VIRTUAL GYM TRACKER USING AI

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ABSTRACT

Exercises like deadlifts, squats, and shoulder presses are good for maintaining human body fitness, but they may also be quite dangerous if done incorrectly. Due to the heavy weights utilized in these workouts, injuries to the muscles or ligaments may result. Many people do not maintain the proper posture while completing these exercises on a regular basis due to a lack of understanding or instruction. Muscle pain and exhaustion may result from this. By creating a project that recognizes a user's position while they are exercising, offers feedback, and proposes modifications as needed, we are able to assist individuals in executing workouts with the proper posture by utilizing the most recent pose estimation methodologies. There is a correlation between our posture and our physical and emotional wellness. The detection of various human postures has been approached in a variety of ways. Determine a patient's resting position, for example, using posture analysis in the medical industry. Image processing using openCV and mediapipe python library for human posture estimation. Analysing standing and sitting postures is made easier with an image processing-based technique. The benefits of fitness activities to a person's health are remarkable, but if they are done improperly, they may be ineffective and even detrimental. Exercise blunders happen when someone doesn't adopt the right posture. A pose estimation module in python called mediapipe helps to detect all major joints of the human body. Then it calculates the angle between the joints and increases the counter for each repetition. Pose estimate uses a picture or video of the subject to determine the precise locations of the body's major joints. This computer vision technology recognizes human posture in films and displays important regions, such the elbow or shoulder, in the finished product. Another way to workout at home is through interactive games. The proposed project has an interactive boxing game built using pygame, which helps all age groups to workout and take care of their health. Overall the user can track all their details on workout on this application, like how much calories are burned and the daily goals, different workout planner for each individual.

Keywords: Machine Learning (ML), Python (PY), OpenCV, Mediapipe.

I. INTRODUCTION

An incorrect type of exercise might result in injury; thus, the exercise should be performed under professional supervision. A squat is a standing exercise in which a person descends to a posture with a vertical torso and fully bent knees, then restores to a normal standing position. Squats are one of the most challenging exercises. Each individual will have a unique squat; when observed, the lengths of their limbs will cause their form to shift. It has been observed that the flexibility of different joints and the power of respective muscles influence the type of squat performed. The squat has several advantages, including increased overall leg strength, stronger knee and hip joints, and a decreased risk of heart disease because of cardiovascular development. Squatting regularly strengthens the legs, muscles and bones, lowering the risk of osteoporosis. This system utilizes MediaPipe as a pose estimation algorithm and uses hard-coded methods to evaluate squats. The metric is the angle formed at the knee, between the hip and the ankle. Consequently, it accepts videos taken from the side and classifies squats as good or bad. Different beginner and advanced modes are also provided, changing the threshold to classify the squats. It can help you perform squats seamlessly, irrespective of whether you are a beginner or a pro. To achieve this task, we can harness the power of a deep learning based human pose estimation algorithm. Several popular frameworks for estimating human pose include OpenPose, AlphaPose, Yolov7, MediaPipe, etc. However, owing to the crazy inference speed on CPU, we have opted to use Mediapipe's Pose pipeline for estimating the human keypoints.
II. LITERATURE REVIEW

This paper proposes a system for squat analysis. This system uses MediaPipe pose estimation on ML Solution for high-fidelity body pose tracking inferring 33 3D landmarks and background segmentation masks on whole body from RGB video.

The proposed system is pipeline for mediapipe pose consists of two-step detection-tracking pipeline similar to Mediapipe Hands & MediaPipe Face Mesh solution.

The above-reviewed papers demonstrate that squat analysis using artificial intelligence can be an effective solution. For identifying this proposed system uses detector, the Pipeline first locates the person's pose-region-of-interest (ROI) within frames. Further research can explore the system for estimating & correcting exercise posture using computer vision techniques. The system was shown to be accurate in estimating posture & providing meaningful feedback making it a valuable tool for individuals looking to improve their posture during exercise.

III. PROPOSED WORK

Beginners in the gym tend to make mistakes in exercises that may lead to lifelong injuries. This is true for more experienced athletes as well. One slight imprecision in an essential activity, such as the squat, can cause the whole form of the person to vary. The squat is one of the most nuanced exercises, and multiple myths about it cause beginners to shy away. Hence, they make common mistakes such as not allowing their knees to cross their toes, not squatting deeper than parallel, etc. This model aims to aid beginners in correcting their form and squat, using advanced tools such as deep learning and computer vision, to the best of their ability. Fitness trainers or coaches have become a common practice. However, it is costly to employ a coach and thus only sometimes feasible for a beginner in the gym. Using pre-existing software and equipment, this model attempts to alleviate the problem by suggesting a method to help beginners get introduced to fitness and working out by assisting them to practice better and avoid injuries while performing exercises by focusing on the squat. Implementing this work may also assist sports scientists and physiotherapists in analysing, diagnosing, and treating people more efficiently.

IV. SYSTEM ARCHITECTURE

Project design is the general approach given to develop the software to solve the problem of particular organization. Project design is stage at which description of project development is given and how the project is designed. The purpose of design is to determine how to build the system and to obtain information needed to
drive the actual implementation of the system. The focus is particularly on the solution domain rather than on the problem domain. Object oriented design consists of transforming the analysis model into the design model. It describes the system in terms of its architecture.

An architectural diagram is a diagram of a system that is used to abstract the overall outline of the software system and the relationships, constraints, and boundaries between components. It is an important tool as it provides an overall view of the physical deployment of the software system and its evolution road map.

V. SOFTWARE AND HARDWARE REQUIREMENT

- Operating System: Windows 10 or Linux
- Python
- PyCharm
- Camera: High-resolution camera capable of capturing video at 30 frames per second (fps)
- Processor: Multi-core processor such as Intel Core i5 or i7
- RAM: At least 8 GB of RAM

VI. RESULT AND DISCUSSION

![Fig 2: Main Window](image1)

![Fig 3:](image2)

![Fig 4:](image3)
VII. FUTURE SCOPE

The scope for Squat analysis virtual gym Bracker For Squat analysis is vast & include various aspects of implementation of squat analysis. In the Future, more data can be collected, included more workout exercises, as well achieving di Transfer learning will play a major role as well in effectiveness of developing such a virtual cash coaching system.

The Software will allow users have their exercise captured For Perfect Squat. User have no other interaction with system except for having their & body captured while they are entering do exercise.

VIII. CONCLUSION

In conclusion, Virtual gym tracker using artificial intelligence can provide a personalized and interactive workout experience for users. With the combination of Python's machine learning and data analysis capabilities and MediaPipe's computer vision technology, the AI trainer can track and analyse user movements and provide real-time feedback and adjustments. The use of AI technology in fitness training can help improve efficiency, accuracy, and motivation, leading to better results and a more enjoyable workout experience.

IX. REFERENCES