

Proceedings of  
the IEEE 2008 International Workshop on  
Nonlinear Circuits and Networks (NCN'08)

Shikoku University

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# Greeting Message

Welcome to the 2008 IEEE Workshop on Nonlinear Circuit Networks (NCN'08), and welcome to Tokushima, a mecca for nonlinear science researchers in Japan.

The NCN has been founded as a closed internal workshop to provide a forum for exchange of the latest results related to nonlinear circuit networks by Prof. Ushida and Prof. Tanaka in 1995. In 2006, NCN'06 was organized as the first open NCN workshop sponsored by the IEEE CAS Society Shikoku Chapter preceded by 17 closed NCN workshops held in Tokushima, Tokyo, Nobeyama and Karuizawa. In 2007, a closed NCN workshop was held in Tokyo in August and the second open NCN workshop (NCN'07) was organized again by the IEEE CAS Society Shikoku Chapter in Tokushima in December.

In this year, the NCN'08 technical program committee received 32 contributions for the regular sessions. All these papers were carefully evaluated by 3 different reviewers. Finally, 22 papers are accepted for presentation in the workshop. This means that the acceptance rate is 68.75%. We consider that this rate is very nice to guarantee the quality of the technical program of NCN'08. We appreciate all of the contributions by many research groups.

The technical program is highlighted by three invited talks. Dr. Tsubone of Nagaoka University of Technology, Prof. Saito of Hosei University, and Prof. Kousaka of Oita University give special talks on their recent research results.

We wish to thank all of the reviewers for their devoted efforts to give many useful comments to the authors, particularly to the student authors, within very short time.

We hope that all of you find this workshop interesting and fruitful. Enjoy NCN'08 and Tokushima.



Yoshifumi Nishio, General Chair  
Tetsushi Ueta, Technical Program Chair

# Workshop Information

## Organizer

IEEE CAS Society, Shikoku Chapter

## In Cooperation with

IEICE Shikoku Section  
Sophia University Open Research Center

## Workshop Committee

- General Chair: Yoshifumi Nishio (Tokushima Univ.)
- Technical Program Chair: Tetsushi Ueta (Tokushima Univ.)
- Secretary: Yasuteru Hosokawa (Shikoku Univ.)

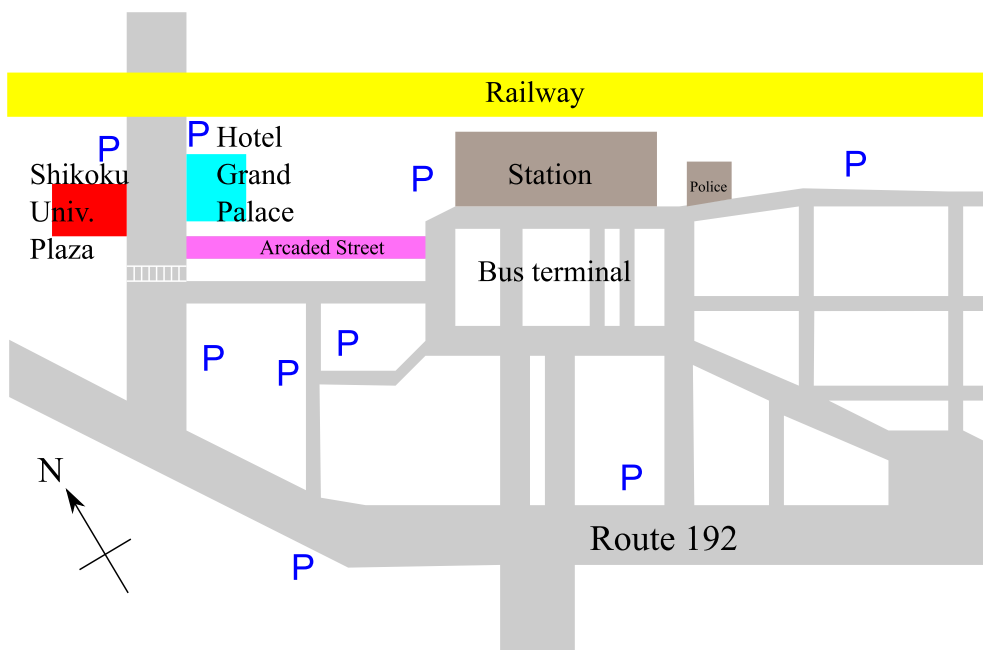
## Advisory Committee

- Akio Ushida (Tokushima Bunri Univ.)
- Mamoru Tanaka (Sophia Univ.)
- Toshimichi Saito (Hosei Univ.)
- Kenya Jinno (JST/ERATO)

