Computer Vision Final Project Proposal

2D Parkour Game Manipulated with Real-Time Pose Estimation
Technique

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1 Introduction

1.1 2D Human Pose Estimation in Video

Human pose estimation is a task in computer vision that focuses on identifying the
position of a human body in a specific scene. The essence of the technology lies in
detecting points of interest on the limbs, joints, and even face of a human. These
key points are used to produce a 2D or 3D representation of a human body model.
The model must identify the fine-grained joint coordinates for the human body.
For a multi-frame 2D human pose estimation, it takes large amount of resource,
such as memory bandwidth and computing power, to have a great performance
in complicated scenes. It is a tradeoff between the computing resource and the
accuracy. In this project, we want to improve this technology, i.e., 2D human pose
estimation and video person pose tracking in real-time constraint.

1.2 Application

In the project, we want to combine the aforementioned technology to some video
game like Xbox 360 - Kinect Sports in Fig. 1. There is a camera sensor will
capture the human body of players, and the action and movement of characters in

the game will be reflected by players. Parkour game seems to be an appropriate application for this technology. It requires real-time feedback and is suitable for body manipulation. Furthermore, parkouring as personal experience would be such an entertainment. Therefore, we want to design a parkour game with the character controlled by the players with their poses. The conceptual graph of Parkour game we expected is showed in Fig 2.
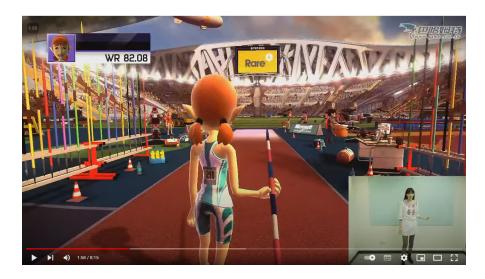

Figure 1: Xbox 360 - Kinect Sports.

Figure 2: Conceptual graph of Parkour game.

2 Technical Part

2.1 Human Pose Estimation

The state-of-the-art work, OpenPose model [1], will be our first choise to utilize this technology, i.e., 2D human pose estimation in video. After training the model, we will define each motion for the video game by the OpenPose model outputs. In the section, we may have to do some extra error compensation mechanisms when the model has wrong predictions.

2.2 Game Designing

Unity is a great tool for prototyping everything from games to interactive visualisations. We will use Unity to design our Parkour game, futher plugging in our pretrained OpenPose model to integrate the human pose estimation technology .

2.3 Some Issues

If our model is too complex, we might encounter low-frame-rate issues, making the video laggy or not smooth. In this case, we need to survey some model compression technique like pruning to decrease our model complexity without degrading too much model accuracy.

3 Milestones

- Week 6-9: Design a game, which is controlled by keyboard

- Week 10: Write midterm project report (due: 11/23)

- Week 11-14: Apply pose detection to Parkour game

- Week 15-16: Final presentation

- Week 17: Write final project report (due: 1/11).

References

[1] Zhe Cao, Tomas Simon, Shih-En Wei, and Yaser Sheikh, "Realtime multi-person 2d pose estimation using part affinity fields," in *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, July 2017.