Pozvánka na přednášku

pořádanou v rámci Semináře z umělých bytostí

středa 15.3.2006
od 19:00
v posluchárně S6

Petr Musílek

(University of Alberta)

Design of a high-level control system for a mobile robot

Design of high-level control systems for autonomous agents, such as mobile robots, is a challenging task. The complexity of robotic tasks, the number of inputs and outputs of such systems and their inherent ambiguity preclude the designer from finding an analytical description of the problem. Using the technology of fuzzy sets, it is possible to use general knowledge and intuition to design a fuzzy control system that encodes the relationships in the control domain into the form of fuzzy rules. However, control systems designed in this way are severely limited in size and are usually far from being optimal. In this talk, several techniques are combined to overcome such limitations. The control system is selected in the form of a general fuzzy rule based system. Antecedents of this system correspond to various situations encountered by the robot and are partitioned using a fuzzy clustering approach. Consequents of the rules describe fuzzy sets for change of heading necessary to avoid collisions. While the parameters of input and output fuzzy sets are designed prior to robot engagement in real world, the rules to govern its behavior are acquired autonomously endowing the robot with the ability to continuously improve its performance and to adapt to changing environment. This process is based on reinforcement learning that is well suited for on-line and real-time learning tasks.

Short biography

Dr. Petr Musilek received his PhD degree in Cybernetics from the Military Technical Academy in Brno, Czech Republic, in 1995. In 1997, he was awarded a NATO Science Fellowship and spent two years as a postdoctoral fellow at the Intelligent Systems Research Laboratory, University of Saskatchewan, Canada. In 1999 he joined the Department of Electrical and Computer Engineering at the University of Alberta, Canada, where he serves as an Associate Professor since 2004. In 2005 he was a Visiting Professor at the Department of Computer Science, University of Carlos III of Madrid, Spain. Currently he is a Visiting Scientist at the Institute of Computer Science, Academy of Sciences of the Czech Republic. Dr. Musilek's research includes computational intelligence applied to the areas of autonomous systems, data analysis, and time series prediction. In particular, he conducts research into neural networks, fuzzy systems, evolutionary computing, and artificial immune systems, and applies these computational methods to navigation and control of mobile robots, program generation, and intelligent risk assessment and decision support. He published a number of journal papers, a textbook and several book chapters, and contributed to many major conferences.