

Training a Mouse Transfer Function using Reinforcement Learning

(Niels)

- A transfer function translates mouse movement into pointer movement
- All OS have their non-linear own transfer function that simply map physical speed to pointer speed [1]
- Unclear how the optimal transfer function looks like
- Reinforcement learning [2] enables to learn functions without paired data

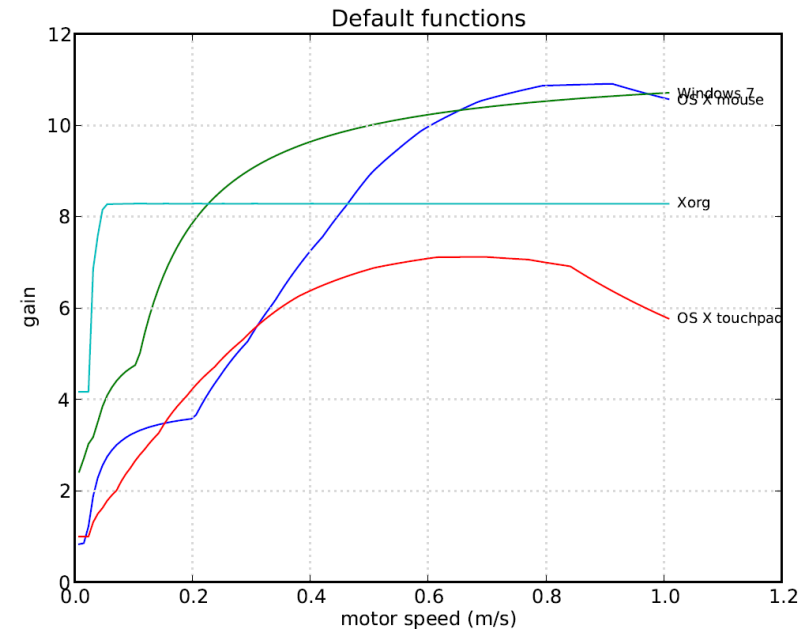


Figure 9: Default functions used by Windows 7, OS X 10.6.7 (mouse and touchpad) and Xorg.

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- Step 1: Generate an Initial Dataset
 - Implement an target selection apparatus (hitting circles with a mouse)
 - Ask participants to select targets using different transfer functions
- Step 2: Setup an Reinforcement Learning Environment
 - Combine recent progress in reinforcement learning
 - Actor-critic with continuous action + state space
 - Experience replay [1]
 - Simulating (dreaming about) the user [2]
 - Initialization using existing transfer functions and initial dataset
- Step 3: Reinforcement Learning with Humans in the Loop
 - Conduct a study where a transfer function is learned while participants select targets
 - Compare learned function with existing one

[1] Adam, S., Busoniu, L., & Babuska, R. (2012). Experience replay for real-time reinforcement learning control. *IEEE Transactions on Systems, Man, and Cybernetics, Part C (Applications and Reviews)*, 42(2), 201-212.

[2] Ha, D., & Schmidhuber, J. (2018). Recurrent world models facilitate policy evolution. In *Advances in Neural Information Processing Systems* (pp. 2450-2462).