

Lecture Notes in Artificial Intelligence 4008

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Juan Carlos Augusto Chris D. Nugent (Eds.)

Designing Smart Homes

The Role of Artificial Intelligence

Series Editors

Jaime G. Carbonell, Carnegie Mellon University, Pittsburgh, PA, USA
Jörg Siekmann, University of Saarland, Saarbrücken, Germany

Volume Editors

Juan Carlos Augusto
Chris D. Nugent
University of Ulster at Jordanstown
School of Computing, Jordanstown, UK
E-mail: {jc.augusto, cd.nugent}@ulster.ac.uk

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Preface

The area of smart homes is fast developing as an emergent area attracting the synergy of several areas of science. Here we offer a collection of contributions addressing how artificial intelligence (AI), one of the core areas of computer science, can bring the growing area of smart homes to a higher level of functionality where homes can truly realize the long-standing dream of proactively helping their inhabitants in an intelligent way.

Here we focus on a particular exemplar application scenario (provision of healthcare and safety-related services to increase the quality of life) and we explore the application of specific areas of AI to this scenario. What will be presented is not an exclusive suite of solutions: other AI techniques can also be applied and other problems can be solved with similar approaches. We hope this volume is the spark that ignites further explorations into these possibilities.

The book starts with an introductory section, *Smart Homes Can Be Smarter*, where we describe a smart home scenario and provide some basic terminology which will be used in other sections.

The next contribution, *Spatiotemporal Reasoning for Smart Homes* by Gotfried, Guesgen, and Hübner, provides a survey of some relevant developments in the area of spatial and temporal reasoning and discusses their role for reasoning about the spaces and the times where activities develop within a house.

Temporal Constraints with Multiple Granularities in Smart Homes, by Combi and Rossato, describes how the problem of temporal granularities can affect the system in practical terms. The balance between reading and storing information from sensors as often as possible to keep good coverage of the main events occurring has to be weighted against the problems that storing and searching vast amounts of information pose for an efficient implementation of the system.

In *Causal Reasoning for Alert Generation in Smart Homes*, Galton considers a topic at the core of a reasoning system, namely, how to represent and use the causal laws governing the behavior of the system. This contribution illustrates how such a framework can be successfully used to implement an important module of the system where alerts are generated as a response to the recognition of meaningful events by the system.

Plans and Planning in Smart Homes by Simpson, Schreckenghost, LoPresti and Kirsch, focuses on the roles of plans and planning in the context of smart homes including their use in monitoring of activities to identify emergencies and on the provision of guidance to people with cognitive impairment.

Temporal Data Mining for Smart Homes by Galushka, Patterson and Rooney introduces temporal data mining and illustrates how the essential components of clustering, classification, and rule discovery and prediction can be used to develop a sophisticated smart home environment.

The next chapter, *Cases, Context, and Comfort: Opportunities for Case-Based Reasoning in Smart Homes* by Leake, Maguitman and Reichherzer, comments on three main areas where CBR can provide benefits for smart homes: supporting personalization, supporting interactive adjustment of the system by the user, and facilitating customization and knowledge acquisition by the developer.

Stankovski and Trnkoczy explain in *Applications of Decision Trees to Smart Homes* that decision trees can be used to evaluate how usual or unusual an activity or event in the smart home can be and in this way help the system to detect contexts where the inhabitant of the house may need assistance.

Artificial Neural Networks in Smart Home by Begg and Hassan explains how ANN can assist in the design of a smart home specially tailored to provide assistance during: entertainment, safety and security, caregiving and health monitoring.

Finally, *A Multi-Agent Approach to Controlling a Smart Environment* by Cook, Youngblood and Das discusses the application of multi-agent systems to control a smart environment and describes its implementation in the MavHome project.

This volume offers important contributions for the development of smart homes. It is expected that as the area reaches maturity a more scientific approach to the design of these systems will replace the less systematic approach currently employed. It is expected that the area will benefit from well-established domains of research like AI and we hope this volume offers a good range of examples of how AI can help those interested in the development of truly smart homes.

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Vlado Stankovski (University of Ljubljana - Slovenia)
John O'Sullivan (University College Cork - Ireland)
Elena Tamburini (Medea - Italy)
Alexey Tsymbal (Trinity College Dublin - Ireland)

Alphabetic List of Contributors

Juan Carlos Augusto, School of Computing and Mathematics, University of Ulster at Jordanstown, UK (jc.augusto@ulster.ac.uk).

Rezaul Begg, Centre for Ageing, Rehabilitation, Exercise and Sport, Victoria University, Australia (Rezaul.Begg@vu.edu.au).

Carlo Combi, Department of Computer Science, University of Verona, Italy (combi@sci.univr.it).

Diane Cook, Computer Science and Engineering Department, University of Texas at Arlington, USA (cook@cse.uta.edu).

Sajal Das, Computer Science and Engineering Department, University of Texas at Arlington, USA (das@cse.uta.edu).

Antony Galton, School of Engineering, Computer Science and Mathematics, University of Exeter, UK (A.P.Galton@exeter.ac.uk).

Mykola Galushka, NIKEL, UK (mg.galushka@ulster.ac.uk).

Björn Gottfried, Intelligent Systems and Image Processing Department (TZI), Universitaet Bremen, Germany (bg@tzi.de).

Hans W. Guesgen, Computer Science Department, University of Auckland, New Zealand (hans@cs.auckland.ac.nz).

Rafiul Hassan, Department of Computer Science and Software Engineering, The University of Melbourne, Australia (mrhassan@cs.mu.oz.au).

Sebastian Hübner, Intelligent Systems Department (TZI), Universitaet Bremen, Germany (huebner@tzi.de).

Ned Kirsch, Department of Physical Medicine and Rehabilitation, University of Michigan, USA (nlkirsch@med.umich.edu).

David Leake, Computer Science Department, Indiana University, USA (leake@cs.indiana.edu).

Ed LoPresti, AT Sciences, USA (edlopresti@earthlink.net).

Ana Maguitman, School of Informatics, Indiana University, USA
(anmaguit@cs.indiana.edu).

Christopher D. Nugent, School of Computing and Mathematics, University of Ulster at Jordanstown, UK (cd.nugent@ulster.ac.uk).

David Patterson, NIKEL, UK (wd.patterson@ulster.ac.uk).

Thomas Reichherzer, Computer Science Department, Indiana University, USA
(treichhe@cs.indiana.edu).

Niall Rooney, NIKEL, UK (nf.rooney@ulster.ac.uk).

Rosalba Rossato, Department of Computer Science, University of Verona, Italy (rossato@sci.univr.it).

Richard Simpson, School of Health and Rehabilitation Sciences, University of Pittsburgh, USA (ris20@pitt.edu).

Debra Schreckenghost, Metrica Inc., USA (ghost@ieee.org).

Vlado Stankovski, Department of Construction Informatics, University of Ljubljana, Slovenia (Vlado.Stankovski@fgg.uni-lj.si).

Jernej Trnkoczy, Department of Construction Informatics, University of Ljubljana, Slovenia (Jernej.Trnkoczy@fgg.uni-lj.si).

Michael Youngblood, Computer Science and Engineering Department, University of Texas at Arlington, USA (youngbld@cse.uta.edu).

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