A NEURAL-LIKE LAYER FOR PROCESSING DYNAMIC IMAGES

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ABSTRACT

A neural-like layer with dynamical mechanisms employed in the processing of continually changing visual images is discussed in this paper. The information embedded in the visual image is assumed to be dynamic in both space and time. The processing of information by dynamic mechanisms is imperative because a conventional static vision system fails to achieve the true adaptability and robustness possessed by even the simplest biological system. Visual information is processed over a hierarchical network of planar regions of nerve cells called neural layers. The neural layer is a collective assembly of numerous interconnected neural subunits. Each neural subunit consists of several localized dynamic neural sets. An individual neural set is modeled as an underdamped second-order system cascaded with a static nonlinear transformation function representing the dynamics of parallel non-interactive biological neuron assemblies. For machine vision applications, it is postulated that a network of numerous densely packed neural layers can emulate certain aspects of human associative memory and visual information processing in real-time. A simulated study of a layer that pays 'selective attention' to a particular line orientation is presented.

NEURAL NETWORKS FOR UNCERTAINTY MANAGEMENT IN VISION SYSTEMS

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Abstract: Uncertainty maintenance is an important part of most computer vision systems. In this paper, we examine a novel methodology for the fusion and propagation of uncertainties in a neural-network-like structure. Each node in the network represents a hypothesis. The inputs are the uncertainties associated with the knowledge sources that support the hypothesis, and the output is the aggregated uncertainty. We propose the use of fuzzy-set based activation functions. The parameters of the activation function are chosen depending on the desired "attitude". In addition to the traditional union and intersection aggregation connectives, we propose the use of a generalized mean connective to increase flexibility. Some attractive properties of the connectives are discussed and a training procedure for such networks is also proposed. Initial simulation results are also presented.

Hand Written Letter Recognition With Neural Networks

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Abstract. Neural networks that can recognize 36 hand written alphanumeric characters are studied. Thin line letters, in 32×32 binary arrays are used as the input pattern. The system is built from two major units, a three layered preprocessing unit and a recognition unit. Shift, scale, and deformation tolerance in recognition are provided through preprocessing. Three learning paradigms including an error back propagation learning, a simple perceptron learning, and a competitive learning are examined and compared

Using Back-propagation Networks to Assess Several Image Representation Schemes for Object Recognition

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0.0 Abstract

Two chapters of research are presented. The first constitutes a demonstration that back-propagation networks can be used as a content addressable memory (CAM) for visual objects represented within digitized real-world images. For networks encoding two or three classes of traffic signs, classification generalization is demonstrated for objects at new positions on the image frame and also for new instances of a trained class of object. The new instance may even be a somewhat degraded representation. Given this optimistic introduction, the work evolves into a second, more comparative chapter. In this further probe, back-propagation networks are employed as content addressable memories with which to determine the relative value of several different visual object representation schemes. These representation schemes are tested along multiple parameters to deduce the efficacy of the scheme itself, and the influence of network parameter changes on the learning and categorization of objects.

A Neural Network for Invariant Object Recognition in a Robotic Environment

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Abstract

In this paper, object recognition, which may be subject to occlusion and /or to various combinations of scaling, translational, and rotational transformations from pre-stored object models, is under investigation. Such an environment is very typical in the applications of robotics. A "pure" neural network approach is adopted here, i.e. without including any mathematical transforms, such as polar or Fourier transform, as a pre-processor. Detailed discussions on Neocognitron by Fukushima are given which show that the network model is able to solve the problems of invariant recognition and of occlusion resolving by adjusting the parameters of both static structures and dynamics learning rules.