

Learning Tai Chi With The Help Of A Kinect Device

Sham Kwok Tung, Owen Yip and Rin Wong
Advised by Prof. Brian Mak

INTRODUCTION

Want to learn Tai Chi, but running out of time? Want to find a great Tai Chi master, but have no idea how to find one?



This project may be an innovating one, offers users an exciting solution of these problems!!

FEATURES

We developed a Tai Chi learning application with Kinect, featuring ...

- Recording and replaying motions of Tai Chi master
- Learning Tai Chi by simply following on-screen master motions
- Real-time feedbacks of users' motions
- Playback mode for users to improve their learning

DESIGN

Master's demonstration
in front of the Kinect device

Record Motion

Replay

Start Learning

Playback
Improved
Motion

"Touch-less" User Interface

- Control without touching any physical surfaces, including physical buttons
- Speech recognition system :
Simply use voice to control !
- "Good bye" to going back and forth just for pressing buttons
- Say "Kinect !" first to wake the Kinect up, followed by command, e.g. "Start !", "Stop !", etc., to control

Pre-record motions of master before the user use the application

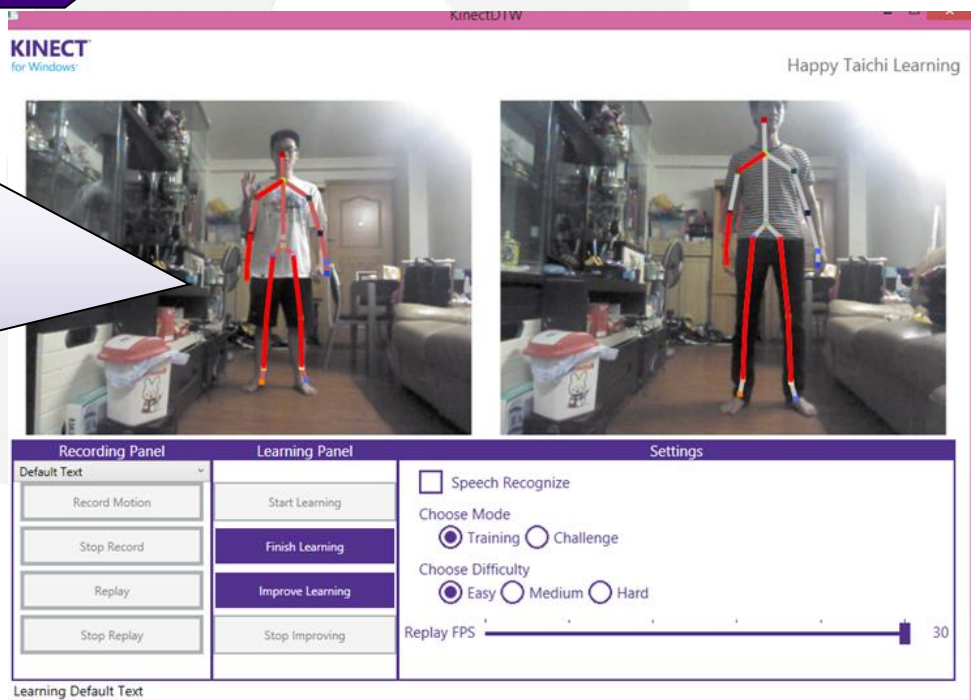
Replay demonstration of master to the user

Allow the user to follow master's motion and get immediate feedback from the real-time learning algorithm

Playback the user's learning performance video together with master's motion at the best matched pace to see how to do better

Clear-to-see Real-time Learning Algorithm

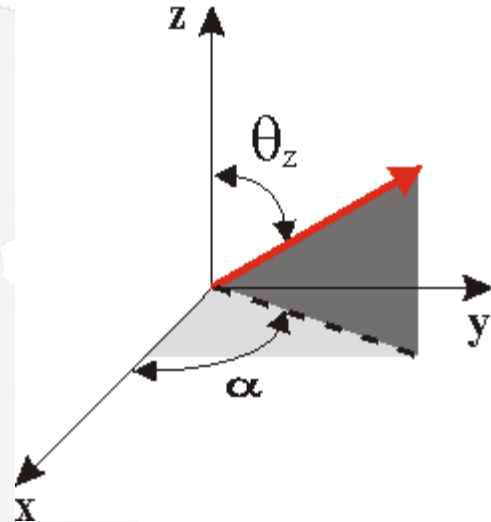
- Clear to identify what is wrong
- Map user's skeleton onto master's body
- If you went wrong, corresponding bones would go red immediately



IMPLEMENTATION

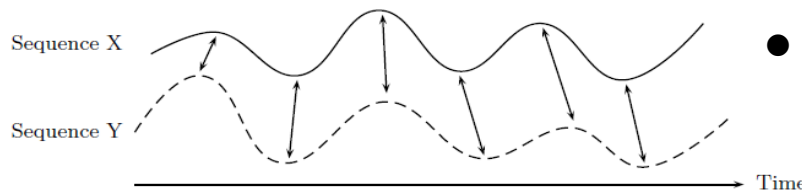
the backbone of real-time feedback - Joint Angle Computation

- **Basic concept:**
Same set of angles,
Same posture
- Calculate the angles of each joint between planes using 3D-vectors
- Compare user's set of joint angles with master's set
- Determine right or wrong based on these angle differences



the intelligent teacher behind "Playback Improved Motion" - Dynamic Time Warping (DTW)

- Intend to dynamically match user's performance with master's motion



- From every moments of user's motion, we compute a best path to the end point

TESTING & RESULT

*Actual screenshot
when the user is learning :

*:

Left frame:
Master's demonstration.
Right frame:
User's performance

