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Electrical Engineering and Information Technology

Title: ***Self-trained Analog Artificial Neural Network Circuits***

UMD16-10

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Applications:

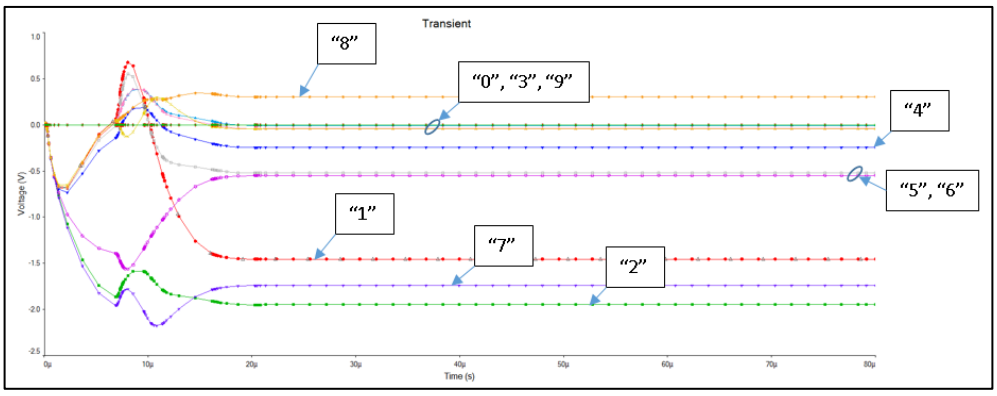
- Online image search and voice recognition
- Character recognition
- Data mining

Benefits:

- Analog hardware provides real-time training of ANN weights in parallel
- Analog hardware provides real-time data processing
- Real-time Artificial Intelligence for Internet-of-Things applications

Technology Description: Artificial neural networks (ANN) are typically realized as software emulations run on computers that execute their instructions serially, thereby losing the advantages of ANN's inherent parallelism. The invention actualizes analog ANNs in *hardware* with *on-chip training* circuitry, for real-time training as well as real-time data processing. Analog electronic feedback loops adjust ANN weights in parallel. The time required to train *software* ANNs can range from seconds to days, depending on the scale of the neural network and the training method. The inventors have demonstrated an analog *hardware* realization which solves the pattern recognition problem for numbers 0-9 in about 20 microseconds. Given the state of the art in integrated circuits, the capabilities of the circuit can easily be extended to process patterns with millions of discrete points, at processing times comparable to those for smaller images.

Patent Status: UMass Dartmouth has filed a provisional patent application on this invention. The research underlying the invention has been presented at ICAI'18: the 2018 International Conference on Artificial Intelligence.



Output voltage transients for ten aggregation function circuits configured to recognize "8" and ignore digits 0-7, and 9.

For more information:

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Return to Available Inventions Page