Maintaining Real-Time Synchrony on SpiNNaker

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SpiNNaker system details

Optimised custom-designed integrated circuit inspired by the biological functions of the human brain.

Features of SpiNNaker chip

SpiNNaker mimics the brain in numerous ways:
- Resilient to individual component failure;
- Maximum power efficiency;
- Asynchronous event based communication;
- High performance through many small elements.

Neural simulation

- Ability to simulate one neuron type per core
- Neuron types can be different across multiple cores in the system during the same simulation

Test board schematic

- Each green dot represents an external connection

Synchronization details

Barrier synchronization

- A three-step synchronization procedure (for multiple chip simulations):
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Simulation timing

- Evolution of the simulation on multiple chips
- Evolution of the simulation on multiple chips
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Phase shifting

- Phase shifting technique to solve the de-synchronization problem;
- Available computation time reduced by this technique;
- The neural simulation is memory bounded (not CPU bounded), so this does not influence the amount of neurons that each core can simulate

Further Information

SpiNNaker website: http://apt.cs.man.ac.uk/projects/SpiNNaker/
Sergio Davies’ webpage: http://apt.cs.man.ac.uk/people/davies/
Sergio Davies’ e-mail: davies@cs.man.ac.uk

Phase of the system

- Examples of simulation running on the SpiNNaker system with the slight de-synchronization.