

2008 11th International Workshop on Cellular Neural Networks and Their Applications

**Santiago de Compostela, Spain
14-16 July 2008**



**IEEE Catalog Number:
ISBN 13:**

**CFP08CNN-PRT
978-1-4244-2089-6**

CNNA 2008- Table of Contents

Live Demo Session

Room A, Monday, July 14th, 16:45-18:45

A 64x64 Cell Mixed-Mode Array Processor Prototyping System	1
Mika Laiho, Jonne Poikonen, Peter Virta, Ari Paasio	
Demonstration of the APRON Processor Array Simulation Software	2
David R.W. Barr, Piotr Dudek	
Robotic Gaze and Vergence Control via Disparity Energy Neurons	3
Eric K.C. Tsang, Stanley Y.M. Lam, Yicong Meng, Bertram E. Shi	
A Standalone FPGA Based Emulated-Digital CNN-UM System	4
Zsolt Vörösházi, András Kiss, Zoltán Nagy, Péter Szolgay	
Experimental Result on Supersonic Flow Simulation on Emulated Digital CNN-UM	5
Sándor Kocsárdi, Zoltán Nagy, Árpád Csík, Péter Szolgay	
An Advanced Real-Time, Multi-Channel Emulated-Digital Retina Model Implementation on FPGA	6
Zsolt Vörösházi, Zoltán Nagy, Péter Szolgay	
A Programmable Hardware for Exploring Spatiotemporal Waves in Real-Time	7
Ramazan Yeniçeri, Müstak E. Yalçın	
Digital Holographic Microscopy and CNN based Image Processing for Biohazard Detection	8
Szabolcs Tökés, Vilmos Szabó, László Orzó, Péter Divós, Zoltán Krivosija	
High-Speed Visual Control of Laser Welding Processes by Cellular Neural Networks (CNN)	9
Marc Geese, Ronald Tetzlaff, Daniel Carl, Andreas Blug, Heinrich Höfler, Felix Abt	
Developing System to Detect and Analyze Spatio-Temporal Tactile Events	10
Attila Kis, Gábor Vásárhelyi	

Technical Session- Implementation- Digital Solutions I

Room A, Tuesday, July 15th, 10:25-11:45

DT-CNN Emulator: 3D Heat Equation Solver with Applications on the Non-Destructive Soil Inspection	11
Fernando Rafael Pardo Seco, Paula López Martínez, Diego Cabello Ferrer	
A DT-CNN Data-Flow Implementation	17
Suleyman Malki, Lambert Spaanenburg	

A New Approach to Emulate CNN on FPGAs for Real Time Video Processing Kamer Kayaer, Vedat Tavsanoğlu	23
An Implementation of 2D Locally Coupled Relaxation Oscillators on an FPGA for Real-Time Autowave Generation Ramazan Yeniçeri, Müstak E. Yalçın	29
Technical Session- Theory I Room B, Tuesday, July 15th, 10:25-11:45	
An Alternative Proof of the Universality of the CNN-UM and its Practical Applications Giovanni Egidio Pazienza, Riccardo Poli, Xavier Vilasís-Cardona	34
Nondeterministic Finite Automata based on Star Cellular Nonlinear Networks Fernando Corinto, Michele Bonnin, Marco Gilli	40
Extended LaSalle's Invariance Principle for Full-Range Cellular Neural Networks Mauro Di Marco, Mauro Forti, Massimo Grazzini, Luca Pancioni	46
Cellular Neural Networks for NP-hard Optimization Mária Ercsey-Ravasz, Tamás Roska, Zoltán Néda	52
Technical Session- Implementation- Design Issues on Cellular Processor Arrays Room A, Tuesday, July 15th, 11:55-13:15	
Analysis of 2D Operators on Topographic and Non-Topographic Processor Architectures Ákos Zarándy, Csaba Rekeczky, Péter Földesy	57
Template-Oriented Hardware Design based on Shape Analysis of 2D CNN Operators in CNN Template Libraries and Applications Natalia Abel Fernández García, Manuel Suárez, Víctor Brea, Diego Cabello Ferrer	63
Design Space Exploration for a DT-CNN Suleyman Malki, Lambert Spaanenburg	69
Current Mismatch and Nonlinearity Compensation in Mixed-Mode Array Processors Joona Marku, Kati Virtanen, Janne Maunu, Jonne Poikonen, Ari Paasio	75

Technical Session- Biomedical Applications

Room B, Tuesday, July 15th, 11:55-13:15

Analysis of Synchronization Phenomena in Human Electroencephalograms with Nonlinear Excitable Media	81
Anton Chernihovskyi, Christian Elger, Klaus Lehnertz	
Arteriolar-to-Venular Diameter Ratio Estimation: A Pixel-Parallel Approach	86
Carmen Alonso Montes, Manuel González Penedo, David López Vilariño	
A CNN-Based Synchronization Analysis for Epileptic Seizure Prediction: Inter- and Intraindividual Generalization Properties	92
Dieter Krug, Christian E. Elger, Klaus Lehnertz	
Analysis of EEG-signals in Epilepsy: Spatio-Temporal Models	96
Frank Gollas, Ronald Tetzlaff	

