لینک های مفید

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Genetic and Evolution Algorithms

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ABSTRACT

Have you ever reflected on some innovative and ideal subjects which you catch a glimpse of literally every day in your life journey? Sure, you do and not only you, merely a lot of people out there that still breathe. In this new generation and colossal world with many contests in it, our technologies are getting more and more up-to-dated and evolved to save members of the public time.

Keywords: Algorithms, Technologies, Structure, Programming Language, Genetic and Evolution, Medical care
INTRODUCTION

You may ask why JS (denoted to JavaScript) in a view of the fact that, JavaScript has been a foundational technology since 1997 in all browsers and it did not stop there, it has been developed and for practical usage for decades, either the platform: web or desktop apps. But now it even used in many parts of computer software such as: back-end, front-end, games and so on.

First and foremost, it is simultaneously easy to perceive and manipulate that has broad conspicuous thus it could be a faint hard, if wary study is not concentrated.

Aside talking about JavaScript, we need to leap to conclusion to have algorithm concepts that can be implemented in ‘JavaScript Environment’.

ENORMOUS OPTIMIZATIONS

applications of optimization are enormous. Because every process has a potential to be optimized and hence of that there are still some huge and even subtle defects out there that required to be fixed and by now it would be easier to detect them, resulting in a good application we want. Howbeit, in one context it may be a virtue but in another a bit vice. That is partly why we have to become more aware to refine our industrial problems and the good news is that we can formulate them in our optimization. In the following slides I will tell you more and we will go deeper but now let us stick to our current speech before everything get mired.

OPTIMIZATIONS IN SHORT PERIOD OF TIME

By the way, optimizations occur in short period of time and better to say it should be unless time is important. In optimizations: time, quality and adequate performance are crucial too. For instance, we have an application that has been used in a company but the problem is that the speed is too slow and provided we want to mutate anything it would cost amount of money that it is great difficult for the company to handle it.

Here engineers and specialists come to rescue, Scientists and Engineers have to be decisive to make decision as soon as possible. I would say shrewd, considering about it might be simple despite of the fact that we do not want to be impulsive and impetuous. Quality matters.

WHAT GENUINELY METAHEURISTIC IS

Now the time has become to resolve our enquiry. The word heuristic originated in the old Greek. Moreover, the word that has been appointed was actually heuriskein, which means the art of discovering new strategies or rules to solve problems.

Now how about meta? The suffix is a Greek word, that means “Upper level methodology.”

Based on “Wiley publication, El-Ghazali Talbi” about Metaheuristic.

Metaheuristic is known as methods and methodologies which can be defined to upper level and particular thoughts about something whether the application is executed or not. There is another partnership in metaheuristic.

It is “Nature” and has inspired from it. As it is said nature is well organized so why not utilize from our nature’s properties so we have guideline if we think a little, we can be innovative to discover a brand-new method that could help humanity in computer science.
COMMON CONCEPTS OF METAHEURISTIC
Computing optimal and desired solutions are unmanageable for many optimization problems. In general, people usually satisfied with ‘good’ solutions, which are derived by metaheuristic algorithms such as Ant colony, Lion, etc. then these types of algorithms are promising and successful that can give a proper result. Metaheuristic or heuristic give ‘acceptable’ solutions. Plus, provide them in a reasonable time so that is largely the point it has the sharp growth of fascination for solving complex and sheer insane problems in science and engineering.

Adequate optimization
Now here I am going to go deeper and tell you more about models and virtually accurate optimization. Recall making decision? In this fierce competitive and contest our head of the studios, companies must decide in a clever way and be astute to make everybody ecstatic and euphoric. Nonetheless, the part needs a little more process than you think, so they transparent it for us hence breaks it down to 3 parts.

THREE STEPS OF ADEQUATE OPTIMIZATIONS
How the web works Initially it commences with the order underneath:

1. Formulating the problem
2. Modeling the problem
3. Optimizing the problem

Formulate the problem
In this primary step, the problem has been identified. Then, beginning statement of the problem is made. It might be vague and imprecise to some factors.
Modeling the problem
In this secondary step and important, once the problem detected and formulated in first step it is time for modeling the problem which most of the time is an abstract mathematical model to reduce the problem to well-studied optimization models.

Optimizing the problem
Now the last one and tertiary step. When the problem modeled procedure generates a “good” solution. Even though, solution may be a proper or not-so-good one, still if it is indicative algorithm designer can reuse state-of-the-art algorithm on.

Figure. 1 Adequate Optimization.

