Chapter 36

Vedic Sutras: A New Paradigm for Optimizing Arithmetic Operations

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ABSTRACT

Any arithmetic operation roots down to the four elementary processes, namely addition, subtraction, multiplication and division. Of these four, multiplication and division happen to be highly resource intensive in terms of memory requirement and execution time. It has been evolved that available ancient Vedic sutras for solving complex arithmetic operations when reorganized as computer algorithms provide a paradigm shift in both memory requirement and speed. Our proposed Vedic sutra based algorithms handle decimal number system instead of conventional binary numbers which eliminates BCD to binary conversion and vice versa, further accelerating the desired process. This chapter focuses primarily on a few Vedic Sutras and their effectiveness in optimizing BCD multiplication and BCD division and also provides substantial statistical data in support.

INTRODUCTION

Man-made computers are limited in their performance by finite processing speed and memory -Paul Davies, Writer, British, 1946.

Although computer memory is no longer expensive, there’s always a finite size buffer somewhere. When a big piece of news arrives, everybody sends a message to everybody else, and the buffer fills -Benoit Mandelbrot, Mathematician, French, 1924-2010.

Performance speed and memory requirement have always been the bottleneck of computer processors. Processors primarily compute logically, although based on underlying mathematical algorithms. Math-
Vedic Sutras

Vedic Mathematics, as we all know, comprise of addition, subtraction, multiplication and division as its primitive operations. Almost all of the complex problems root down to these elementary processes. Of the four, multiplication and division happen to be the most resource consuming operations. Vedic mathematics provides easy and optimized solutions to these operations (Tirathji Maharaj, 1986). Computers process binary numbers, whereas real world communicate via decimal numbers. Therefore the need for binary to BCD conversions and vice versa becomes imperative while processing any mathematical algorithm. Vedic Mathematics provides algorithms which equate decimal numbers; hence, when converted to computer algorithms can operate directly on BCD numbers.

BACKGROUND

Vedic Mathematics, or the ancient form of mathematics, was rediscovered from the Indian Sanskrit texts in the early 20th century (between 1911 and 1918) by Jagadguru Swami Sri Bharti Krshna Tirthaji Maharaj (1884 – 1960) (Tirathji Maharaj, 1986). Swami Sri Bharti Krsna Tirthaji Maharaj wrote 16 volumes describing the 16 sutras but they were reportedly lost. Before his demise, Sri Bharti Krsna Tirthaji Maharaj wrote a simple book covering all the 16 sutras and 13 corollaries which specific examples. Dr. V S Narasimhan further translated the book into tamil in two volumes. Dr. V S Narasimhan is a Retired Professor of an arts college and C. Mailvanan, M.Sc Mathematics (Vidya Barathi state-level Vedic Mathematics expert). The first edition and the correctd second edition appeared in 1998 and 2003 respectively. Vedic Mathematics is normally referred to the ancient Indian mathematics system which comprises of simple tricks and calculations to solve complex and tedious mathematical problems (Srivathsa, 2002; William, 2013; Glover, 1995). It is popularly said that these simple tricks and knowledge were drained down the generations by word of mouth, that is, void of any pen or paper. It itself signifies the simplicity and merit of the procedures incorporated in Vedic Mathematics. There have been numerous views regarding the Vedic nature of Vedic Mathematics (Dani, 2001; Kandasamy & Smarandache, 2006), but most agree on the fact that the tricks do enhance the speed of operations mentioned in Vedic mathematics. What we are interested is in the speed up of arithmetic operations using the relevant Vedic Sutras and not in whether Vedic mathematics is Vedic or not. Throughout the progress of the chapter, we witness that multiplication and division procedures definitely perform faster using the Vedic Sutras.

MAIN FOCUS OF THE CHAPTER

Objective of the Chapter

This chapter throws light on multiplication and division algorithms based on Vedic Mathematics. Vedic Mathematics comprises of 16 sutras and 13 corollaries as listed in Table 1. A few of these sutras relate to special multiplication and division procedures. The proposed algorithms combine two or more of these sutras to evolve a generic algorithm which equate on the whole domain of numbers. These algorithms process BCD numbers and have exhibited remarkable results in comparison to existing computer algorithms processing binary numbers. The processing time absorbed in binary to BCD conversions and vice versa is also gained in case of these proposed algorithms as they compute on BCD numbers directly. These algorithms use arrays of 4 – bit or 8 – bit registers, thereby, capable of computing very