Introduction to Artificial Intelligence
Assignment 2
Vasilev Vyacheslav
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This report contains all the information about my project, examples, it's advantages & disadvantages and other important things.

How it works

We have a population made up by chromosomes (triangular polygons) that always mutates or crossovers to become similar to the input image. At every generation, there is randomly choosing to mutate or crossover by random point or color of a randomly chosen polygon. After that, we look by the fitness function is it better than the previous generation. If yes, then this generation is the parents. If no, we image there was no new generation and go next. After every 100 successful evolution, it saves the result in the directory "res" and names it as "name.ext Generation i.0"

How long does it work

It gains 40% of maximum fitness by a few seconds, but then it is stagnating and gaining to 50% by 15-40 minutes. I didn't try to get more, because it becomes very slow. Generations are coming, but very rare they are better than previous.

How the fitness function works

It picks 2 pictures (current and input) and calculates the fitness of each pixel by taking the square root from (difference_in_blue^2 + dif_in_green^2 + dif_in_red^2). Then these fitnesses summing up. And to get the fitness in percents, the result is dividing by (512*512*255*3) and multiplying by 100%
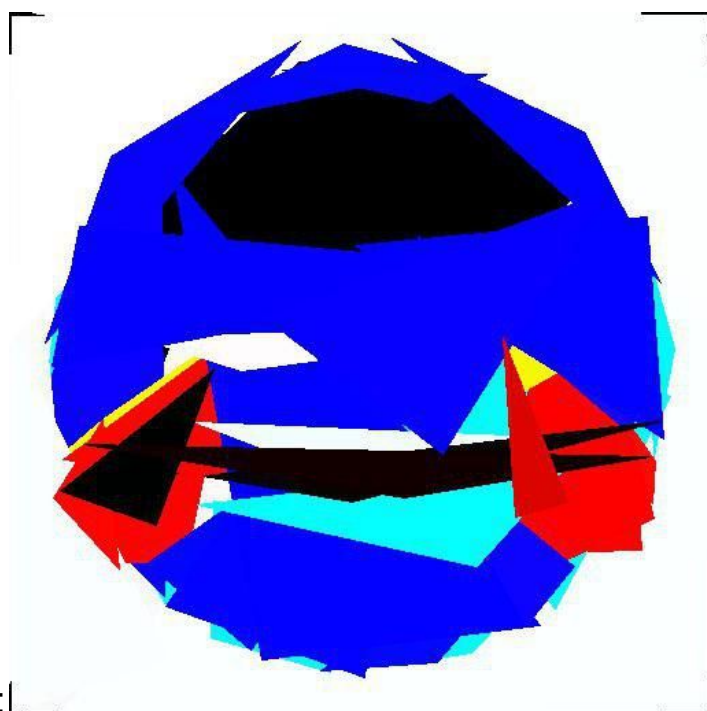
What's interesting

Colors. After a couple of minutes, we can see interesting colors in the picture. Examples generated by ≈ 30 minutes are below:

1st example:

Input:

Output:

2nd example:

Input:

Output:

3rd example:

Input:

Output:

4th example:

Input:

Output:

Why it is artistic?

Colors always are different. The result is similar to input but only similar. It is arts generated by my code basing on the input, but they are beautiful by themselves with their own colors and charm.

Advantages

1) Unusual colors. One of my friends named it "Invert style". (Also there is a funny moment that I'm a color blind). Now the first example's output is my profile's picture in the telegram. Firstly, it was a bug, but when I fixed that, I understood that this bug makes my project better. So I revert this fixing and now it is, actually, the feature. A kind of the charm of my project.

2) I'm using "Numba" library to execute fitness function by its compiler that transfers it into machine code. I didn't make it in the whole project because this library is very whimsical and it is difficult to use it. It supports only a part of python and NumPy functions

Disadvantages

1) There are improvements that may exist in the future to prevent so fast stagnation. When I added a crossover, it was improved by 10 percents

2) I planned to use n-angle polygons, but there were some bugs, so I confined by triangles

3) Somewhere there is better to use a different number of polygons in DNA, but it is coded as a global variable