Mini Project 4

Pose-Based Exercise Routine Tracking

Deadlines

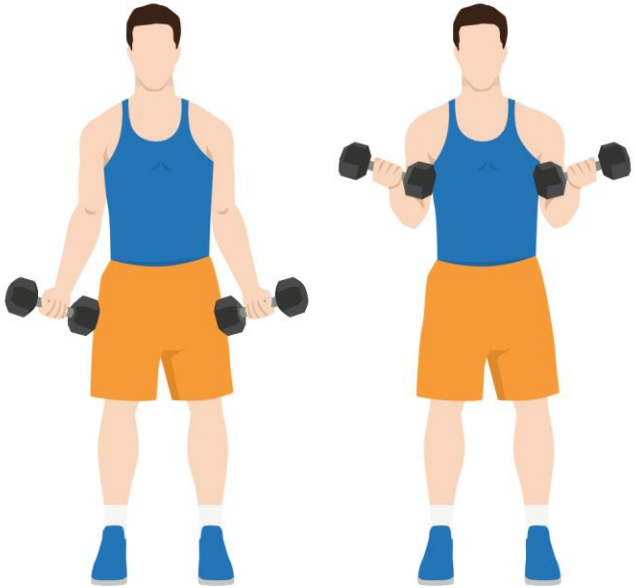
- November 4: Project announced.
- December 2 and 4: Project 4 demos.

Background

- Pose-based routine tracking has been implemented at a commercial scale (e.g. FitWise: https://www.thefitwise.com/) or even for personal use (e.g. https://medium.com/@pawelkapica/using-pose-estimation-algorithms-to-build-a-simple-gym-training-aid-app-ef87b3d07f94).

Your Task

- Your task is to build a pose based exercise routine tracker for a very simple dumbbell bicep curl.



Source: https://gymgeek.com/exercises/arms/bicep-exercises-bicep-workouts/

Your Task

- Your routine tracker should be able to detect the dumbbell weight. Hint: consider using AprilTags that can be affixed on the dumbbell. Sample code can be found here: https://pyimagesearch.com/2020/11/02/apriltag-with-python/
- You do not need to consider all possible weight options. For this project we will use 5lb and 10lb weights. During the demos, I will bring 5lb and 10lb weights and you can affix your AprilTags if you choose to go that route.

Your Task

- Your routine tracker should allow the person to set the number of repetitions, rest interval duration, and sets. The definitions are:
  - Repetition: one completion of the bicep curl performed correctly, i.e., starting from the lower position and moving all the way to the top. The number specifies how many are performed before the rest interval.
  - Rest interval: how long the person rests before the next repetition starts. The rest interval is specified in seconds.
  - Set: how many groups of repetitions will be performed.

Your Task

- Your application should use a body pose skeleton to show the correct form before it starts tracking.
- Your routine tracker should not count repetitions if they are done incorrectly.
- You should overlay the correct pose over the incorrect pose during the rest interval for the person to review their form.
- You can choose any body pose estimator that you want to use.
- You can choose what body joints to use and whether you want frontal or lateral views.

Grading Criteria

- Real Time Performance (10 points)

  It is expected that you will be able to run the application in real time. Points will be lost if you need to use a video.

- Weight Detection (10 points)

  Correct detection of the dumbbell weights, i.e., 5lbs and 10lbs.

- User Interface (40 points)

  The user should be able to set the repetitions, rest interval, sets, and see overlays of the correct and incorrect form.

- Form Checking (40 points)

  Automatically check for correct form and track incorrect ones.

Demos

- Teams will be randomly assigned to each demo day. The assignments will be announced on December 2 to ensure no team has an unfair advantage.
- The demos must be done in person by at least 1 member of the team, this means no remote demos.
- During the demo, each team will get 10 minutes to show their entire system and I will try it out by setting various parameters based on the task criteria provided.