

From Single Neurons to Intelligent Networks

Presentation by Lambert Spaanenburg, Lund University, Dept. of Electrical & Information Technology

Abstract.

After several fail starts, neural networks finally take off in the early nineties. Adaptive control finds its way into model-free diagnosis for industrial automation and automotive applications. Image processing provides for smart cameras in highway management and medical services. The typical intelligent system is composed from neural modules as the monolithic part has notorious learning problems and is often enhanced by rule-based mechanisms. The next development step from single product with modular composition into distributed network of modules has important consequences. In addition to the well-known robustness enhancement from structural redundancy, it introduces behavioral redundancy for precision improvement beyond the imprecise parts.

The presentation will shortly pass through history. From a roadmap on industrial automation we see the on-set of vision networks. The camera has made a remarkable development from analog sensor array to autonomous digital system. Convergence with other technologies leads to the camera phone as a universal communicator. We will discuss here mobile gesturing by cell-phone in competition with Wii gadgets. Finally a look is taken at surface defect detection and measurement with camera arrays. Where the human eye provides depth estimation by dynamic lens adaptation, the network of cheap vision sensors can deduce such values from communicating observations on the individually extracted lighting effects.

(This presentation is an extended version of "Heterogeneous Networks for Dynamic Surface Inspection", International Surface Inspection Summit ISIS2008, Amsterdam, February 2008)