Tiansi Dong

Recognizing Variable Environments

Studies in Computational Intelligence, Volume 388

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To my parents, Peiling, and Sophia

Foreword

Tiansi Dong sent me an e-mail asking whether he can read for some days a book which I borrowed from the library. This way I came in contact with a young scholar sitting not more than 150 m away in another building on the same campus. I went to his office to bring him the book, and interested in his research work, in particular, his motivation to read the book. Our chatting soon went beyond the book. He told me about his background, how he came to Germany and what brought him to Fernuniversität in Hagen. Especially interesting was what he experienced as doctoral student in Bremen, where his research was integrated in the framework of the so-called "Cluster of Excellence for Spatial Cognition".

Dong's doctoral work challenged several basic assumptions of qualitative spatial representation, established an axiom governing the connection relation which is missing in the well-known Region Connection Calculus and neglected in the formalism of Whitehead's *Process and Reality*. Dong's work does not only lead to the fact that all qualitative orientation frameworks can be unified, but also that qualitative and quantitative orientation relations form a continuum. Having made these remarkable contributions he spent a couple of years in understanding why his supervisor discouraged him to submit his results to journals for publication and, even more, that a "Cluster of Excellence" shall not just praise itself as excellent, rather shall justify its existence by making contributions to the tax-payer.

After his doctorate, with great efforts Dong managed to publish some of his results in scientific journals and at conferences. Also, he received some recognition by being invited to serve on the panel of Zentralblatt MATH, maintained by the European Mathematical Society, Leibniz Institute for Information Infrastructure Karlsruhe, Heidelberg Academy of Sciences and Humanities, and Springer-Verlag. Nevertheless, due to many obstacles Dong did not succeed in publishing his results in their entirety. Therefore, I persuaded him to choose a way where he would not encounter censorship in form of reviewing, viz. as a book, which, I convinced him, is the genuine form of publication – books are read even after centuries, whereas journal contributions are considered obsolete within just a few years.

The resulting book you hold in your hands starts with an interesting story to motivate its arguments in a natural way, analyzing the problem considered and laying ground in psychology and philosophy for the results developed later. Readers can enjoy Dong's interesting ideas and solid arguments from Chapter 1 through 4 without any knowledge of mathematics. To understand Chapter 5, readers are assumed to know a little bit about first-order logic. Chapter 6 should be interesting to programmers and engineers who like to implement algorithms.

Hagen, May 2011 Wolfgang A. Halang

Preface

This book is based on my research that has spanned over a couple of last years, resulted in my PhD dissertation and papers after that. To put it briefly, the topic of my research, including that of my PhD dissertation, is how dynamic environments could be recognized by artificial systems. The focus was placed on identifying a simple method to represent spatial knowledge, which anchors as much as possible to cognitive psychology, linguistics, philosophy and neurology. One of the results obtained is an axiom system which represents spatial knowledge. If this system is correct, the Region Connection Calculus (RCC), currently prevailing in science for the purpose of spatial knowledge representation, will turn out to be incomplete and flawed, and all orientation frameworks could be considered as trivial cases of the system presented here. This is indeed the case.

This book should not only be interesting for researchers in the field of spatial knowledge representation and reasoning, but also for scientists working in areas related to computational intelligence, for which spatial intelligence plays a fundamental role. Since the book demonstrates a way to integrate research results from different fields into a unified system, it should also be interesting for those carrying out interdisciplinary research. Particularly, I dedicate this book to talented doctoral students to make them aware of the possibility that ground-breaking research results they may come up with are not welcomed, and that they may even encounter difficulties in their lives. Allan Baddeley mentioned this in his lecture during the Summer School in Cognitive Science'03 in Sofia, Bulgaria, which I tested in my PhD research and proven to be correct.

I am indebted to the Chinese Christian communities in Germany for their understanding and support during my difficult times – if there is an original contribution in this book, it will be to *give glory to our Father in heaven*. I am definitely indebted to Wolfgang Halang, Janusz Kacprzyk and Thomas Ditzinger who helped me publishing this book in high quality in a renowned book series for an easy accessibility to the scientific community.

Hagen, May 2011 Tiansi Dong

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