Studies in Computational Intelligence

Volume 507

Series Editor

J. Kacprzyk, Warsaw, Poland

For further volumes:
http://www.springer.com/series/7092

Anis Koubâa · Abdelmajid Khelil
Editors

Cooperative Robots and Sensor Networks

Springer

Editors
Anis Koubâa
Prince Sultan University
Riyadh
Saudi Arabia

Abdelmajid Khelil
DEEDS Group, CS Department
TU Darmstadt
Darmstadt
Germany

ISSN 1860-949X ISSN 1860-9503 (electronic)
ISBN 978-3-642-39300-6 ISBN 978-3-642-39301-3 (eBook)
DOI 10.1007/978-3-642-39301-3
Springer Heidelberg New York Dordrecht London

Library of Congress Control Number: 2013951137

© Springer-Verlag Berlin Heidelberg 2014
This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed. Exempted from this legal reservation are brief excerpts in connection with reviews or scholarly analysis or material supplied specifically for the purpose of being entered and executed on a computer system, for exclusive use by the purchaser of the work. Duplication of this publication or parts thereof is permitted only under the provisions of the Copyright Law of the Publisher's location, in its current version, and permission for use must always be obtained from Springer. Permissions for use may be obtained through RightsLink at the Copyright Clearance Center. Violations are liable to prosecution under the respective Copyright Law.
The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.
While the advice and information in this book are believed to be true and accurate at the date of publication, neither the authors nor the editors nor the publisher can accept any legal responsibility for any errors or omissions that may be made. The publisher makes no warranty, express or implied, with respect to the material contained herein.

Printed on acid-free paper

Springer is part of Springer Science+Business Media (www.springer.com)

Preface

Mobile robots and Wireless Sensor Networks (WSNs) have enabled great potentials and a large space for ubiquitous and pervasive applications. Robotics and WSNs have mostly been considered as separate research fields and little work has investigated the marriage between these two technologies. However, these two technologies share several features, enable common cyber-physical applications, and provide complementary support to each other. The primary objective of the book is to provide a reference for cutting-edge studies and research trends pertaining to robotics and sensor networks, and in particular for the coupling between them.

The book consists of five chapters. Chapter 1 presents a cooperation strategy for teams of multiple autonomous vehicles to solve the rendezvous problem. Chapter 2 is motivated by the need to improve existing solutions that deal with connectivity prediction, and proposed a genetic machine learning approach for link-quality prediction. Chapter 3 presents an architecture for indoor navigation using an Android smartphone for guiding a variety of users, from sighted to the visually impaired, to their intended destination. In Chapter 4, the authors deal with accurate prediction modeling of ocean currents for underwater glider navigation. In Chapter 5, the authors discuss the challenges and limitations of RSS-based localization mechanisms and propose, EasyLoc, an autonomous and practical RSS-based localization technique that satisfies ease of development and implementation.

Contents

1 Genetic Machine Learning Approach for Link Quality Prediction in Mobile Wireless Sensor Networks 1
Gustavo Medeiros de Araújo, A. R. Pinto, Jörg Kaiser and Leandro Buss Becker

2 Generation of Trajectories Using Predictive Control for Tracking Consensus with Sensing and Connectivity Constraint 19
Bernardo Ordoñez, Ubirajara F. Moreno, Jés Cerqueira and Luis Almeida

3 Localization, Route Planning, and Smartphone Interface for Indoor Navigation 39
Balajee Kannan, Nisarg Kothari, Chet Gnegy, Hend Gedaway, M. Freddie Dias and M. Bernardine Dias

4 Real-Time Modeling of Ocean Currents for Navigating Underwater Glider Sensing Networks 61
Dongsik Chang, Xiaolin Liang, Wencen Wu, Catherine R. Edwards and Fumin Zhang

