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Paper Abstract

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Paper Title: Multi-Sensory Opto-Electronic Feature Extraction Neural Associative
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Description (use additional sheet if necessary):

A novel multi-sensory opto-electronic feature extraction neural associative retriever (MOFENAR) has been developed and constructed. The MOFENAR is based on artificial neural network (ANN) holographic associative retrieval techniques. The innovation of the approach is that images and/or 2-D data vectors from a multiple number of sensors may be used as input via an electrically addressed spatial light modulator (SLM) and hence processing can be accomplished in parallel with high throughput. A set of Fourier transforms of reference inputs can be selectively recorded in the hologram. Photorefractive phase conjugators are used for the associative retrieval and iteration of the multi-sensory data. When convergence is reached, the output can either be displayed or used for post-processing computations. Computer simulations of the MOFENAR architecture based upon a mathematical approach indicate the general performance of the proposed architecture and reveal information regarding the system's characteristics. Hardware experimental results demonstrated that the ability to recognize and recover input images (or vector sets) by means of iterative optical processing of those inputs is possible, and that this image recovery process lends itself well to many important applications. Potential NASA applications of the MOFENAR include automated smart robotics vision for space station and deep-space planetary explorations. The commercial application potential exists in 3-D holographic displays, entertainment, document authentication, and finger prints identification.