MULTI-ROBOT HUNTING IN DYNAMIC ENVIRONMENTS

ZHIQIANG CAO\textsuperscript{1}, NONG GU\textsuperscript{2}, MIN TAN\textsuperscript{1}, SAEID NAHAVANDI\textsuperscript{2}, XIAOFENG MAO\textsuperscript{3} AND ZHENYING GUAN\textsuperscript{2}

\textsuperscript{1}Laboratory of Complex Systems and Intelligence Science
Institute of Automation
Chinese Academy of Sciences
Beijing 100080, P. R. China

\textsuperscript{2}School of Engineering and Information Technology
Deakin University
Geelong, VIC 3217, Australia

\textsuperscript{3}Mechanical Engineering Department
Pennsylvania State University
University Park, PA 16802

E-mail: zqcao@compsys.ia.ac.cn, ng@deakin.edu.au, tan@compsys.ia.ac.cn,
saeid.nahavandi@deakin.edu.au, xum102@psu.edu

ABSTRACT—This paper is concerned with multi-robot hunting in dynamic environments. A BCSLA approach is proposed to allow mobile robots to capture an intelligent evader. During the process of hunting, four states including dispersion-random-search, surrounding, catch and prediction are employed. In order to ensure each robot appropriate movement in each state, a series of strategies are developed in this paper. The dispersion-search strategy enables the robots to find the evader effectively. The leader-adjusting strategy aims to improve the hunting robots’ response to environmental changes and the outflank strategy is proposed for the hunting robots to force the evader to enter a besieging circle. The catch strategy is designed for shrinking the besieging circle to catch the evader. The predict strategy allows the robots to predict the evader’s position when they lose the tracking information about the evader. A novel collision-free motion strategy is also presented in this paper, which is called the direction-optimization strategy. To test the effect of cooperative hunting, the target to be captured owns a safety-motion strategy, which helps it to escape being captured. The computer simulations support the rationality of the approach.

Key Words: Multi-robot, hunting, besieging circle, dynamic environment