Advanced Topics in Neuroscience Course Project
Motor Learning & Adaptation
Initial Presentation

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1 Introduction

Saving refers to re-learning a task faster if we've had a prior learning of that task; even if we have unlearned the prior learning or it has been washed out. The unlearning block must have enough trials so the net motor output reaches zero; and not too many trials so the net motor output changes to negative values.

0. What is the motivation behind the idea of deriving a two-state system for motor adaptation, due to the physiology of the brain? What do previously presented models fail to demonstrate?

2 Simulations

The following instructions will guide us through evidently demonstrating the difference between what these 3 models account for.

1. Design a task and show savings in different motor adaptation models. Note that it is essential for it to have (1) prior learning (2) unlearning, and (3) re-learning blocks.
2. Now add a washout block after unlearning and compare the results.
3. Change the decay factor and learning rate and repeat the questions above and compare the results. (prove the fact that we can change the values of these parameters without losing generalization of the result)
4. Try using a dynamic learning factor and decay factor and compare the results
5. Change the two-state multi-rate to cascade formation and compare the results.

3 The Effect of Noise

In the context of motor learning, as well as in other control systems, error serves as a crucial component that informs subsequent adjustments to the system. Each stimulus in the motor learning process can introduce error, which subsequently influences the final outcome.

6. Error terms and noise are computed for each stimulus, how they influence the motor learning process, and how they contribute to the final motor response?
7. Explain how these factors relate to the models described in this study, particularly in terms of their impact on the final predicted outcome of the model.

4 Bonus

In the Cascade models of synaptically stored memories (reference 32) paper, it is showed that it's possible to model the changes in one single synapse to be heavily influenced the stimulus history.

8. Explain their mean-field equation. How does this statement relate to our models?