COMPUTER VISION BASED WORKOUT APPLICATION

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ABSTRACT

Nowadays virtual assistants are playing a very important role in our daily activities and have become an inseparable part of our lives. Computer Vision is an emerging field that we aim to explore through this project of CV-based workout assistants. Our project focus is on building a convenient, user friendly and self contained workout application which is based on computer vision. The application will be able to guide the user during his/her workout sessions and correct postures where applicable. We wish to implement hands free control of this application, by this the user can workout without using a mouse or a keyboard. Having been able to identify the poses and errors in posture of the user during the exercise we may be able to give voice feedback to help the user correct his/her posture. The application uses the MediaPipe to detect a person's pose, and afterwards analyses the geometry of the pose from the dataset and real-time video and counts the repetitions of the particular exercise

Keyword *workout, cvbased, computer vision*

I. 1. INTRODUCTION

Physical fitness provides strong bones and muscles, leads to better health and well-being, prevents various health problems, reduces the risk of several diseases like blood pressure, diabetes, cancer, etc. and improves a better quality of life. Physical fitness reduces stress, tension and chances of being depressed and makes you feel better.

You can improve your physical fitness and body composition by making healthier food choices and regularly engaging in both aerobic and anaerobic exercises. Staying at home for long periods of time can become boring, especially when most fun activities are done outdoors, which is difficult considering the current scenario of pandemics and lockdown.

But this cannot be a relevant excuse for being unproductive because it is an excellent idea to utilize the extra time we get into our own health. Most gyms have a wide variety of exercise equipment and also have trainers who guide us about the exercise and its correct posture.But the unavailability of the above equipment and trainers can be an important reason that can stop us from doing exercise at home. Now recently due to the Pandemic situation of COVID crises nobody is willing to take the risk of going out. So our Project focuses on building a workout application which is made for people who wish to workout on their own without any human guidance and minimal physical interaction with their device. The previously developed workout applications need the user to physically possess the device which has the workout application running on. This is not good as the user may have to switch between handling the device and getting back to working out. Our application focuses on guiding the user throughout his workout session, giving health related stats.

1.2 LITERATURE REVIEW

This chapter details recent developments and findings that align with the proposed problem statement, which has helped gain clearer perspectives. Detailed Literature review has been performed systematically based on the different aspects that are required to build this project.
This includes:Several existing research papers related to Posture analysis. Research papers related to hand gesture recognition.Different tools for extracting live images and analysing the frames.
Several methods and algorithms to extract required info from the frame extracted and comparing their conclusions for choosing the best etc.,
In the following sections, the understanding of the distinct aspects of the project has been presented, including the current scenario and the substantial findings that have helped in the design of this project.

2. Hardware Requirements

The only hardware that is the basic necessity of this application is a webcam. This hardware is used to capture the user's actions. The connection and transfer of frames from the camera to the application is carried out by the OpenCV module of python. MediaPipe is another module which recognizes the hand gestures and gives the coordinates for a few specific points on the user's hand. OpenCV allows python programs to access the webcam of the device for as long as the program runs.

3. Software Requirements

- OpenCV2: The version of OpenCV2 used in our application is 4.5.5, this version is compatible with python version>2.7
- Python : The main programming language used is python and the versions of the same used are 3.7.9 and 3.9.6. Although all the development plans are in the 3.9.6 version, testing will be done in both the versions.
- Media pipe
- Other software components may be included as and when necessary. Some planned software components include PoseNet, etc,.
- OpenCV2: The version of OpenCV2 used in our application is 4.5.5, this version is compatible with python versions >2.7
- Python : The main programming language used is python and the versions of the same used are 3.7.9 and 3.9.6. Although all the development plans are in the 3.9.6 version, testing will be done in both the versions.

3 Workout tracking using Pose-Estimation and DNN

Main focus in this paper is to reduce deaths due to lack of fitness. Auto_fit uses Postnet for doing pose estimation to find 17 body key points followed by using the DNN classifier to identify the state of exercise and then counts the repetitions performed. Auto_fit takes live video feed and counts the repetitions of exercise performed. It works on two common exercises. In the first part, it creates the skeleton of the user with 17 points like wrist, knees, ankles, etc. these points are identified using the TensorFlow Postnet model which uses Mobilenet_V1 under the hood

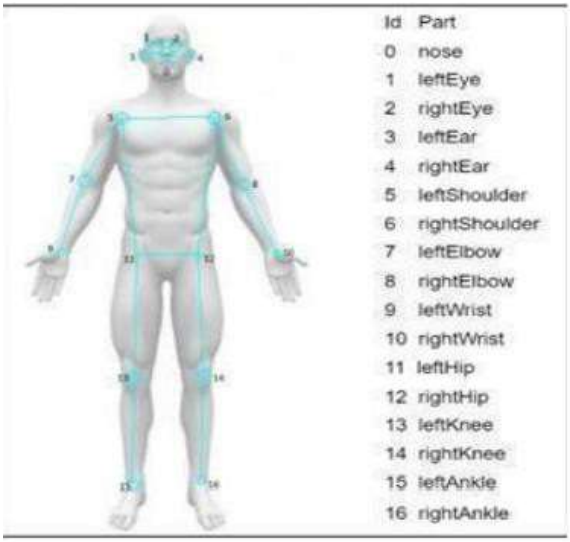

Figure 3.1 Workout tracking using Pose-Estimation and DNN

4. **CONCLUSION OF CAPSTONE PROJECT**

• In the Phase 1 of the project we are able do a in depth literature survey of many research going on in this area.

• We stumbled upon few amazing work arounds that the authors have come up with when they faced problems that we feared we may face further during the implementation of the project. One of them being the distance and size of user and reference frames.

• With the help of the suggestions and feedbacks given by the panel we were able to put a boundary on our scope and deliverables, such as the type of exercises to implement.

• Furthermore we got rid of unnecessary planned implementations such as the gesture control itself, which added not fruitful value for the project.

PLAN OF WORK FOR CAPSTONE PROJEC PHASE-2

• In the phase 2 we decided upon the complete set of exercises and their constraints for the same, generate or collect the necessary voice or visual guide contents and start integrating the same with a suitable front-end(as mentioned in the previous slides).

• Create a database locally for the application to save user related data, which may later be used for analytical stats about the user's workout sessions.

• On the sidelines document the same with suitable installations. Also prepare a comprehensive research paper and a report.

• In case of any issues with the integration with the front- end, we have planned few more methods through which the project can be run as an application instead of a web- app.

PLAN OF WORK FOR CAPSTONE PROJECT PHASE-3

• Prepare to publish the paper(plagiarism check, paper review, etc.,).

• In case of any implementation difficulties or changes suggested by panel at the end of Phase 2, provide

suitable time and resource to implement the same.

• Plan for further more exercises if feasible and make a report about the continuation of the project i.e., sequence building

5. REFERENCES

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