

Proceedings

**15th IEEE Real-Time and Embedded Technology  
and Applications Symposium**

RTAS 2009

**13-16 April 2009  
San Francisco, CA**



Los Alamitos, California  
Washington • Tokyo



# TABLE OF CONTENTS

## MULTIPROCESSOR SCHEDULING

<b>Notional Processors: An Approach for Multiprocessor Scheduling</b> .....	1
<i>Konstantinos Bletsas, Björn Andersson</i>	
<b>An Evaluation of the Dynamic and Static Multiprocessor Priority Ceiling Protocol and the Multiprocessor Stack Resource Policy in an SMP System</b> .....	11
<i>Jim Ras, Albert M.K. Cheng</i>	
<b>Semi-partitioned Fixed-Priority Scheduling on Multiprocessors</b> .....	21
<i>Shinpei Kato, Nobuyuki Yamasaki</i>	

## EXECUTION TIME 1

<b>Minimizing WCET for Real-Time Embedded Systems via Static Instruction Cache Locking</b> .....	31
<i>Tiantian Liu, Minming Li, Chun Jason Xue</i>	
<b>Static Prediction of Worst-Case Data Cache Performance in the Absence of Base Address Information</b> .....	41
<i>Diego Andrade, Basilio B. Fraguera, Ramón Doallo</i>	
<b>Model Identification for WCET Analysis</b> .....	51
<i>Björn Lisper, Marcelo Santos</i>	

## CYBER-PHYSICAL SYSTEMS

<b>CSL: A Language to Specify and Re-specify Mobile Sensor Network Behaviors</b> .....	61
<i>Joshua Love, Jerry Jariyasunant, Eloi Pereira, Marco Zennaro, Karl Hedrick, Christoph Kirsch, Raja Sengupta</i>	
<b>Execution Strategies for PTIDES, a Programming Model for Distributed Embedded Systems</b> .....	71
<i>Jia Zou, Slobodan Matic, Edward A. Lee, Thomas Huining Feng, Patricia Derler</i>	
<b>On Dynamic Reconfiguration of a Large-Scale Battery System</b> .....	81
<i>Hahnsang Kim, Kang G. Shin</i>	

## SYSTEMS & SOFTWARE

<b>The System-Level Simplex Architecture for Improved Real-Time Embedded System Safety</b> .....	91
<i>Stanley Bak, Deepti K. Chivukula, Olugbemiga Adekunle, Mu Sun, Marco Caccamo, Lui Sha</i>	
<b>QeDB: A Quality-Aware Embedded Real-Time Database</b> .....	100
<i>Woochul Kang, Sang H. Son, John A. Stankovic</i>	
<b>Adaptive Failover for Real-Time Middleware with Passive Replication</b> .....	110
<i>Jaiganesh Balasubramanian, Sumant Tambe, Chenyang Lu, Aniruddha Gokhale, Christopher Gill, Douglas C. Schmidt</i>	

## **ENERGY AWARE**

<b>Thermal-Aware Global Real-Time Scheduling on Multicore Systems</b> .....	120
<i>Nathan Fisher, Jian-Jia Chen, Shengquan Wang, Lothar Thiele</i>	
<b>Proactive Speed Scheduling for Real-Time Tasks under Thermal Constraints</b> .....	130
<i>Jian-Jia Chen, Shengquan Wang, Lothar Thiele</i>	
<b>Power-Aware Mapping of Probabilistic Applications onto Heterogeneous MPSoC Platforms</b> .....	140
<i>Andreas Schranzhofer, Jian-Jia Chen, Lothar Thiele</i>	

## **SCHEDULING 1**

<b>A Metric for Judicious Relaxation of Timing Constraints in Soft Real-Time Systems</b> .....	150
<i>Yue Yu, Shangping Ren, Xiaobo Sharon Hu</i>	
<b>Dynamic Reconfiguration in Reservation-Based Scheduling: An Optimization Approach</b> .....	160
<i>Augusto Born de Oliveira, Eduardo Camponogara, George Lima</i>	
<b>Bounding Worst-Case Response Times of Tasks under PIP</b> .....	170
<i>Harini Ramaprasad, Frank Mueller</i>	

## **APPLICATIONS**

<b>Lightweight Modeling of Complex State Dependencies in Stream Processing Systems</b> .....	180
<i>Anne Bouillard, Linh T.X. Phan, Samarjit Chakraborty</i>	
<b>Real-Time Video Surveillance over IEEE 802.11 Mesh Networks</b> .....	190
<i>Arvind Kandhalu, Anthony Rowe, Ragunathan Rajkumar, Chingchun Huang, Chao-Chun Yeh</i>	
<b>Effect of Battery Charge on Energy Consumption</b> .....	200
<i>Harri Heinimäki, Petri Niska, Jussi Ruutu</i>	

## **DISTRIBUTED SYSTEMS**

<b>Modeling and Analysis of Multi-hop Control Networks</b> .....	206
<i>Rajeev Alur, Alessandro D’Innocenzo, Karl H. Johansson, George J. Pappas, Gera Weiss</i>	
<b>Power-Aware CPU Utilization Control for Distributed Real-Time Systems</b> .....	216
<i>Xiaorui Wang, Xing Fu, Xue Liu, Zonghua Gu</i>	
<b>EMWF for Flexible Automation and Assistive Devices</b> .....	226
<i>T.S. Chou, S.Y. Chang, Y.F. Lu, Y.C. Wang, M.K. Ouyang, C.S. Shih, T.W. Kuo, J. S. Hu, J.W.S. Liu</i>	

## **SCHEDULING 2**

<b>A Conservative Approximation Method for the Verification of Preemptive Scheduling Using Timed Automata</b> .....	236
<i>Gabor Madl, Nikil Dutt, Sherif Abdelwahed</i>	
<b>Energy-Conscious Co-scheduling of Tasks and Packets in Wireless Real-Time Environments</b> .....	246
<i>Jun Yi, Christian Poellabauer, Xiaobo Sharon Hu, Jeff Simmer, Liqiang Zhang</i>	

<b>Optimizing Extensibility in Hard Real-Time Distributed Systems</b> .....	256
<i>Qi Zhu, Yang Yang, Eelco Scholte, Marco Di Natale, Alberto Sangiovanni-Vincentelli</i>	

## **EXECUTION TIME 2**

<b>Guaranteed Loop Bound Identification from Program Traces for WCET</b> .....	266
<i>Mark Bartlett, Iain Bate, Dimitar Kazakov</i>	
<b>Partial Program Admission</b> .....	274
<i>Michael Wilson, Ron Cytron, Jonathan Turner</i>	
<b>On Time-Aware Instrumentation of Programs</b> .....	284
<i>Sebastian Fischmeister, Patrick Lam</i>	

## **SENSOR NETWORKS**

<b>Efficient Aggregate Computations in Large-Scale Dense WSN</b> .....	294
<i>Nuno Pereira, Ricardo Gomes, Björn Andersson, Eduardo Tovar</i>	
<b>Wi-HTest: Compliance Test Suite for Diagnosing Devices in Real-Time WirelessHART Network</b> .....	304
<i>Song Han, Jianping Song, Xiuming Zhu, Aloysius K. Mok, Deji Chen, Mark Nixon, Wally Pratt, Veena Gondhalekar</i>	

## **Author Index**