An interactive game with children using QTrobot

GAO Chongkai

USC Viterbi
School of Engineering

The Interaction Lab
University of Southern California

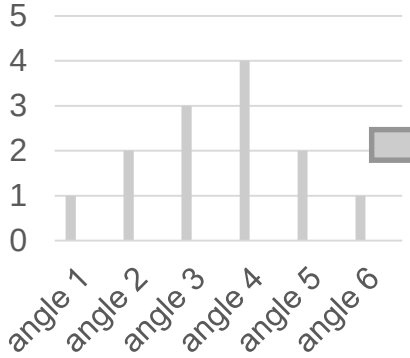
Background: The Experiment

Children with DYSTONIA:

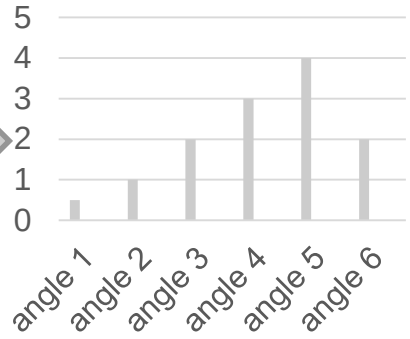
a movement disorder in which your muscles contract involuntarily, causing repetitive or twisting movements.

Orthoses Experiment

Orthoses Power Off



Orthoses Power On



QTrobot Experiment

Playing with a screen

Playing with QTrobot

The number of times they want to play

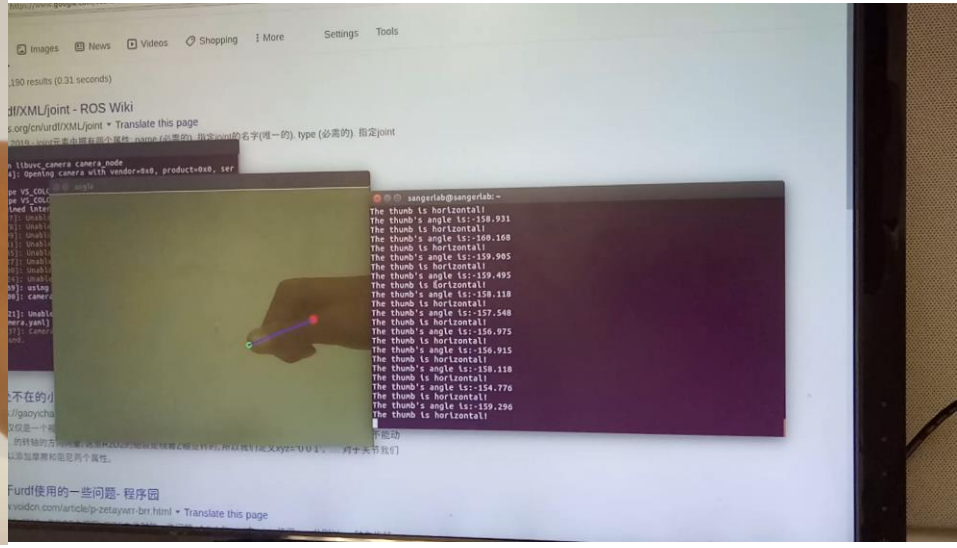
day1	day2
Orthoses Power Off & Playing with a screen	Orthoses Power Off & Playing with QTrobot
Orthoses Power On & Playing with a screen	Orthoses Power On & Playing with QTrobot

Thumb Angle Detection

Tools: OpenCV, Astra pro camera, ROS CV_bridge
Steps:

1. use ROS subscriber to get camera images from ROS topic
2. use Gaussian Mixture-based Background/Foreground Segmentation Algorithm to get the mask and then get the foreground image(hand)
3. use image erode algorithm and Gaussian filter to remove noise
4. find the center of hand
5. find the contour of hand and get the point furthest away from the center, and then calculate the angle by connecting the two points
6. use the result to define thumb up/down

Thumb Angle Detection -- Video Demo



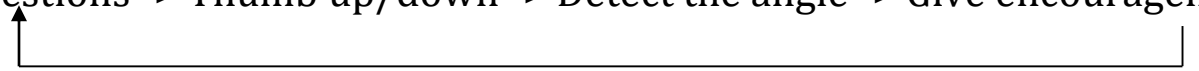
QTrobot -- NumberGame

Steps:

- Qtrobot Introduction
- Game Rules Introduction: using thumb up/down to say yes/no
- Level Initialization: do thumb up/down both for one time
- Enter The Game:
  - while playing:
    - think a number between 1~100
    - while wrong:
      - QT guess it
      - right/wrong?
      - higher/lower?
    - play again?

Play NumberGame:

Ask questions -> Thumb up/down -> Detect the angle -> Give encouragement or reward



QTrobot -- Behaviors and Functions

Gesture: 18 different gestures for 6 different categories
Emotion: 10 different emotions for 6 different categories
Talking: 4 or 5 sentences for every step

Encouragement: for not doing well
Reward: for doing well

Methods:
use camera result, fatigue level, past responses and past encouragement/reward to decide the probability of encouragement/reward of this step

MDP?

QTrobot -- Video Demo

Later Works

1.Combine all parts

2.Find a proper way to record different kinds of data

3.Do the experiment

Thanks for listening

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