Guest Editorial

Special Issue on Fuzzy Logic and Control in Robots

Fuzzy control has been applied successfully to consumer electronics, industrial applications, and intelligent robots, for the last decade. It is found in some government or company reports that we could have robots in every home by 2015, 2020, or 2025. Fuzzy logic-based techniques could be used to describe or model the environment that robots stay. Fuzzy controllers could be utilized to drive the actuators of the wheels, legs, or arms of a robot; or to tell the robot where to go; or to determine which behavior the robot should perform; and so on. The main theme of this special issue is to design and implement autonomous robots by using fuzzy logic and control. Due to the limited space, we only are able to select eight papers for publication.

The first paper "An Optimized Neuro-Fuzzy Controller Design for Bipedal Locomotion" by Shieh and Chang proposes a bipedal locomotion controller using an optimized Neuro-Fuzzy inference structure. The real experiment results demonstrate that the robot can autonomously keep its balance when facing the disturbances and a suddenly shifting surface. The next paper "Fuzzy Balancing Control of a Small-size Humanoid Robot based on Accelerometer" by Cheng *et. al.* applies the fuzzy balancing control to their developed humanoid robot. The practical experiments show that the proposed method can adjust the posture of the robot to change its center of gravity for different standing environment so that it can balance and stand on an inclined plane by itself. The paper "Fuzzy Logic Path Planner and Motion Controller by Evolutionary Programming for Mobile Robots" by Min *et. al.* proposes a hierarchical fuzzy logic control for mobile robots. The applicability of the controller is demonstrated by using robot soccer system. In "ACA-based Fuzzy Controller Design for Robot Soccer," Chiou and Wang present the use of an ant colony algorithm combined with a fuzzy logic controller to optimize the movement of a soccer robot. The experimental results illustrate that the ant colony algorithm can determine the obstacle-avoidance path and the fuzzy ant colony algorithm can successfully find a path for soccer robot to its optimal target with minimum time.

The paper "Fuzzy Logic Control Design for a Stair-Climbing Robot" by Wang *et. al.* designs and implements a fuzzy logic controller for a robot that can move up-and-down stairs for providing service. The robot mechanism is introduced in detail and two walking experiments of moving up and down stairs with the rise/depth of 120/400 mm and 175/280 mm are given to verify the feasibility of the proposed scheme. In "Fuzzy Target Tracking and Obstacle

Avoidance of Mobile Robots with a Stereo Vision System," Chao *et . al.* propose a two-level hierarchical intelligent controller for a mobile robot to deal with target tracking and obstacle avoidance tasks. The hardware architecture of the mobile robot is addressed. The real experiment of obstacle avoidance and target tracking control for mobile robot with two cameras shows that the proposed methods are feasible and effective. In "Neuro-Fuzzy Rule Generation for Backing up Navigation of Car-like Mobile Robots," Park *et. al.* present an automatic neuro-fuzzy rule generation scheme for backing up navigation of car-like mobile robots. Simulation results illustrate that the proposed method is able to guide the truck, and the truck-trailer to dock, from almost any initial position. The last paper "Fuzzy Controller based Biped Robot Balance Control using 3D Image" by Park *et. al.* propose a balance control algorithm based on fuzzy controller using 3D geometric information obtained from sequential images. The fuzzy controller keeps the biped robot in stable pose using the recent pose and velocity of a biped robot. The efficiency of the proposed algorithm has been proven by the experiments performed on even floor using a mini humanoid robot.

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