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% Optimization(minimization) of the Booth function with differential evaluation

function [] = main_func()
clc;
clear;
steps=300; %specify the no.of iterations
best_val=zeros(steps,3);
chromo=init_pop(10);
for itr=1:steps
    donor=mutate(chromo);
    trail=crossover(chromo,donor);
    chromo=select(chromo, trail);
    [best_val(itr,1),best_val(itr,2), best_val(itr,3)] =evaluate(chromo);
end
disp("best fit X1 X2 matrix:");
disp(best_val);
disp("best fit X1 and X2 of this run respectively,");
[best,x1,x2]=best_at_run(best_val);
disp(best);
disp(x1);
disp(x2);
display(best_val(:,1));

function [chromo] = init_pop(n)
for i=1:n
    chromo(i,:) = randi([-10,10], 1,2);
end
end

function [donor] = mutate(chromo)
donor=zeros(10,2);
for it=1:10
    for i=1:2
        b=randi([1,10], 1,1);
        c=randi([1,10], 1,1);
        while (b==c || it==b || it==c)
            b=randi([1,10], 1,1);
            c=randi([1,10], 1,1);
        end
        donor(it,i)=chromo(it,i)+randn*(chromo(b,i)-chromo(c,i));
    end
end
end

function [trial]=crossover(target, don)
cr=0.5;
for it=1:10
    val=randn;
    if(val<=cr)
        trial(it,1)=don(it,1);
        trial(it,2)=don(it,2);
    else
        trial(it,1)=target(it,1);
        trial(it,2)=target(it,2);
    end
end
end

function [chromo]=select(target, trail)
for it=1:10
    call=(target(it,1) + 2*target(it,2) - 7)^2+(2*target(it,1) + target(it,2) - 5)^2;
    cal2=(trail(it,1) + 2*trail(it,2) - 7)^2+(2*trail(it,1) + trail(it,2) - 5)^2;
    if(call<cal2)
        chromo(it,1)=target(it,1);
        chromo(it,2)=target(it,2);
    else
        chromo(it,1)=trail(it,1);
        chromo(it,2)=trail(it,2);
    end
end
end

function [op_val, x1, x2]=evaluate(ch)
op_val=(ch(1,1) + 2*ch(1,2) - 7)^2+(2*ch(1,1) + ch(1,2) - 5)^2;
x1=ch(1,1);
x2=ch(1,2);
for it=2:10
    if(((ch(it,1) + 2*ch(it,2) - 7)^2+(2*ch(it,1) + ch(it,2) - 5)^2)<=op_val)
        op_val=(ch(it,1) + 2*ch(it,2) - 7)^2+(2*ch(it,1) + ch(it,2) - 5)^2;
    end
end
end

```


[illegible]

[illegible]

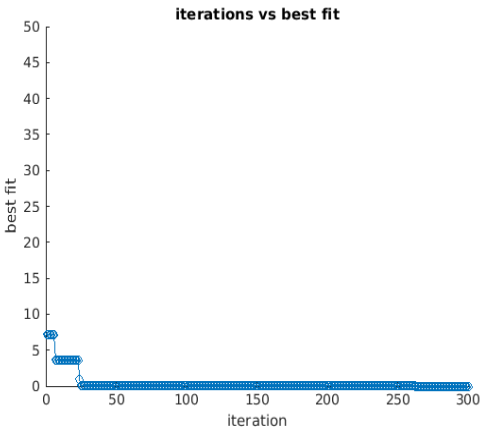
[illegible]

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best fit X1 and X2 of this run respectively,
4.1919e-07

1.0004

2.9998



□