TECHNOLOGY DESCRIPTION

SpiNNaker – a contraction of Spiking Neural Network Architecture – is a massively-parallel brain-inspired neuromorphic computer for large-scale real-time brain modelling applications. It has three aims:

- To simulate very large brain-like networks, to advance our understanding of how the brain works
- As a real-time neural simulator that allows roboticists to design large neural networks, that are both flexible and low power, into mobile robots
- To question the restrictions that we impose on our computer architectures, by comparing them to the very different principles evolved by nature in the brain

- Simulations employing massively-parallel spiking neural networks that mimic the functioning of a brain are run as tools for both computational neuroscientists, to help understand how the brain works, and roboticists, to design large neural networks into flexible, low power robots.
- More than 1 Million processors in 1200 boards allows large-scale real-time brain modelling simulations without buying time on a supercomputer.

AREAS
Computing | Robotics | Computational neuroscience | Theoretical neuroscience
**COMPETITIVE ADVANTAGES**

**Flexibility:**
The use of software to model neuron and synapse dynamics allows new theories to be explored rapidly.

**Scale:**
With a million processors, each capable of modelling several hundred neurons and several million synapses, real-time models up to full mouse-brain scale are possible.

**PyNN:**
A standard spiking neural network description open-access language allows rapid user access with minimal training.

**Research and development:**
Next SpiNNaker generation will deliver 10 times the computer performance while consuming about the same power as the original chip.

**APPLICATION & MARKET POTENTIAL**

- Event-based machine learning for energy-efficient AI, for example in mobile platforms
- Novel learning algorithms for event-based machine learning
- Neuro-robotic control systems for compliance and user safety
- Large-scale brain models, to understand brain function and ultimately, perhaps, to model the effects of drugs

**REFERENCES**

- Around 100 SpiNNaker systems are in use in labs around the world, including US, Japan, Australia and New Zealand
- The University of Manchester built the world’s first operational stored-program computer, which ran its first program on June 21st 1948
- Alan Turing wrote his 1950 paper on “Computing Machinery and Intelligence” when at Manchester, introducing the Turing Test for human-like AI – still not passed by any machine!

**TECHNOLOGY READINESS LEVEL**

1 2 3 4 5 6 7 8 9

Tech sheet designed and co-developed by Universidad Politécnica de Madrid

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SPINNAKER IS THE LARGEST NEUROMORPHIC COMPUTING PLATFORM IN THE WORLD TODAY!