Automated 3D human motion tracking using statistical body shape model and dual cameras

Motivations

Motion capture systems are commonly used in many fields in recent years, including animation, clinical experiments and human-machine interfaces, etc. However, such measurement systems suffered limitations. For instance, optical motion capture systems often require custom-made markers attached to the human body, which inevitably raise the cost of human and material resources. Therefore,

the study aims to develop a relatively low-cost and markerless motion tracking method using dual color cameras and statistical body shape model.

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Purpose

- Set up dual cameras to capture body movements.
- To implement “Openpose” to identify 2D skeleton from video images.
- To reconstruct 3D skeleton using 2D skeletons from two views.
- To register the skinned multi-person linear model (SMPL) to human 3D skeleton
- To reconstruct 3D whole body movement during particular motion tasks.

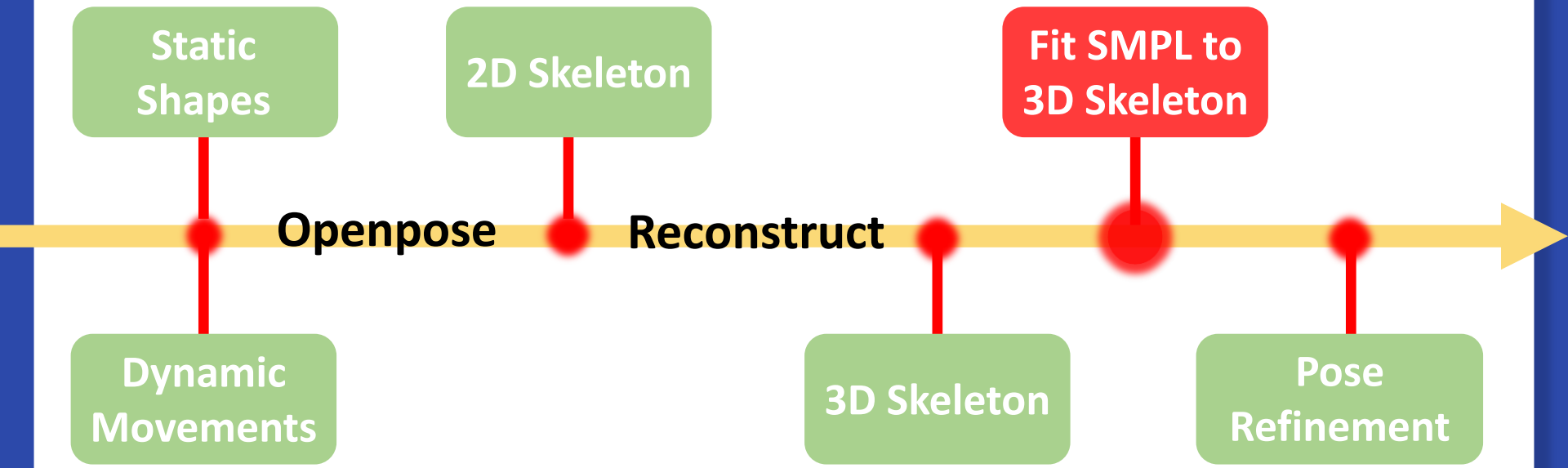
SMPL

A Skinned Multi-Person Linear Model

OPENPOSE

Real-time Multi-Person 2D Pose Estimation using Part Affinity Fields

Method Digram



Static Shapes

T Pose

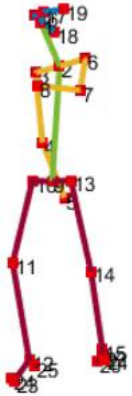
Dynamic Movements

Walking motion

3D Skeleton

T Pose

Walking motion



Fit SMPL to 3D Skeleton

Output as animation after each frame calculation

SMPL & Openpose

SMPL

SMPL & Openpose

SMPL

Optimal ← **Initial**

Increase the number of frames

Eliminate the points with artifactual errors

SMPL & Openpose

Using **moving average filter** to skeleton and model

Using **moving average filter** to skeleton

Original Move

SMPL

Optimal **Initial**

Results

Stand up and sit down

Dribble

Walking motion

Open And Close Jump

Current limitations & Future works

① **Motion tracking is not accurate enough**

② **Difficulties in fitting Openpose and SMPL**

③ **Lack of third-party actual verification**