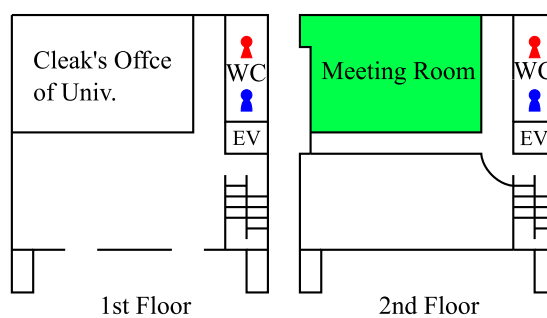
# Workshop Venues

## Friday, December 5

Shikoku University Plaza  
 2-35-8, Terashima-Honcho, Tokushima  
 TEL: 088-602-4858



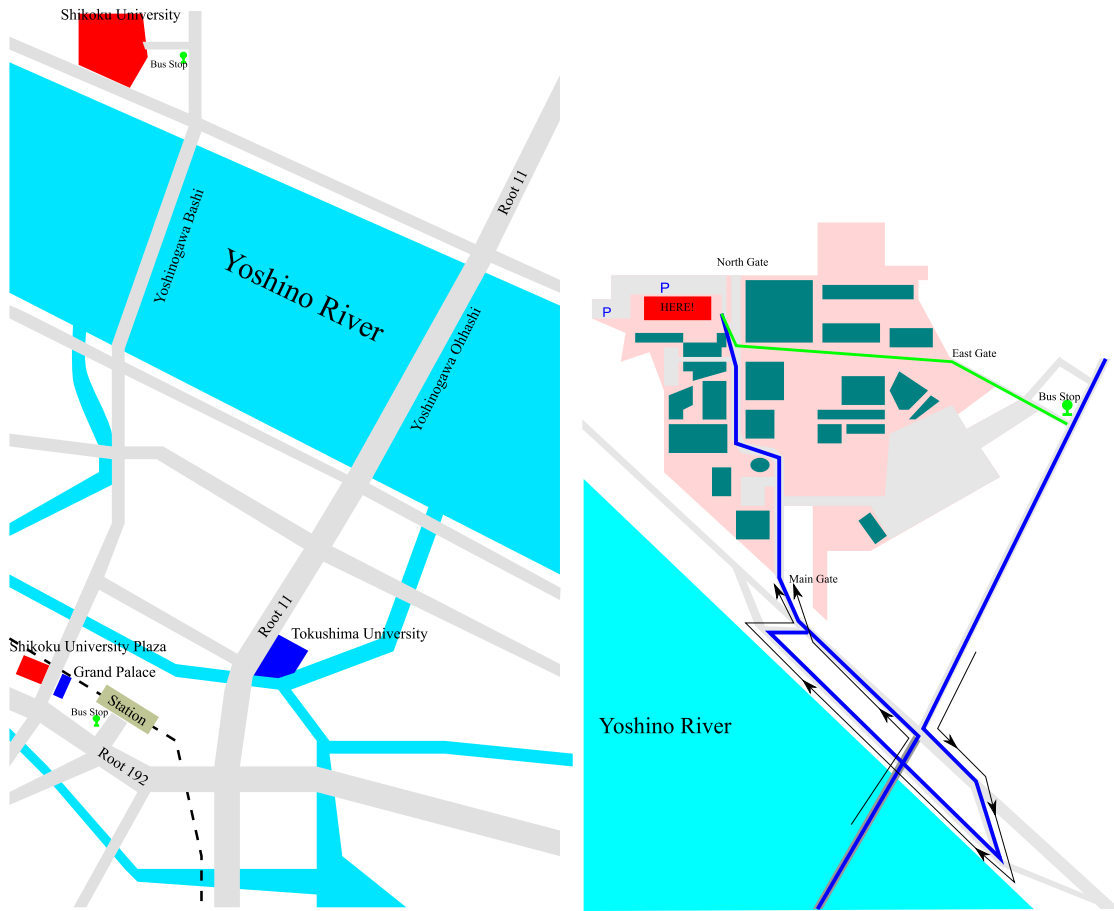
Location of the venue



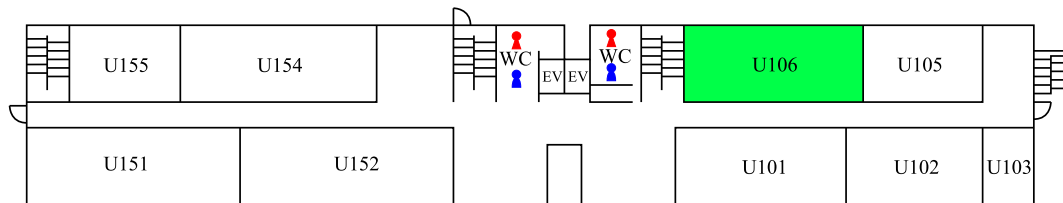
Floor plan

## Saturday, December 6

Room U106, Academic Institution for Computing and Media Studies  
 Shikoku University  
 TEL: 088-665-1300



Location and campus map



1st Floor  
Floor plan

# Technical Program

## 5PM1: Neural Networks

Date: December 5, 13:30-15:30

Room: Meeting Room, Shikoku University Plaza, Shikoku University

Chair: Kenya Jinho (ERATO)

- |               |   |    |
|---------------|---|----|
| <b>5PM1-1</b> | <b>Application of Particle Swarm Optimization to Design of DC-AC Inverter</b>   | 1  |
|               | Katsuma Ono (Hosei University), Toshimichi Saito (Hosei University)   |    |
| <b>5PM1-2</b> | <b>Particle Swarm Optimization with Map Structure</b>   | 3  |
|               | Haruna Matsushita (Tokushima University), Yoshifumi Nishio (Tokushima University)   |    |
| <b>5PM1-3</b> | <b>A Basic Learning Algorithm for Digital Support Vector Machine</b>  | 6  |
|               | Shutaro Kabeya (Hosei University), Toshimichi Saito (Hosei University)  |    |
| <b>5PM1-4</b> | <b>Improved Fuzzy Adaptive Resonance Theory Combining Overlapped Category</b>   | 8  |
|               | Haruka Isawa (Tokushima University), Haruna Matsushita (Tokushima University), Yoshifumi Nishio (Tokushima University)      |    |
