# Brief Final Report

## Survey: Reinforcement learning in Model-Free Adaptive Control

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1. Introduction

   In class we mostly focus on identifier based adaptive control, implying that the model of the plant is already known. With the rapid development of technology, however, the processes and systems become more and more complicated. Therefore modeling them using the traditional model-based approach may not be suitable.

   Moreover, nowadays with the huge amount of data collected from the systems, it is possible to apply them with model-free adaptive control(MFAC), a field which has caught attention recently. For the final project we will briefly introduce a few MFAC methods, such as compact form dynamic linearization(CFDL), and mainly focus on reinforcement learning control(RLC). Stability design will also be covered.

2. Plan
   a. paper survey: exploring literature about MFAC, especially RLC with stability analysis
   b. simulation: implement algorithms in papers and do simulation to analyze the performance
   c. final report: elaborate the results of (a) and (b) to give a complete final report

3. References
   a. Yuanheng Zhu, Dongbin Zhao. *Model-Free Adaptive Algorithm for Optimal Control of Continuous-Time Nonlinear System.*
   b. Theodore J. Perkins, Andrew G. Barto. *Lyapunov Design for Safe Reinforcement Learning.* Journal of Machine Learning Research 3 (2002) 803-832
   c. Frank L. Lewis, Draguna Vrabie, Kyriakos G. Vamvoudakis. *Reinforcement Learning and Feedback Control. IEEE Control Magazine Dec 2012*