INTENTION OF INNOVATION OF GENETIC ALGORITHM
Back in then when for the first time in the 19th century, J. Mendel stated the basic forms of heredity or genetics from parents to off springs. C. Darwin, had a theory of evolution and he introduced it in his popular book that called ‘On the Origin of Species’. Which it absolutely drew computer scientist’s attention to it. All these theories that were in their first stage of creation new species and evolution which actually, based on ‘Population’, persuaded and motivated a lot of scientists to design evolutionary algorithms.
And when the time had gone by, roughly during the past 40 years, evolutionary algorithms have evolved and since then the growth in this field had risen significantly. Which brought world appeal to it. Genetic Algorithm (GA), mainly developed in Michigan, USA, by J. H. Holland. I can go on and on about Genetic and Evolution algorithms but I do not want this preparation regarded as downright tedious, so I stop here.

**Figure. 2** A generation in evolutionary algorithms.

There is another thing about Genetic Algorithm (GA) and it is the idea simply it is blatant it came from population so it means that based on the whole process of DNA or even like germinate of plants which first we scatter the seeds or plant a bulb then it will grow roots, stems and gradually it becomes a tremendous tree. In fact, Genetic Algorithm is a class of Evolutionary Algorithm Genetic Programming is a more recent evolutionary approach.

**GENETIC ALGORITHM**

Related to the EA which extends the Genetic model of learning. On the whole, GP is a form of program induction that allows to automatically generate programs that solve a given task. Nonetheless, it has a principal problem and is a compulsive growth of trees. This extraordinary is called bloat.

You can check the book I had used as a main guideline and resource which I mentioned before; - Wiley publication, El-Ghazali Talbi” about Metaheuristic.

Here is some parts that distinguish how they struggled to seek the solution for it:

“Originally, J. Koza used Lisp expressions to encode programs. More generally, representations of solutions (programs) are S-expressions (or parse trees) were the leaves are terminals and the internal nodes are operators (functions). The definition of the leaves and the operators depend on the target application. They need a huge population (e.g., thousands of individuals) and then they are very computationally intensive. Theory of GP is less developed than in evolution strategies and genetic algorithms [493]. Contemporary GPs are widely used in machine learning and data mining tasks such as prediction and classification.”

“**Example 3.7 Symbolic regression problem.** The objective of the symbolic regression problem is to find a program that matches a given mathematical equation. It is a well-known problem in statistics. The terminals of the tree represent significant variables and constants for the problem while the internal nodes of the tree represent arithmetic operators $F = \{*,+,−,\}$. The objective function to minimize may be formulated as the sum of the square errors for each test data point.”

<table>
<thead>
<tr>
<th>Example 3.8 Artificial ant on the Santa Fe trail</th>
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<tbody>
<tr>
<td>This is another classical example in the GP community. An artificial ant is placed on a cell of a 32 · 32 toroidal</td>
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grid (Fig. 3.10). Food pellets are mapped on some cells of the grid. The objective of this problem is to find a path planning strategy to maximize the food intake of the ant. The objective function will be the number of food pellets lying in the path minus the amount of food the ant eats during the move. For the representation, leaves may represent move operators in several directions (turn left, turn right, move forward) and the internal nodes represent conditional if statements that are sensing functions.

Table. 1 Example 3.8 Artificial

Figure. 3 Tree-like representation in genetic algorithms.

DETECTING AN OBJECTS IN PICTURES
- As I read it, former is to train filters in order to detect fruits (Oranges and Apples) in natural scenes.
- They have trained RGB filters 8 * 8 and 9 greyscale which would be 9 * 8 * 8 = 576
- As you can see the data that been used is real pictures which have been taken in iLab and outside for better variety.
- As mentioned before objects here in these pictures are fruits that include oranges and apples (green and red).
- 14 pictures have been shot to have a broad understanding and detection process.

Figure. 4 Orange in a picture.
Here the wavelet transformation is added to train more meaningful filters.

The sustainable project that uses Genetic Algorithm

Filters are instigated with arbitrary values

Figure. 5 Wavelet transformation.

CONCLUSION

Metaheuristic is a spine-tangling topic which accommodated a lot of sections in carrier fields, that millions of people have been suffering from any kind of unnecessary chores.

GA and EA in medical and health systems commenced a whole and huge reformation in the entire system and eradicated conventional usages of machines that saved thousands of people in our society by reducing time consumption.

We have to be thankful and thoughtful that technologies can make the things sufficient and are conveyed, humans can learn and merchandise many tools which can help humanity.

This project is still in progress to get more accurate as it required to detect objects automatically with eye movement.

As they said their next step is to add more filters

For long term this training process would be really useful and practical for colossal satellite images.

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