**Exercise Monitoring System – Knee bend count**

Counting the number of knee bends using OpenCV is a computer vision application that involves analyzing the movement of a person's legs while they perform the exercise. Knee bends, also known as squats, are a popular exercise that involves bending and straightening the knees while keeping the back straight and the feet flat on the ground.

To count the number of knee bends using OpenCV, a camera is used to capture video of the person performing the exercise. Computer vision techniques are then used to track the movement of the person's legs throughout the exercise and to detect when their knees bend and straighten.

The process of counting knee bends using OpenCV involves several steps, including preprocessing the video frames, detecting and tracking the person's legs, and detecting when their knees are bent. Once the knee bends are detected, the number of repetitions can be counted and displayed in real-time.

The ability to automatically count the number of knee bends using OpenCV has many applications, including fitness tracking, physical therapy, and sports performance analysis. By accurately counting the number of knee bends performed during an exercise, trainers, and coaches can monitor their clients' progress, adjust their workouts as needed, and ensure that they are performing the exercise correctly to avoid injury.

The procedure for counting the number of bent knee exercises using OpenCV is as follows:

* Capture video: Use a camera to capture video of the person performing the exercise.
* Preprocess frames: Apply preprocessing techniques such as resizing and smoothing to the frames to improve the accuracy of the tracking algorithm.
* Object detection: Use an object detection model, such as YOLO or Faster R-CNN, to detect the person's legs in the video frames.
* Track leg movements: Use feature tracking techniques, such as optical flow, to track the movements of the person's legs throughout the exercise.
* Detect bent knee positions: Use a thresholding technique to detect when the person's knees are bent beyond a certain angle.
* Count repetitions: Count the number of times the person's knees cross the bent threshold to determine the number of repetitions.

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To run this code you should have a python environment with the following packages installed.

***mediapipe==0.8.9.1***

***numpy==1.21.4***

***opencv\_python==4.5.5.62***

Here,

cap = cv2.VideoCapture('KneeBendVideo.mp4')

you must provide video path and simply run the .py file.

If you want to capture live video, then replace it with this.

cap = cv2.VideoCapture(0)

Now your camera opens and place your full body in front of the camera and then you start your knee bend exercise.

You can observe that knee bend rep count gets started.

Features:

1. Robust algorithm to calculate successful rep count for knee bend exercise using [mediapipe](https://google.github.io/mediapipe/solutions/pose) pose model.
2. Added a holding timer limit of 8 sec.
3. Include feedback logic in code, which is triggered only when a person fails to stay in holding position for 8 sec.

Feedback message - **“Keep your knee bent” is displayed.**

1. Rapid fluctuations do not affect the algorithm flow.
2. Reports the performance of the user (stat of bendness) on the screen.