Contrast of Evolution between in Computer and in Cell

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Abstract: This paper discusses the difference between the evolutions in cell and that in computer, to find the difference in logic, and by learning from nature to improve the evolutionary computation method.
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1. CONVERGENCE OF COMPUTATION AND GENETIC EVOLUTION

As a general knowledge, the genetic evolution computation is simulated as a stochastic process described by a Transient

Probabilities Matrix

$$M: G_n = G_{n-1} M$$

The vector G is the probabilities of all possible populations. In this series G_n, if the computation converges then converges to the solution A at this equation

$$A = MA$$

Obviously, the convergent computation always converges to a stable distribution like A. Or, the divergent computation has distributions of two next generations that differ greatly and follow no regulation, just like a fluctuation that is similar to a wave function of electron. For example, man has to die as he old, which is a kind of convergence. In the discussed case here, some different, for example, a bowl in the world in carefully reservation have not to be broken, but in some case it's a probability 1/2 to be broken and a probabilities 1/2 to not be broken in the end, for example. This aspect is more like the wave function in quantum theory, a electron is not always in a place but be in many place with a density distribution. There do exist divergent stochastic process, like the process described by transient probability matrix with characters e^{ia} in which case the probability of the serial generations fluctuates with characters e^{ina}.

It is or never, the recursive substitution prefers to converge to a stable solution of probabilities distribution.

On the other way the evolution in cell does not subject to the values of convergence, it follows the value of surviving. By observing the species on the earth we can found not only the human that's self-defined as most advanced kind, but also many other kinds: virus, mushroom, ants, dogs, monkeys, etc. from the most simple of structure to the kind with most complicated functions. There seems no difference to the criteria about fitness degree, and the all live the same healthy in the surface of this planet. But if we probe into the history of life's evolution we can find they are evolutes from one to the others gradually in the geological history of the earth.

2. SURROUNDING CATASTROPHE SCULPTURES THE CELL

In stable surroundings cell will stop variation of its gene, as we already know, but the problem is that the convergent genetic feature are often disadvantageous. This is also the problem of computational evolution that computation converges prematurely to a local optimal. The solution to this problem is changing strategies of selections in some intervals after a signal of convergence emerges. This method can keep heritage of good gene sections and add new positive factors to the evolution.

In the early history of life the originally created life is simple and these simple lives governed the earth surrounding many billion years without prominent change of themselves. Only in some day some catastrophe happens to the surrounding of the earth with many a lot new lives more complicated in structures bloom suddenly. The other events of surrounding changing is also be observed by scientists, with new species were created.

The similar process is also observed for computational evolution, if we change the strategy of selection or evolutionary operators new sample in populations will emerge. For the cell the almighty of nature takes the place of man's intervenes, to invest many disasters to the earth so that all lives would benefit from those events. The history of life in the earth proves this kind of process helpful.

In the view point of philosophy, it's that surrounding makes life what it is.

3. THE SPEED OF NATURE'S COMPUTATION

Several years ago scientists of computer are fascinated by genetic computation---Life also computes and its computation is very much faster than mankind's electric computer. Scientists encoded the program into the chain of DNA, and the way to operate the program or the solving questions is to match the two linear DNA for some time and take the matched chain of DNAs to analysis of the A,G,T,C. The so-called computing in cell (or tube) is operated by atomic reaction in the speed of

10-16s per molecular, which speed the e-computer will never reach. Not only the reaction of two DNA, all the chemical reaction is activated with some meaning to the cells, in the other words they takes information or transfer some information. In fact the body of life is an incredibly elaborated machine in which all and bulky information is created, transferred and reacted to in high speed and high accurate degree. Contrasting this process in cell to the mechanical logics it has some aspect beyond: It's in high speed and accurate degree, and it's parallel operation in cell. The second aspect is can't be rivaled by computers.

So that in the near future human doesn't dream of to prevail and replace cells' mechanics in this aspect. This is the reason why we always unsatisfied with the results of the evolution by computation. The nature makes its selection very fast (a whole sex-mature time) because surrounding assists it by two hands and the physics processes all the information automatically, and how enormous the bulk of these informations are!

In this view point all the tricks and games on computer are childish or even worse.

4. THE COMPLICATION OF SURROUNDINGS AND FITNESS FUNCTION

Because the "computation" of cell is operated automatically, the complication of selection is not frustrates the evolution. But for computer a little long

expression will has the computation a life of cosmos, because it run in a unnatural way. And in fact the natural surroundings for life is so complicated that by now no one can formulate it precisely.

To simulate the evolution of life is an absurd dream, or we can evolutes only some molecular with weight less than 10^4u

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5. THE KNOWLEDGE THE NATURE TEACH US ON EVOLUTIONARY COMPUTATION

The nature Created life by different phases, similarly the computational evolution can't find the optimal in a strategy, a round of computation, or by a haste judge for convergence.

Currently many experts of GA prefer to design a complicated algorithm in one round of evolution to hope of emergence of optimal solutions. This hope is very naive and merely the ending population satisfied them. Like nature, evolution need the two phase of breathing: one to set the data or population to face server selection, the other phase to give them a rest and festivals to let them thriving. A server father without a mild mother would have children losers.

The ideal evolution is operated by several phases with distinct strategies. Each phase has a clear objective to rule out of the bad sample and to reside the good samples. The crossing manipulation is aimed to condense the good properties; The mutation is to explore the potential advantageous properties. In this order the condition of selection is not server and also not mild.

5. CONCLUSION

The method of evolution that manipulated on computer is different in the following aspects: speed, scale and objective or values. In this century human can't dream to overtake the evolution of the earth's life by computer. Though scientist has find some secrete of evolution of life but our technology is really tinny before the nature. The method of evolution that manipulated on computer is different in the following aspects: speed, scale and objective or values. In this century human can't dream to overtake the evolution of the earth's life by computer. Though scientist has find some secrete of evolution of life but our technology is really tinny before the nature.

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References
[1] K. A. De Jong, Evolutionary computation: a unified approach. MIT Press, Cambridge MA, 2006.
[2] J. R. Koza. Genetic Programming: On the Programming of Computers by means of Natural Evolution. MIT Press, Massachusetts, 1992.
[3] Koza, John R. (1992). Genetic Programming. MIT Press. ISBN 0262111705.
[4] S. Cagnoni, et al, Real-World Applications of Evolutionary Computing, Springer-Verlag Lecture Notes in Computer Science, Berlin, 2000.