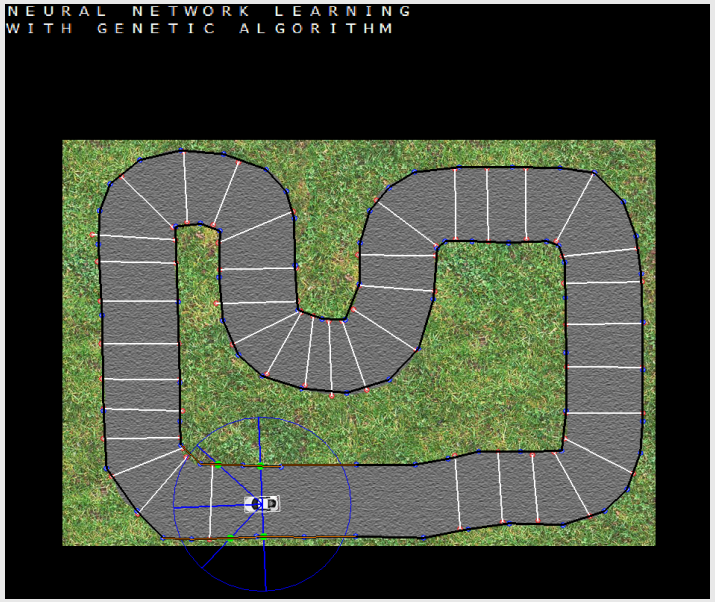

BrainChip
Milestone 1
Race Car Demonstration
Aziana
Limited
ACN 151 159 812
Proof of Concept
Spiking Neurons vs Sigmoid Neurons

# Introduction

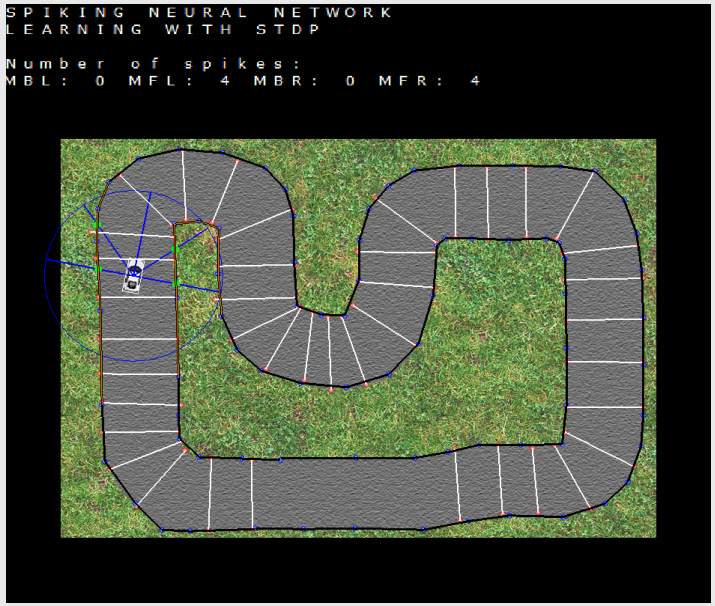

- In this demonstration, two windows display a 2D simulated environment in which the cars drive around the track and must learn to avoid the walls.
- Both cars are equipped with proximity sensors and are controlled by a neural network that can learn over time.
- Each car has a different neural network model and learning method and their performance is compared. One is that created by BrainChip's Peter Van Der Made, and the other is a sigmoid neuron network.
- Both neural networks have no prior knowledge of the track.

# Identical Tracks




**Sigmoid Neurons**
**(second generation)**

Learning algorithm: Genetic Algorithm




**Spiking Neurons**
**(third generation)**

Learning algorithm: STDP
(Synaptic Time Dependent Plasticity)

# Race Results


- Sigmoid Neural Network (Left window):
  Using a sigmoid based neural network trained by a genetic learning algorithm, the learning process took 25 minutes (average).

- BrainChip STDP Neural Network (Right window):
  Using a spiking neural network of spiking neurons with the STDP learning method, the learning process took 15 seconds.

- Time differential will become greater as the complexity of the tasks are increased.

# Conclusion


- BrainChip neurons learn rapidly and have distinct advantages over previous Artificial Neural Networks.
- BrainChip can control a process
- BrainChip can start with "blank" neurons and produce a functional set of synaptic values through STDP learning
- The interface between the BrainChip neurons and a computer is working
- The computer can read and write configuration parameters to the BrainChip