5 EasyLoc: Plug-and-Play RSS-Based Localization in Wireless Sensor Networks 77
Maissa Ben Jamâa, Anis Koubâa, Nouha Baccour, Yasir Kayani, Khaled Al-Shalfan and Mohamed Jmaiel

Reviewers

Anis Koubâa, Al-Imam Mohamed bin Saud University (Riyadh)/CISTER Research Unit (Porto), aska@isep.ipp.pt, http://www.dei.isep.ipp.pt/∼akoubaa

Abdelmajid Khelil, TU Darmstadt, abdelmajid.khelil@huawei.com, http://www.deeds.informatik.tu-darmstadt.de/khelil/index.html

Raul Aquino, University of Colima, aquinor@ucol.mx, http://raquino.siteldi solutions.com/

Luis Almeida, Fac. de Eng. da Universidade do Porto, lda@fe.up.pt

Adel Ben Mnaouer, University of Trinidad and Tobago, adel_mnaouer@yahoo.com, http://www.cud.ac.ae

Andrea Zanella, Dep. of Information Engineering (DEI), University of Padova, zanella@dei.unipd.it, http://dgt.dei.unipd.it/people/read/Andrea+Zanella/

Habib Youssef, Institut Superieur d'Informatique et des Technologies de Communication de Hammam Sousse, habib.youssef@fsm.rnu.tn, http://www. infcom.rnu.tn/

Jiong Jin, The University of Melbourne, jiong.jin@gmail.com

Gian Pietro Picco, University of Trento, gianpietro.picco@unitn.it

Daniel Mosse, Univ of Pittsburgh, mosse@cs.pitt.edu

Andreas Willig, University of Canterbury, awillig@ieee.org

Joerg Haehner, Leibniz Universitaet Hannover, joerg.haehner@informatik. uni-augsburg.de, http://www.informatik.uni-augsburg.de/lehrstuehle/oc/

Marco Zuniga, University of Duisburg-Essen, mzunigaz@gmail.com

Fumin Zhang, fumin@gatech.edu, http://users.ece.gateh.edu/∼fumin

Silvia Santini, Darmstadt Univ, santinis@wsn.tu-darmstadt.de, http://people.inf. ethz.ch/santinis/

Rongxing Lu, University of Waterloo, rxlu@bbcr.uwaterloo.ca, http://www.ntu.edu.sg/home/rxlu/

Ye-Qiong Song, LORIA-Nancy University-INPL, Ye-Qiong.Song@loria.fr, http://www.loria.fr/∼song/

M. Bernardine Dias, Carnegie Mellon University, mbdias@ri.cmu.edu

Mário Alves, CISTER Research Unit, Politécnico do Porto, mjf@isep.ipp.pt, http://www.cister.isep.ipp.pt

Carlos Sagues, Universidad de Zaragoza, csagues@unizar.es, http://webdiis.unizar.es/∼csagues/

Geoffrey Hollinger, Carnegie Mellon University, geoff.hollinger@gmail.com

Xianghui Cao, edwincxh@gmail.com

Tian Huang, th@eng.warwick.ac.uk, http://http//www.tju.edu.cn

Xu Li, University of Waterloo, easylix@gmail.com, https://ece.uwaterloo.ca/∼x279li/

Michel Devy, LAAS-CNRS, Michel.Devy@laas.fr, http://homepages.laas.fr/michel

Mohamed Elarbi-Boudihir, IMAM, elarbi-boudihir@lycos.com

Yuuichi Teranishi, Osaka University, teranisi@ist.osaka-u.ac.jp

Naoki Wakamiya, Osaka University, wakamiya@ist.osaka-u.ac.jp, http://www.anarg.jp/∼wakamiya/

Fakir Dawood, fakir.dawood@yuc.edu.sa

Takashi Tsubouchi, tsubo@esys.tsukuba.ac.jp

Ramiro Martinez, University of Seville, jdedios@cartuja.us.es

Maissa Ben Jemaa, University of Sfax, Tunisia, maissa.benjamaa@rtrackp.com