



EVOLUTIONARY ALGORITHMS

HOMEWORK

Tenth task

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<http://www.github.com/csp98>

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1. Write the gradient method algorithm in your favorite programming language, and test it for the $f(x, y) = x^2 + y^2$ function and for your own test-function (the two dimensional version of it).

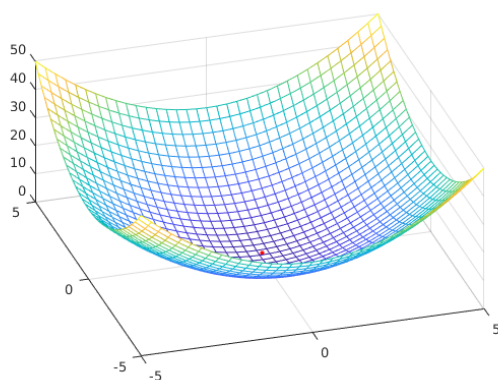
CHI5TC Rosenbrock function

I wrote the gradient method algorithm in *Matlab*. The code is the following:

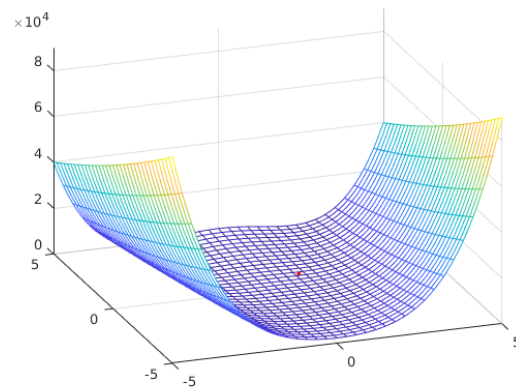
```
function r=gradient_method(f,initial,lr,iterations)
    % Gradient method
    syms x y;
    previous = initial;
    current = initial;
    grad = [ diff(f,x) diff(f,y) ];
    for i=1:iterations
        current = previous + lr * (-grad(previous(1),previous(2)));
        previous = current;
    end
    value = f(current(1),current(2));
    sprintf("Minimum at (%f,%f) = %f",current(1),current(2),value)
    % Plot the function and the point
    fmesh(f);
    hold on;
    plot3(current(1),current(2),value,'.b','markersize',10,'color','red');
```

The chosen parameters and the results are:

	Initial point	Learning rate	Iterations	Result
$f(x, y) = x^2 + y^2$	(6,6)	0.01	1000	$f(0, 0) = 0$
Rosenbrock function	(6,6)	0.0001	10000000	$f(1, 1) = 0$



(a) $f(x, y) = x^2 + y^2$



(b) Rosenbrock function

For the Rosenbrock function I had to desing an auxiliar function for the gradient, in order not to take very high symbolic variables that made the running time too big.

Bibliography

- [1] Course Webpage
<http://math.bme.hu/~safaro/evolalgen.html>
- [2] <https://tex.stackexchange.com/>