

Xiao-hua Wang, Juan-juan Yu, Yao Huang, Hua Wang, Zhong-hua Miao, 2014.  
Adaptive dynamic programming for linear impulse systems. *Journal of Zhejiang University-SCIENCE C (Computers & Electronics)*, **15**(1):43-50.  
[doi:[10.1631/jzus.C1300145](https://doi.org/10.1631/jzus.C1300145)]

# Adaptive dynamic programming for linear impulse systems

**Key words:** Adaptive dynamic programming (ADP), Impulse system, Optimal control, Neural network

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# Major discussion in this paper

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In this study, the optimization of linear impulse systems is investigated with the reinforcement learning based adaptive dynamic programming (ADP) method. For linear impulse systems, the optimal objective function is shown to be a quadric form of the states. The adaptive dynamic programming method provides solutions that iteratively converge to the optimal objective function.

# Iterative process for finding the optimal objective function

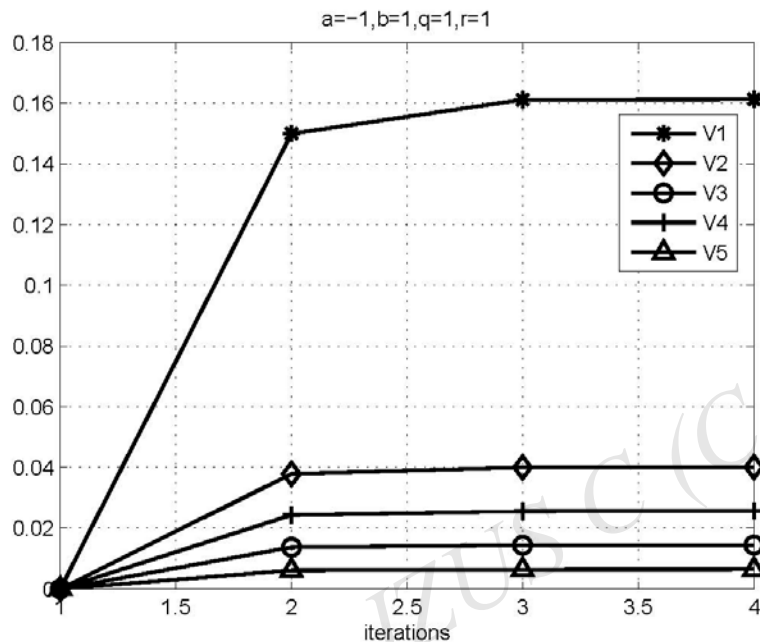


Fig. 6 Iterative process of the pre-impulse objective function for  $a=-1, b=1, r=1$ , and  $q=1$

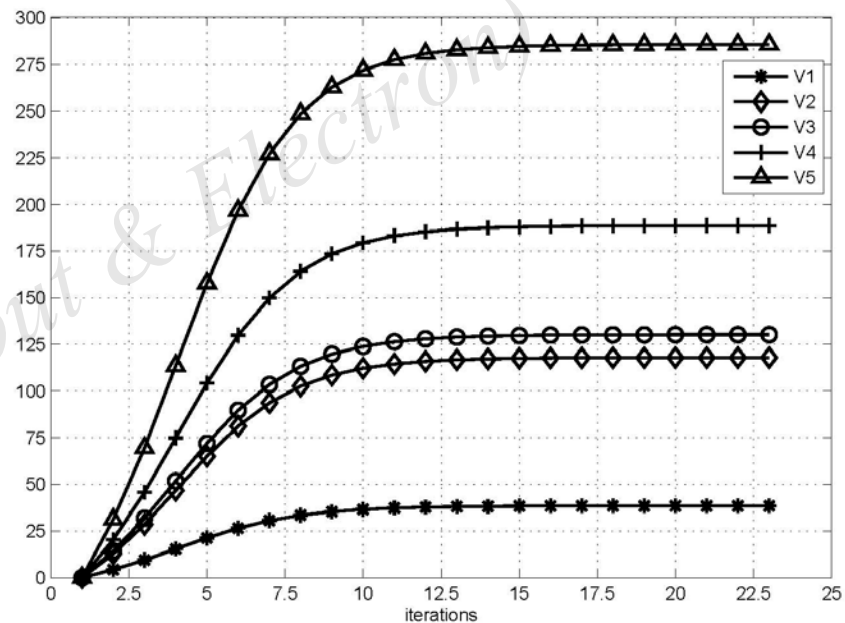


Fig. 8 Iterative process of the neural network weights for the vector case

# Conclusions

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1. A neural network based adaptive (ADP) dynamic programming method is proposed to solve the optimal impulse control problem.
2. The convergence of the ADP algorithm has been shown with simulation examples.