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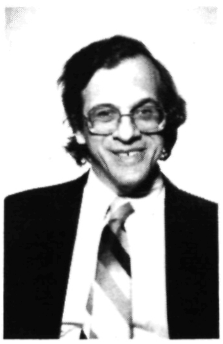

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Dr. Levine received his Ph.D. in applied mathematics at MIT in 1975, under Professor Stephen Grossberg. He has been an associate professor of mathematics at the University of Texas at Arlington since the fall of 1983, and his research articles have been in the theory, modeling, and simulation of biological (neural or ecological) processes using dynamical systems of differential equations. In neural networks, Dr. Levine has written an 86-page review article (Mathematical Biosciences, Vol. 66, 1983) and is currently writing a graduate textbook (Introduction to Neural and Cognitive Modeling, Erlbaum, to appear in 1989). He is an editor of Neural Networks and has been on the organizing committees of both 1987 and 1988 International Neural Network Society meetings. His recent work has centered on interactions between cognitive and motivational variables in neural networks. Dr. Levine has also been a commissioned officer at the National Institute of Health; a postdoctoral trainee in physiology at UCLA; and an assistant professor of mathematics at Rutgers University, the University of Pittsburgh, and the University of Houston.

NEURAL MODELING OF SELECTIVE ATTENTION

Abstract

A neural network is presented in which there are modifiable, bidirectional connections between nodes representing sensory events and other nodes representing reinforcement sources. There is also competition between sensory nodes. Through these competitive and associative mechanisms, the presenter, together with Stephen Grossberg, has simulated some data on attentionally modulated Pavlovian conditioning. In particular, if two stimuli are presented simultaneously, and one of them has already been associated with a primary reinforcer (such as electric shock or food), selective attention occurs which inhibits the other stimulus from forming new associations. Context changes can profoundly alter the dynamics of selective attention. For example, if one stimulus has been paired with a reinforcer and that stimulus combined with another is paired with a greater or lesser amount of that reinforcer, the second stimulus is no longer blocked. Also, selective attention based on positive or negative reinforcement can compete with selective attention based on other criteria. Nonmotivational criteria are enhanced by frontal lobe damage, which weakens the sensory-reinforcement linkage. For example, a frontally lesioned monkey can prefer a novel object to one that has previously been rewarded. Also, a human frontal lobe patient can persevere in a habit that was once, but is no longer, rewarding.

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