| <b>5PM1-5</b> | <b>Analysis of an Interactive Connection Network by Using a Maximum-Flow Neural Network</b>                                 | 12 |
|               | Masatoshi Sato (Sophia University), Hisashi Aomori (Sophia University), Mamoru Tanaka (Sophia University)                   |    |
| <b>5PM1-6</b> | <b>Chaotic BP Algorithm for Sine Wave Function Learning with Different Frequencies</b>                                      | 15 |
|               | Azian Azamimi Binti Abdullah (Tokushima University), Yoshifumi Nishio (Tokushima University), Yoko Uwate (UZH / ETH Zurich) |    |

## 5PM2: Invited Talk I

Date: December 5, 15:45-16:15

Room: Meeting Room, Shikoku University Plaza, Shikoku University

Chair: Yasuteru Hosokawa (Shikoku University)

**5PM2-1 A Discrete-Time Control Approach for Stabilizing Unknown Steady State of Chaotic Spiking Oscillator** 19

Tadashi Tsubone (Nagaoka University of Technology), Yasuhiro Wada (Nagaoka University of Technology)

## 5PM3: Circuits and Systems

Date: December 5, 16:15-17:15

Room: Meeting Room, Shikoku University Plaza, Shikoku University

Chair: Yasuteru Hosokawa (Shikoku University)

**5PM3-1 Time Domain Techniques to Compress Sigma-Delta Domain Circuits** 21

Keita Hayashi (Hiroshima City University), Hisato Fujisaka (Hiroshima City University), Takeshi Kamio (Hiroshima City University), Chang-Jun Ahn (Hiroshima City University), Kazuhisa Haeiwa (Hiroshima City University)

