Abstract

Character animation is a challenging task in traditional animation design. To create the expected motions with a high level of reality, human motion data is used to rig up the character model. In recent years, Motion Capture (Mocap) is being widely used to record subjects' joints movement and turn physical motion into digital data for Computer Graphics (CG) animation. However, the Mocap process requires special equipment such as the Mocap suit with a set of markers or motion sensors which are not easily accessible to common animators. Although there are thousands of accessible Mocap data on the Internet, it is laborious and time-consuming to retrieve an expected one because most of the motion libraries require keywords to category the motion which is unintuitive.

More recently, the 2D pose estimators such as Openpose and Alphapose which are trained by using deep learning (DL) algorithm were proposed to directly track motions from a video. The animator can record their motion trajectories using an RGB camera as a motion reference input. Although applying the pose estimation makes it easier to reproduce physical motion, it takes effort on computation. Besides, it requires further DL process such as Generative Adversarial Networks (GANs) to covert 2D motion data to 3D which increase the noise and invalid pose in a motion sequence.

In this study, instead of querying by keywords or generating desired motion sequences using the DL process, we propose a sketch-based user-interface for users to retrieve the anticipate motions. Because the human motion data is spatially and temporally dynamic, it is more intuitive to describe the motion by using trajectories curves than text keywords. We extract the trajectories of 5 joints (head, left hand, right hand, left feet, right feet) movement from the Mocap database to draw the motion map for each joint. Each motion sequence is related to its motion map.

After comparing the performance of two different image feature descriptors, we then match the features between the users' sketch and motion map by applying an image patch descriptor called Scale-invariant feature transform (SIFT). SIFT extracts the key points in both images and measuring the similarity of the features based on the Euclidean distance of feature vectors. The most similar motion map can be selected accordingly.

In our interface, users can browse overall motion by viewing the skeleton motions in the database by simply drawing the expected motion trajectories as the input query. Inspired by ShadowDraw UI, we suggest user draw the valid strokes by displaying the similar trajectories' maps behind their sketches. Since browsing the overall motion sequence from the first to the last frame is time-consuming, we researched the visualization of motion data and designed two motion maps (one in the absolute

coordinate system and the other in a relative coordinate system) for users to check the motion once the sketching completed.

We verify the utility of the proposed sketch-based user interface with a user study, in which the participants retrieved the expected motion sequence from the database with 98 Mocap data proposed. A comparative study is designed to confirm the effectiveness of our interface. The participants are asked to retrieve a target category of motion from a small-size motion library we constructed with and without using the sketch-based interface. Besides, a questionnaire is conducted for an evaluation study with 5-point Likert-scales. The participants were asked to score our interface up after experience the operations.

To have a better understanding of how the users prefer to sketch the motion, we observe all of the input query sketches. It is considered that the users have the same habit of sketching gestures to the specific category of motions. Therefore, it is verified that the proposed sketch-based interface is also applicable for other types of motions which can be the straightforward future work.