Chapter 17
Supercomputers: A Philosophy of Their Language

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ABSTRACT

Binary logic is the language of supercomputers. Programming applications do work more rapidly, efficiently, and accurately than humans, with supercomputers doing thermodynamic modeling, simulation of societies, and other large number-crunching projects. More recently, the supercomputer is taking on human brain functions, with increasing attention to actually replicating the human brain. Elsewhere in this book, the author has written about the philosophy underpinning these developments, but he now focuses on how computers communicate with us. The binary language computers use has an underpinning philosophy that may help explain at least one aspect of consciousness. When we probe deeply into the philosophy of bivalent systems, radical issues emerge that embrace the nature of our very being, such as completeness, certainty, process, the very nature of our universe, and possibly a consciousness pervading it.

INTRODUCTION

This chapter of Research and Applications in Global Supercomputing is an expedition into the world of supercomputer language: binary logic. Understanding a person is partially understanding the language they use (Whorf, 1959). Binary logic on the surface is merely a set consisting of a zero and one with which to designate whether a switch is on or off, the switch positions ultimately being mapped to an ordinary language alphabet and number system, accompanied by a symbol set. When viewed and used in this way, they convey no unusual meaning. Yet, within the structure of a bivalent, or two-valued, system is the capacity to represent what may be considered innate structures in the universe, and perhaps consciousness, itself. If the supercomputer does acquire the ability to think, it perforce will acquire the meanings carries by the bivalent logic. This is partly what this chapter will convey: what meanings are inherent in the structure, itself. A question is whether representation, as with the mapping just mentioned, assumes the essence of what it represents, not unlike a political representative in an ideal republic reflecting the will of those s/he represents.

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The supercomputer ultimately becomes replicative of the human brain, and if the bivalent system is a representative of innate structures in the universe and with it consciousness, then such may be carried over into the domain of “computer consciousness.” In examining bivalency we may arrive at some constituents of consciousness.

**MAIN FOCUS OF THIS CHAPTER**

This chapter explores the idea that binary logic as both a structure and the processes within it is innate in the universe. That is, what we set forth on paper as binary logic describes the essence of the universe. At its most fundamental level, it is a two-valued system, and binary logic displays all that happens with these values. The substance of the system may at first not appear to be elegant, but there appears to be an irreducible empirical truth in what constitutes order and how it translates into mind, as well be discussed below.

The most immediate technical aspect of interfacing with a supercomputer is the language by which a supercomputer communicates: binary logic. The supercomputer has a potential of being a sentient entity, and I discuss why in “The Philosophy of Supercomputers”, appearing elsewhere in this Encyclopedia. The question is raised whether the structure of a language inherently carries with it a philosophy. Whorf (1956) argued:

> My own studies suggest, to me, that language, for all its kingly role, is in some senses a superficial embroidery upon deeper processes of consciousness, which are necessary before any communication, signaling, or symbolism, whatsoever can occur, and which also can, at a pinch, effect communication (though not true AGREEMENT) without language’s and without symbolism’s aid. ... The statement that ‘thinking is a matter of LANGUAGE’ is an incorrect generalization of the more nearly correct idea that ‘thinking is a matter of different tongues.’” ... The different tongues are the real phenomena and may generalize down not to any such universal as ‘language’ but to something better – called ‘sublinguistic’ or ‘superlinguistic’ – and not altogether unlike, even if much unlike, what we now call ‘mental’. (p 239)

A deep philosophy underpins bivalent logic. It is a logic which frames the very meaning of order, with every computer output possibly being infused not simply with a superficial ordering but with fundamental meaning. It is found that a recursion of logical operators exists, the essence of which is transferred to matrices of very large binary spaces. A three-dimensional hypercube (Horne, 2012) offers a way discovering the origin of patterns generated by cellular automatons, as described by Wuensche (2013) and Wolfram (2013), as well as patterns found in binary arrays, in general, and may contribute to the discussion about the massive parallelism found in supercomputer gating architectures.

**BACKGROUND**

Binary logic has been the language used for expressing content, and the mechanical way of conveying that language is routing by electrical pulses through a system of switches, first by vacuum tubes, then transistors, and now semiconducting devices. This logic, when associated with computers, refers to zeros and ones representing whether a switch is on or off, and the switches are related in specific ways by operators. These mechanics are the substance which computer programmers in machine language have immediate concern. Beyond this use, to the ordinary developer binary logic has no significance. Our interest extends far past this technical side of supercomputing. That is, I argue that there is “mechanical” logic and philosophical logic. The mechanical refers to symbol manipulation; the latter is understanding the reason(s) for the system, i.e., the “why” of its existence. As somewhat of an aside and example