Technical Session- Implementation- Hardware Solutions

Room A, Tuesday, July 15th, 16:30-18:30

Interconnect-Efficient Reference Data Shift for Optimized Analog Motion Estimation	102
Jonne Poikonen, Mika Laiho, Lauri Koskinen, Ari Paasio, Kari Halonen	
A Cellular Neural Network made of Relaxation Oscillators for Autowave Generation in CMOS	108
Serdar Ozoguz, Mustak E. Yalcin	
Clusterable Cellular Visual Microprocessor	113
Péter Földesy, Ákos Zarándy, Csaba Rekeczky, Tamás Roska, László Kozák	
Scalable Fault-Tolerant Logic System Based on Regular Array of Locally Interconnected Gates	116
Jacek Flak, Mika Laiho, Ari Paasio	
Implementing the Grayscale Wave Metric on a Cellular Array Processor Chip	120
Dániel Hillier, Piotr Dudek	
Self-adapting Compressive Image Sensing Scheme	125
Mika Laiho, Jonne Poikonen, Kati Virtanen, Ari Paasio	

Technical Session- Applications I

Room B, Tuesday, July 15th, 16:30-18:30

CNN Implementation of a Moving Object Segmentation Approach for Real-Time Video Surveillance	129
David Rodríguez-Fernández, David López Vilariño, Xosé M. Pardo	
A Class of Gaussian-Shaped CNN Filter Banks	135
Radu Matei, Paul Ungureanu	
An Improved Method for CNN-based Detection of Symmetry Axis in Black and White Images	140
Daniele Casali, Giovanni Costantini	
A Fully CNN Based Fingerprint Recognition System	146
Reza Abrishambaf, Hasan Demirel, Izzet Kale	
Estimating Learner's Comprehension with Cellular Neural Network for Associative Memory	150
Michihiro Namba	

Special Session- Emulated Digital CNN-UM on Different Kind of Array Processors

Room A, Wednesday, July 16th, 15:30-17:00

Emulated Digital CNN-UM on Different Kind of Array Processors	154
Péter Szolgay	
Toward Exploitation of Cell Multi-processor Array in Time-Consuming Applications by Using CNN Model	157
Zoltán Nagy, László Kék, Zoltán Kincses, András Kiss, Péter Szolgay	
GPU Powered CNN Simulator (SIMCNN) with Graphical Flow based Programmability	163
Gergely Soós, Ádám Rák, József Veres, György Cserey	
Two-dimensional Compressible Flow Simulation on Emulated Digital CNN-UM	169
Sándor Kocsárdi, Zoltán Nagy, Árpád Csík, Péter Szolgay	
FPGA based Emulated-Digital CNN-UM with GAPU	175
Zsolt Vörösházi, András Kiss, Zoltán Nagy, Péter Szolgay	

Technical Session- Applications II

Room B, Wednesday, July 16th, 15:30-17:00

Cellular Neural Networks Model of Risk Management	181
Angela Slavova	

CNN and Collective Perception	186
Paolo Arena, Luigi Fortuna, Davide Lombardo, Luca Patanè	
A V2 Neuron-Based Model for Salient Point Detection	192
Yanning Yang, Bertram Shi	
Feature Extraction in Laser Welding Processes	196
Marc Geese, Ronald Tetzlaff, Daniel Carl, Andreas Blug, Heinrich Höfler, Felix Abt	
Technical Session- Implementation- Digital Solutions II	
Room A, Wednesday, July 16th, 17:10-18:30	
SIMD Array on FPGA for BW Image Processing	202
Alejandro Nieto, Víctor Brea, David López Vilariño	
Cellular Neural Networks Implementation on a Parallel Graphics Processor Unit	208
Andres Fernández, Ruben San Martín, Enric Farguell, Giovanni Egidio Pazienza	
A Cellular Processor Array Simulation and Hardware Prototyping Tool	213
David Robert Wallace Barr, Piotr Dudek	
CAM2-Universal Machine: A DTCNN Implementation for Real-Time Image Processing	219
Tomohiro Fujita, Takashi Okamura, Mamoru Nakanishi, Takeshi Ogura	
Technical Session- Theory II	
Room B, Wednesday, July 16th, 17:10-18:30	
Spiral Waves Occurrence in Cellular Nonlinear Networks	224
Fernando Corinto, Valentina Lanza, Marco Gilli	
Localized Patterns in the Quintic Generalized Swift-Hohenberg Cellular Neural Network	230
José Medina, Felipe Gómez, José Moreno	
Sufficient Conditions for Limit Cycles in Autonomous Antisymmetric Two Neuron CNNs	236
Xavier Vilasís-Cardona, Mireia Vinyoles-Serra	
Cellular Neural Networks with Second-Order Cells: Dynamics Analysis and Linear Filtering	242
Radu Matei	
The CNN Solution to the Shortest-Path-Finder Problem	248
Alberto P. Muñuzuri, Alejandro Vázquez-Otero	