

● Dr. HESHAM HAMED AMIN

<Profile>

Nationality: Egypt

Educational Background in Japan:

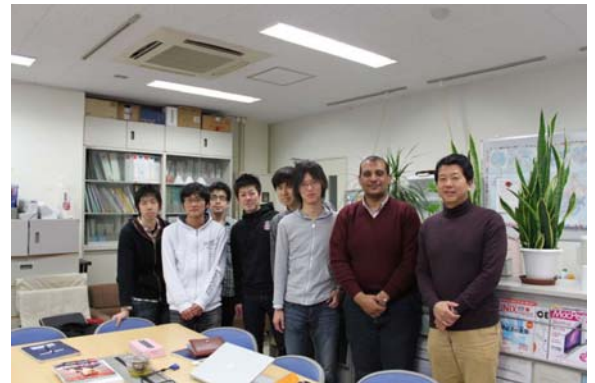
October 2000 - September 2002: The University of Aizu, Graduate School of Computer Science and Engineering (Master course)

October 2002 – September 2005: The University of Aizu, Graduate School of Computer Science and Engineering (Doctor course)

Major Field: Computer Science and Engineering

Present Institution / Status:

Aswan Faculty of Engineering, South Valley University, Aswan City, Egypt /
Assistant Professor



Department of Information and Computer Sciences, Saitama University on Feb 24, 2010.

<Follow-up Research Fellowship>

Period: November 30, 2009 - February 27, 2010 (90 days)

Host University: The University of Aizu

Theme of Research

Spike Timing Dependent Plasticity (STDP) Based Spiking Neural Network learning

Outline of Research

1. Applying STDP learning technique to advance the previous research.
2. How to design the proposed learning algorithm and the applied applications on VLSI chips.

Encoding of input stimulus such as visual inputs and images, into a unique and reasonable (from length, number of spikes, and inter-spike intervals) spike trains. These spike trains is proven by the biological research that represent inputs.

The research activities concern on the following points:

1. Reforming the learning techniques in spiking neural networks using spike time dependent plasticity (STDP). This gives the learning and encoding methods more realistic and biologically plausible in the research.
2. Methodology should take into account the VLSI design. Simplification of complex equations and methods should be done.

3. The design of VLSI chip will be done as a result of the previous research in step 1.

Results of Research

Some of the previous points had been discussed and had been surveyed.

STDP learning is missed in real engineering application, although tremendous theoretical researches in STDP learning techniques have been done.

Using the feedback connection technique in learning of spiking neural networks may be interesting due to its usefulness in combining the new inputs with old input history.

Sound applications may be interesting to be used for demonstration of such techniques.

Simulation of large spiking neural network is a hot topic due to the increasing of computation power of personal computers and computer network usage.

Further Research Plan

Beginning from the previous "Results of Research", the continuation of research will be done.

Two papers may be published in the near future.

Another visit to Aizu University may be done in the near future to continue research.

● Research Advisor: Professor FUJII Robert

Theme of Research

- a) Research of recurrent spiking neural networks for temporal sequence detection.
- b) Developing a spiking neural network simulator.

Outline of Research

- a) Recurrent spiking neural networks:
 - 1) Proposal of new recurrent neural networks based leaky integrator spiking neurons.
 - 2) Learning algorithm for the proposed network
 - 3) Sound/speech recognition selected as the application area.
- b) Spiking neural network simulator
 - 1) Survey the literature for existing free source spiking neural network simulators.
 - 2) Research methods for achieving event driven simulator with good graphical interface.

Results of Research

a) Recurrent neural networks

Various recurrent spiking neural network organizations were discussed. Mathematical models of dynamic systems were discussed.

b) Spiking neural network simulator

Found that most of the current spiking neural network simulators are not event driven and that most have only a primitive graphical user interface.

Further Research Plan

The plan is to keep working together on the above topics with frequent exchange of information via the internet.



Tsuruga-jo, Aizu-Wakamatsu on Jan 11, 2010.



Aizu University, Snowing at night, Jan 18, 2010.