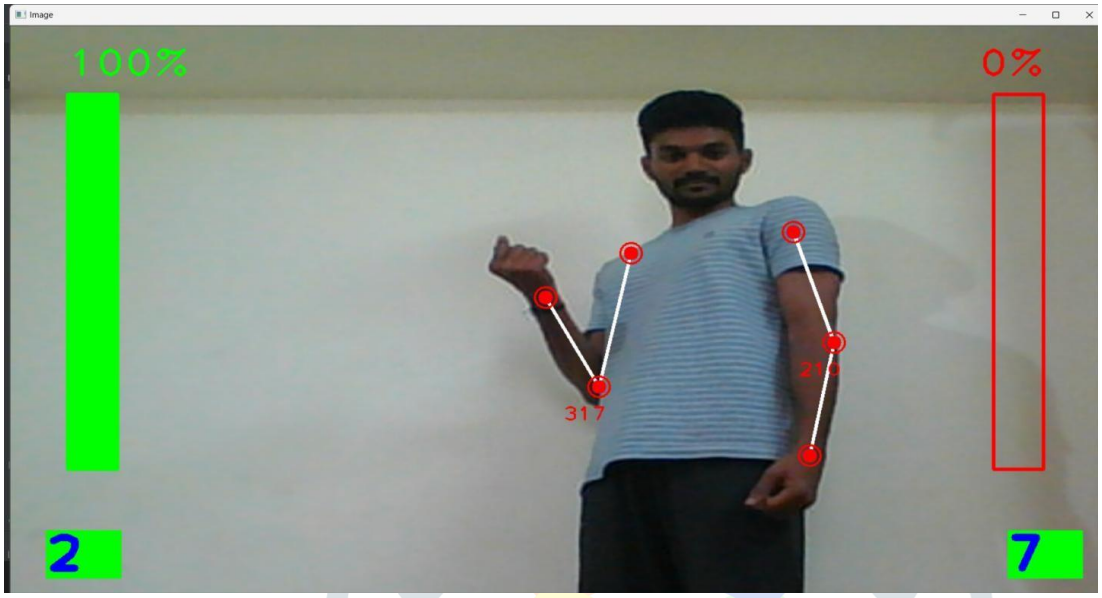
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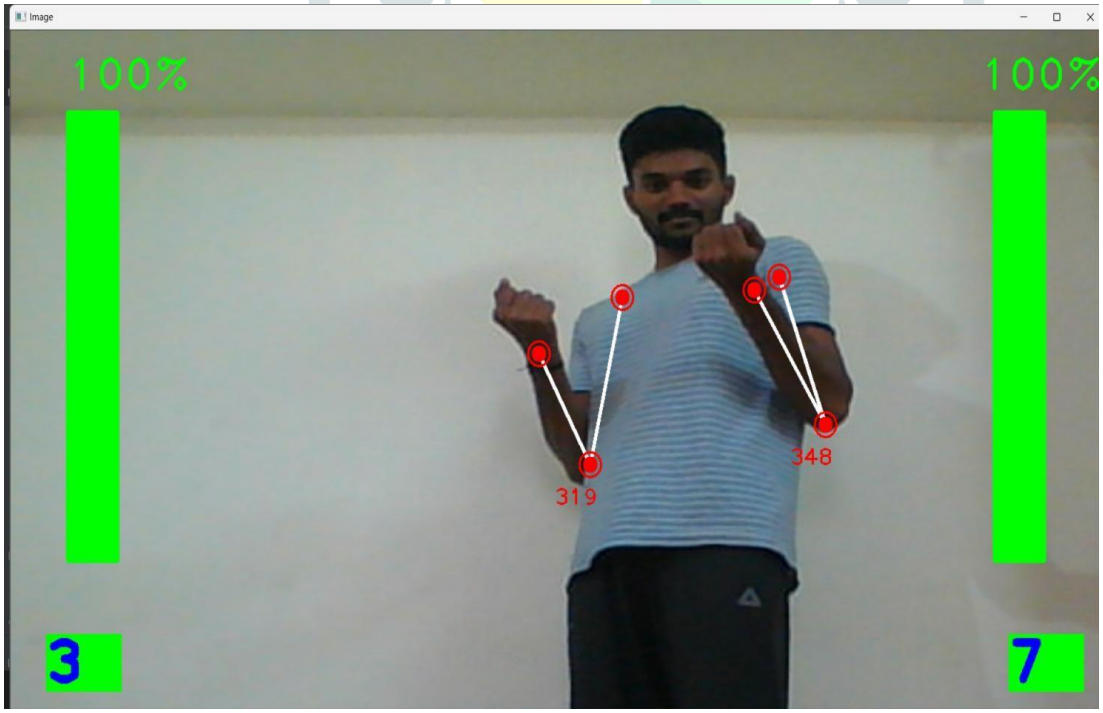
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VI. CONCLUSION

AI is at the centre of a new enterprise to build computational models of intelligence. The main assumption is that intelligence (human or otherwise) can be represented in terms of symbol structures and symbolic operations which can be programmed in a digital computer. This project based on AI Training using OpenCv and python have many future implementations like they can be used in this covid 19 .Adopting and integrating AI technologies is a roller-coaster ride no matter how business-friendly it may sound. A Deloitte report says, around 94% of the enterprises face potential Artificial Intelligence problems while implementing it.As an AI technology consumer and developer, we must know about both the merits and the challenges associated with the adoption of AI.

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