

Preface

This work is a synopsis of research work done by me and my fellow co-investigators in the fields of computer arithmetic and computer architecture spanning a period of over 20 years.

During the 1990s, discussion among the computer architects used to be focused on weighing the merits and demerits of control-flow and data-flow models of computation for parallel processing. As a doctoral student of computer engineering at the Florida Institute of Technology (USA) at that time, I became interested in devising a better model of computation which would amalgamate the best features of data-flow model with the content-addressability features of the associative memories. These efforts resulted in formulating the concept of *associative dataflow* and, consequently, the design and implementation of an *associative dataflow processor* by me in 1996.

In 1999, while at the University of Tasmania (Australia), Neville Holmes, a colleague of mine in the School of Computing, showed me a paper written by Donald Knuth, a pioneer in the field of computing, published in the *Communications of the ACM* advocating a binary number system with a base other than 2. This kindled my interest in computer arithmetic and I started doing further research in this avenue of computing. During this investigation, I found out about Walter Penny's proposal for a $(-1 + j)$ base number system which appeared more promising to me and Neville than Donald Knuth's idea. We called $(-1 + j)$ base number system as the *Complex Binary Number System (CBNS)* and what followed in the next 12 years of my work on CBNS is now in your hands.

During the past several years, I have worked as principal investigator on several research grants provided by Sultan Qaboos University (Oman) in an effort to establish CBNS as a viable number system. This has resulted in the publication of several conference and journal papers authored by me and my co-investigators and, in this book, I have tried to compile a succinct summary of all these publications for the benefit of anyone interested in continuing research in this area of computer arithmetic. An innovative patent on *complex binary associative dataflow processor* has been granted to me by the Australian Patent Office in 2010 which incorporates CBNS within the associative dataflow processor designed by me earlier.

It is sincerely hoped that this book will give new impetus to research in computer arithmetic and parallel processing and will enable the researchers of tomorrow to improve and implement CBNS within the realm of computing.

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