Intelligent Automation and Soft Computing, Vol. 9, No. 4, pp. 245-258, 2003

HYBRID INTELLIGENT CONTROL FOR SHIP STEERING

CHEN GUO AND GUOXUN YANG
Lab of Simulation and Control of Navigation Systems
Dalian Maritime University
Dalian 116026, P.R.China
e-mail: guoc@dlmu.edu.cn

MARWAN A. SIMAAN
Department of Electrical Engineering
University of Pittsburgh
Pittsburgh, PA USA
e-mail: simaan@engr.pitt.edu

ABSTRACT—This paper is concerned with the application of hybrid intelligent control techniques for improving the performance of ship steering. Hybrid intelligent controllers can make full use of the advantages of a variety of intelligent algorithms. In this paper, optimization with genetic algorithms is used in off-line learning periods and reinforcement learning and neural fuzzy control are integrated in on-line learning periods. This combination overcomes the need for measurement data as is the case in conventional hybrid intelligent algorithms. According to a new definition of fitness function, it is shown that the optimized result obtained is more suitable to the actual situation. Similarly, simulation results show that our hybrid intelligent controller can effectively improve the ship steering performance in cases where additional sea state disturbances are present. We feel that our hybrid intelligent controller is a promising alternative to conventional autopilots.

Key Words: Genetic algorithms; reinforcement learning; fuzzy-neural networks; ship autopilot