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MEMRISTOR-BASED NEURAL LEARNING FOR ADAPTIVE CONTROL SYSTEMS

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Motivation

- Control algorithms are used in almost all mechanical and electrical systems for controlling movements and activities.
- Control algorithms are highly computationally intensive, requiring the use of high powered computers and this makes their use in mobile platforms (especially small robots) almost impossible.
- Memristor based circuits implement neural networks at high speeds, but at several orders of magnitude lower power than traditional computers.
- Control systems on memristor neural learning circuit is designed for achieving such highly computationally intensive processes at lower power.

Memristor Neural Network Implementation

\[ DP_j = \sum_{i=1}^{n} x_i W_{ij} \]

\[ y_j = f(DP_j) \]

Adaptive Control System

- Control energy (CE) of SLP is in 10^7 magnitude.
- 3 layer MLP has unacceptable spike.
- 4 layer MLP resolve that and has good values for MSE and CE.

OBSERVATION

- Deep neural networks are good for advanced control algorithms.
- Memristor based devices support lower power for advanced computations.