2D/3D Real-Time Pose Estimation using Posenet

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Introduction

Pose estimation refers to computer vision techniques that detect human figures in images and video, so that one could determine, for example, where someone's elbow shows up in an image. Today learning a skill like dance or yoga requires a lot of commitment and putting in tremendous amount of time and money. However, in this technology driven world it is the need of the hour to use technology to its best. Imagine if you want to learn a particular pose, and replicate it, and doing it is just a click away. This is what this system MatchPose assures. This system provides the user with a web-based interface wherein the user can use an existing pose from provided dataset that he/she wants to replicate. Real time input feed taken through the webcam will be analyzed by the system and compared with the desired pose to give accuracy of user pose through a prompt. PoseNet is a machine learning model that allows for Real-time Human Pose Estimation. PoseNet can be used to estimate either a single pose or multiple poses. The system system Match-pose makes use of PoseNet in order to locate the key points in human body and forms skeleton to match the pose.

Objectives

Leaning dance/ yoga takes a lot of dedication. User has to put in a lot of money and time in it. The objective of the Match-pose system is to provide user a platform to learn dance and yoga poses without putting in a lot of money. The system should be available to the user anytime he/she wants to unlike the training institutes which put time constraints on the learner. This system intends to make learning poses easy and flexible as per user's requirements.

Methods

1. **Keypoints Estimation for selected image**
   Here, 17 body joints are considered for pose estimation. And the skeleton is drawn by joining those keypoints.
2. **Keypoints Estimation for webcam feed**
   Here also 17 body joints are considered for pose estimation. And the skeleton is drawn by joining those keypoints.
3. **Calculate angles and compare**
   Post Keypoint estimation the angles between the joints calculated for both webcam feed and the selected image. And then compare the angles formed and give the result.
4. **Display result**
   then display the result by blinking green skeleton on the webcam feed.

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Architecture Diagram

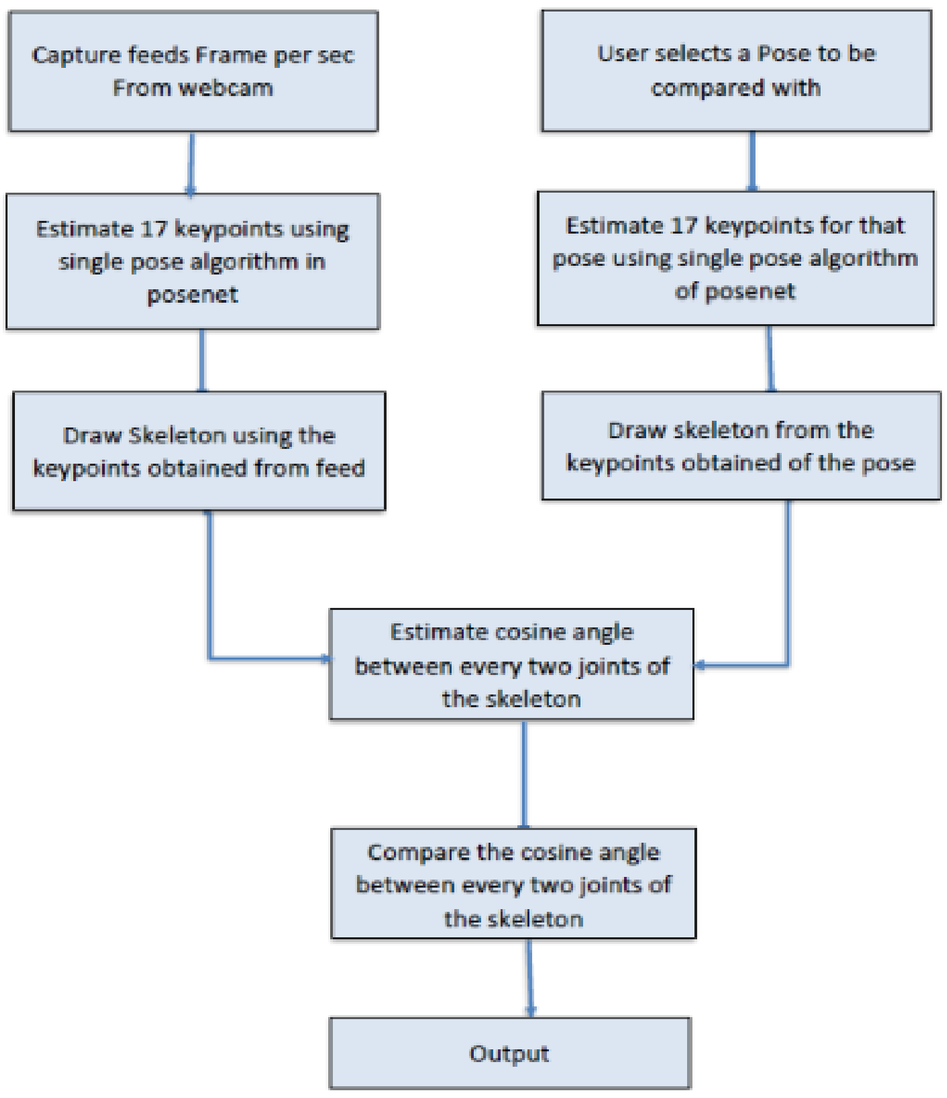

Figure 1: Architecture Diagram

Results

1. **Formation of skeleton:**
   For the perceived image as well as the webcam feed (taken in frames per second) skeleton will be formed using the 17 key points obtained.
2. **Calculation of angles and displaying them:**
   For each skeleton around 8 angles of hands and legs are taken under consideration which are calculated and displayed in real-time for user reference.
3. **Comparing angles and matching the pose:**
   Once both the skeletons(first one for the desired pose and second one for the webcam feed) are formed and angles are calculated, comparison of angles takes place and if the angles of the webcam feed match perfectly with the desired pose, the skeleton formed on the webcam feed blinks green indication that the user is doing the pose perfectly.

4. **Pose estimation for multiple people:**
   Not only for single person, the Match-pose software is capable of comparing pose for multiple people as well on a single screen.

Conclusions

Yoga is a group of physical, mental, and spiritual practices or disciplines which originated in ancient India. It is an one of the most famous activities performed for physical fitness. However, learning yoga is a tedious task to do. Same applies for learning different dance styles as well. Dance styles like Ballet or hip-hop demand high dedication to learn. In such dance styles the posture of the dancer is one of the most important things to concentrate on.

Earlier, to learn dance or yoga, the person had to go to the training institutes, pay a considerable amount of money and also had to manage timings accordingly. But now with Match-pose user can learn different dance and yoga postures without an intervention of the second person. User does not have to disturb his/ her schedule to go to the training institutes and with Match-pose he/she can learn the postures whenever they want and that too for free.

The aim of the software was to provide user a system to learn different yoga or dance postures and the Match-pose software is exactly working as per the goal by providing user a web application wherein the user can select the desired pose which he/she wants to learn and after the user does the pose in front of the webcam, the system tell user how correctly he/she is doing the pose.

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