We will also demonstrate a visualization of the DANNA neuromorphic implementation running in real-time alongside the simulation of the hardware on at least three applications: pole balancing, one-dimensional navigation with gravity (a game based on the mobile application Flappy Bird), and two-dimensional navigation with obstacle avoidance.

DANNA is the original implementation of the model. Currently we have DANNA running on Xilinx Virtex-7 models at 1 million DANNA cycles per second (1 MHz). Communication with the FPGA is implemented with a Cypress FX3 over USB 3.0. Currently we have the 690T model FPGA implementing an array size of 45 by 45 using 87% of the slices.

For the DANNA model, we have implemented the model on the Xilinx Virtex-7 XC7VX690T (supporting DANNA arrays up to 47 X 47), and XC7V2000T (supporting arrays up to 75 X 75). We have verified the functionality of these implementations with a cycle-level simulator.

Dynamic Adaptive Neural Network Array (DANNA) is a neuromorphic implementation meant for conventional digital hardware that is currently implemented on field programmable gate array (FPGA) with a VLSI implementation in progress. In this demo, we will demonstrate the FPGA implementation of DANNA running in real-time on at least three applications: pole balancing, one-dimensional navigation with gravity (a game based on the mobile application Flappy Bird), and two-dimensional navigation with obstacle avoidance. We will also demonstrate a visualization of the DANNA neuromorphic implementation running in real-time alongside the simulation of the hardware on the FPGA.

Danna Network
- Two-dimensional grid of elements.
- Elements can be neurons or synapses.
- 16 nearest neighbor connectivity.
- Programmable synaptic delays.
- FPGA implementation deployed.
- VLSI implementation designed.

Danna Element
- A neuromorphic structure which can act as a neuron or a synapse.
- Each element can be configured as either a neuron or as synapse.
- Connection scheme connects elements together to form array.

Communication
- The inverted pendulum is a classic application from control theory. The goal of the system is to apply periodic forces to move the cart left or right, to keep the pole from falling, and to keep the cart from moving beyond its boundaries.

Hardware
- For the DANNA model, we have implemented the model on the Xilinx Virtex-7 XC7VX690T (supporting DANNA arrays up to 47 X 47), and XC7V2000T (supporting arrays up to 75 X 75). We have verified the functionality of these implementations with a cycle-level simulator.

Applications
- Pole Balance
- XD Nav