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Patrick Laube

Computational Movement Analysis

 Springer

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For Esther and André Laube

Preface

This volume was initially written to fulfill the formal requirements for achieving *venia legendi* (Habilitation) from the Faculty of Science at the University of Zurich, Switzerland. Therefore, the text reports on my research from the years 2006 to 2014. It does so by offering a synthesis from a set of publications I have contributed to on the topic of movement analysis in the wider area of Geographic Information Science. These publications include articles published in peer-reviewed journals and peer-reviewed conference proceedings, as well as conference contributions, book chapters, editorials, and review articles.

The book proposes the theoretical underpinnings of the emerging interdisciplinary research field termed here *Computational Movement Analysis* (CMA). The book features three core chapters, each set out around a number of overarching research questions covering a certain aspect of CMA. The contribution of each chapter is twofold.

First, each of these chapters offers a comprehensive synthesis of work that I was involved in. Emphasizing that the chapters first and foremost summarize my own work, the respective publications are marked with a bold label (**P2**. Laube and Dennis 2006) added to their citation (see Fig. 1.1 for the respective codes). Even though the arguments in the synthesis sections are supported mainly from publications I contributed to, some complementary references helped to complete the picture in these synthesis sections.

Secondly, in order to offer the reader a wider perspective than could be possibly offered through a summary of my own work alone, every chapter concludes with a comprehensive review of the selected related work in the area. These “Related Work” sections systematically revisit the lines of argument in the before made synthesis and discuss further work or alternative approaches in the respective areas.

Furthermore, I happily acknowledge that my personal contribution to the set of publications building the core of this book varies. In many projects I acted as the principal investigator, in others, however, I contributed less. Hence, clearly, the minds of many colleagues helped in shaping the ideas summarized in this SpringerBriefs volume. However, the presented book here offers my synthesis of the developing field of Computational Movement Analysis.

Finally, the choice of the term “Computational Movement Analysis” was inspired by my attending of the Dagstuhl Seminar 10121 on Computational Transportation Science at Schloss Dagstuhl, 21–26 March 2010, and additional fruitful discussions with Joachim Gudmundsson and Thomas Wolle when writing a section for the 2012 Springer Handbook of Geographic Information (P17. Gudmundsson et al. 2012).

Zurich, June 2014

Patrick Laube

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Acronyms

CMA	Computational Movement Analysis
DDIG	Deferred Decentralized Information Grazing
DeSC	Decentralized Spatial Computing
EOC	Error of commission
EOO	Error of omission
FLAGS	Flocking Amongst Geosensors
GIS	Geographic Information System
GISc	Geographic Information Science
GPS	Global Positioning Service
GSM	Global System for Mobile Communications
GSN	Geosensor Network
ICT	Information and Communications Technology
KDD	Knowledge Discovery in Databases
LBS	Location-Based Service
MOD	Moving Object Databases
MPO	Moving Point Object
NWED	Normalized Weighted Edit Distance
POI	Point of Interest
QTC	Qualitative Trajectory Calculus
RFID	Radio-frequency identification
VANET	Vehicular ad hoc network
WSN	Wireless Sensor Network