**5PM3-2 Simultaneous Path Searching Based on WTA network For Several Moving Objects** 25

Yusuke Igarashi (Sophia University), Masatoshi Sato (Sophia University), Hisashi Aomori (Sophia University), Mamoru Tanaka (Sophia University)

**5PM3-3 A Spice-Oriented Frequency Domain Peak Search Algorithm** 29

Akiko Kusaka (Tokushima University), Takaaki Kinouchi (Tokushima University), Yoshihiro Yamagaki (Tokushima University), Yoshifumi Nishio (Tokushima University), Akio Ushida (Tokushima Bunri University)

## 6AM1: Cellular Neural Networks

Date: December 6, 09:30-10:30

Room: Room U106, Academic Institution for Computing and Media Studies, Shikoku University

Chair: Hisato Fujisaka (Hiroshima City University)

**6AM1-1 Memristor's Behavior and Synchronization in Cellular Neural Networks** 32



Kikuya Dan (Sophia University), Hisashi Aomori (Sophia University), Mamoru Tanaka (Sophia University)

**6AM1-2 A Design Method of 5x5 Templates for Cellular Neural Networks** 35

Takashi Inoue (Tokushima University), Yoshifumi Nishio (Tokushima university)

**6AM1-3 Stock Price Prediction using Kalman Filter** 39

Mitsushi Yoshida (Sophia University), Masatoshi Sato (Sophia University), Hisashi Aomori (Sophia University), Mamoru Tanaka (Sophia University)

## 6AM2: Invited Talk II

Date: December 6, 10:45-11:15

Room: Room U106, Academic Institution for Computing and Media Studies, Shikoku University

Chair: Hiroyuki Torikai (Osaka University)

**6AM2-1 Rotation map with a window and its encoding function** 41

Toshimichi Saito (Hosei Univ.), Yusuke Matsuoka (Hosei Univ.), Shimon Teshima (Hosei Univ.)

## 6AM3: Chaos Applications

Date: December 6, 11:15-12:15

Room: Room U106, Academic Institution for Computing and Media Studies, Shikoku University

Chair: Hiroyuki Torikai (Osaka University)

**6AM3-1 A Simple Authentication System Using Several Chaotic Maps** 43

Yoshitaka Nakano (Konan University), Masahiro Wada (Konan University)

**6AM3-2 A Simple Method of Digital Watermarking for Biometrics Using a Chaotic Cryptography** 47

Takayuki Sunagawa (Konan University), Masahiro Wada (Konan University)

**6AM3-3 Suboptimal Receiver using Chaotic Sequences with Biased Values** 51

Shintaro Arai (Tokushima University), Yoshifumi Nishio (Tokushima University), Takaya Yamazato (Nagoya University)

## 6PM1: Coupled Oscillators

Date: December 6, 13:15-14:15

Room: Room U106, Academic Institution for Computing and Media Studies, Shikoku University

Chair: Masahiro Wada (Konan University)

**6PM1-1** **Traveling Pulse Wave Induced by Global Phase-Space Structure in Inductor-Coupled Bistable Oscillators** 54

Kuniyasu Shimizu (Meiji University), Tetsuro Endo (Meiji University)

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Junji Fujii (Shikoku University), Yasuteru Hosokawa (Shikoku University), Yoshifumi Nishio (Tokushima University)

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Satoshi Nishioka (Tokushima University), Yoshiyuki Ichioka (Tokushima University), Tetsushi Ueta (Tokushima University)

## 6PM2: Invited Talk III

Date: December 6, 14:30-15:00

Room: Room U106, Academic Institution for Computing and Media Studies, Shikoku University

Chair: Mamoru Tanaka (Sophia University)

**6PM2-1** **A Bifurcation Problem for an Impact Oscillator** 63

Takuji Kousaka (Oita University)

## 6PM3: Bifurcation and Chaos

Date: December 6, 15:00-16:20

Room: Room U106, Academic Institution for Computing and Media Studies, Shikoku University

Chair: Mamoru Tanaka (Sophia University)

**6PM3-1** **Chaotic Oscillator Using Two RC Circuits** 64

Shuhei Masuda (Tokushima University), Yumiko Uchitani (Tokushima University), Yoshifumi Nishio (Tokushima University)

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