Chemical Computing: The different way of computing
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ABSTRACT:--This paper is tells about the different and unconventional computing device. A chemical computer, also called reaction-diffusion computer, BZ computer theseare the computers in which processes information by transforming an input concentration profile to an output concentration profile in a deterministic and controlled manner. The computations are performed by naturally occurring chemical reactions. This paper also tells about MOE Molecular Operating Environment. This is the environment in which the chemical computing is occurred. The simplicity of this technology is one of the main reasons why it in the future could turn into a serious competitor to machines based on conventional hardware. A modern microprocessor is an incredibly complicated device that can be destroyed during production by no more than a single airborne microscopic particle. In a BZ solution the waves are moving in all thinkable directions in all dimensions, across, away and against each other.

Molecular Operating Environment

- MOE strongly supports drug design through molecular simulation, protein structure analysis,
- Data processing of small molecules, docking study of proteins and small molecules, and so on under the
- Unified operations. SVL, the Scientific Vector Language, is the portable high performance programming language built-in MOE. SVL is the vectrized command language, scripting language and applications programming language. One-tenth reductions in code size over C and FORTRAN are routinely realized. SVL source code to MOE applications is distributed with MOE to end-users; this allows MOE applications to be freely customized or modified.

Introduction

A chemical computer, also called reaction-diffusion computer, BZ computer or gooware computer is an unconventional computer based on a semi-solid chemical "soup" where data are represented by varying concentrations of chemicals. The computations are performed by naturally occurring chemical reactions. The simplicity of this technology is one of the main reasons why it in the future could turn into a serious competitor to machines based on conventional hardware. A modern microprocessor is an incredibly complicated device that can be destroyed during production by no more than a single airborne microscopic particle. In a BZ solution the waves are moving in all thinkable directions in all dimensions, across, away and against each other.

Basic Principal

The basic principal of chemical computing is motion of ions when the concentration of compound was changed. The wave properties
Fig 1: Hard Disk replaced by Chemicals

of the BZ reaction means it can move information in the same way as all other waves. This still leaves the need for computation, performed by conventional microchips using the binary code transmitting and changing ones and zeros through a complicated system of logic gates. To perform any conceivable computation it is sufficient to have NAND gates

Method

There are some methods of chemical computing on the basis of structure, type, concentrations of chemicals used in it. The wave properties of the BZ reaction means it can move information in the same way as all other waves. This still leaves the need for computation, performed by conventional microchips using the binary code transmitting and changing ones and zeros through a complicated system of logic gates. To perform any conceivable computation it is sufficient to have NAND gates. (A NAND gate has two bits input. Its output is 0 if both bits are 1, otherwise it’s 1). As we see in figure 2 the inputs are in the form of chemical concentration of calcium and magnesium. In the chemical computer version logic gates are implemented by concentration waves blocking or amplifying each other in different ways.

Possibilities and Limitations

This technology is having very large range of applications. At the heart of information, processing by reaction–diffusion systems is the concept of reaction–diffusion processor. A schematic diagram of this device, which is based on a chemical or a biochemical system, is shown in Fig. 5.1. Chemical reaction–diffusion media of the Belousov–Zhabotinsky type represent a convenient starting material for the creation of information processing devices. They are stable and not toxic.

Conclusion

The simplicity of this technology is one of the main reasons why it in the future could turn into a serious competitor to machines based on conventional hardware. A modern microprocessor is an incredibly complicated device that can be destroyed during production by no more than a single airborne microscopic particle.

In a conventional microprocessor the bits behave much like cars in city traffic; they can only use certain roads, they have to slow down and wait for each other in crossing traffic, and only one driving field at once can be used. In a BZ solution the waves are moving in all thinkable directions in all dimensions, across, away and against each other. These properties might make a chemical computer able to handle billions of times more data than a traditional computer.

References


