**حل مسئله 30 وزیر با الگوریتم هارمونی hs در متلب**

**صورت مسئله:**

در یک صفحه شطرنجی 30x30، می خواهیم به نحوی 30 وزیر را در صفحه قرار دهیم که در هر ستون تنها یک وزیر باشد و هیچ دو وزیری یکدیگر را گارد نکنند.

**شرح کد:**

این سورس کد شامل 3 فایل می باشد که عبارتند از:

این الگوریتم ماکزیمم یاب است و ما بعد از محاسبه هزینه و کم کردن آن از تعداد وزیرها برازندگی را حساب می کنیم.

**MyCost:**تابعی که گارد بودن وزیرها را بررسی می کند و هزینه آن را محاسبه می کند.

function [z sol]=MyCost(s)

n=numel(s);

[~, X]=sort(s);

Y=1:n;

Hit=zeros(n,n);برخورد ها

z=0;

for i=1:n-1

for j=i+1:n

if abs(X(i)-X(j))==abs(Y(i)-Y(j))بررسی برخورد

Hit(i,j)=1;

Hit(j,i)=1;

z=z+1;تعداد برخورد

end

end

end

دادن مقادیر به مدل

sol.X=X;

sol.Y=Y;

sol.Hit=Hit;

sol.z=z;

end

**PlotSolution(sol):** کشیدن بهترین راه حل

function PlotSolution(sol)

X=sol.X-0.5;

Y=sol.Y-0.5;

Hit=sol.Hit;

z=sol.z;

n=numel(X);

for i=1:n-1

for j=i+1:n

if Hit(i,j)==1

plot([X(i) X(j)],[Y(i) Y(j)],'b:','LineWidth',2);

hold on;

end

end

end

plot(X,Y,'ko','MarkerSize',12,'MarkerFaceColor','y');

strTitle=[num2str(n) '-Queens: '];

if z==0

title([strTitle 'No Hits!']);

elseif z==1

title([strTitle 'Just one Hit']);

else

title([strTitle num2str(z) ' Hit(s)']);

end

grid on;

axis square;

set(gca,'XTick',0:n);

set(gca,'YTick',0:n);

xlim([0 n]);

xlim([0 n]);

hold off;

end

**hs.m:پیاده سازی هارمونی**

clc;

clear;

close all;

تعریف مسئله

nQueen=30;

CostFunction=@(s) MyCost(s); محاسبه هزینه(برای برازندگی)

nVar=nQueen; تعداد متغیرهای تصمیم

VarSize=[1 nVar]; اندازه ماتریس متغیرهای تصمیم

VarMin=0; حد پایین متغیرهای تصمیم

VarMax=1; حد بالا متغیرهای تصمیم

پارامترهای سرچ هارمونی

MaxIt = 500; تعداد تکرار ماکزیمم

HMS = 50; اندازه حافظه هارمونی

nNew = 60; تعداد هارمونی جدید

HMCR = 0.9; میزان توجه به حافظه هارمونی

PAR = 0.1; میزان تنظیم پیچ

FW = 0.02\*(VarMax-VarMin); عرض پهنای باند (پهنای باند)

FW\_damp = 0.995; نسبت کم کم عرض

مقدار دهی اولیه

ساختار هماهنگی خالی

empty\_harmony.Position = [];

empty\_harmony.Cost = [];

empty\_harmony.Sol = [];

حافظه هارمونی را آغاز کنید

HM = repmat(empty\_harmony, HMS, 1);

هماهنگی های اولیه ایجاد کنید

for i = 1:HMS

HM(i).Position = unifrnd(VarMin, VarMax, VarSize);

[HM(i).Cost, HM(i).Sol]= CostFunction(HM(i).Position);

end

مرتب سازی حافظه هارمونی

[~, SortOrder] = sort([HM.Cost]);

HM = HM(SortOrder);

به روز رسانی بهترین راه حل که تاکنون پیدا شده است

BestSol = HM(1);

آرایه برای نگه داشتن بهترین مقادیر هزینه

BestCost = zeros(MaxIt, 1);

حلقه اصلی Harmony Search

for it = 1:MaxIt

آرایه را برای هارمونی جدید مقداردهی کنید

NEW = repmat(empty\_harmony, nNew, 1);

ایجاد هارمونی جدید

for k = 1:nNew

ایجاد موقعیت هارمونی جدید

NEW(k).Position = unifrnd(VarMin, VarMax, VarSize);

for j = 1:nVar

if rand <= HMCR

از حافظه هارمونی استفاده کنید

i = randi([1 HMS]);

NEW(k).Position(j) = HM(i).Position(j);

end

تنظیم پیچ

if rand <= PAR

%DELTA = FW\*unifrnd(-1, +1); % Uniform

DELTA = FW\*randn(); نرمال گوسی

NEW(k).Position(j) = NEW(k).Position(j)+DELTA;

end

end

افزودن حدود متغیر

NEW(k).Position = max(NEW(k).Position, VarMin);

NEW(k).Position = min(NEW(k).Position, VarMax);

ارزیابی

[NEW(k).Cost, NEW(k).Sol]= CostFunction(NEW(k).Position);

end

ادغام هارمونی حافظه و هارمونی جدید

HM = [HM

NEW]; خوبه

ذخیره هارمونی حافظه

[~, SortOrder] = sort([HM.Cost]);

HM = HM(SortOrder);

هارمونی های اضافی را خارج کنید

HM = HM(1:HMS);

به روز رسانی بهترین راه حل که تاکنون پیدا شده است

BestSol = HM(1);

کم ترین هزینه ای(بیشترین برازندگی) را که تاکنون پیدا کرده اید ذخیره کنید

nQueen-BestCost = برازندگی

BestCost(it) = BestSol.Cost;

نمایش برازندگی در هر تکرار

disp(['Iteration ' num2str(it) ': Best Fit = ' num2str(nQueen-BestCost(it))]);

عرض صدای ضعیف

FW = FW\*FW\_damp;

نمایش بهترین راه حل

figure(1);

PlotSolution(BestSol.Sol);

if BestCost(it)==0

break;

end

end

BestCost=BestCost(1:it);

نتایج

figure;

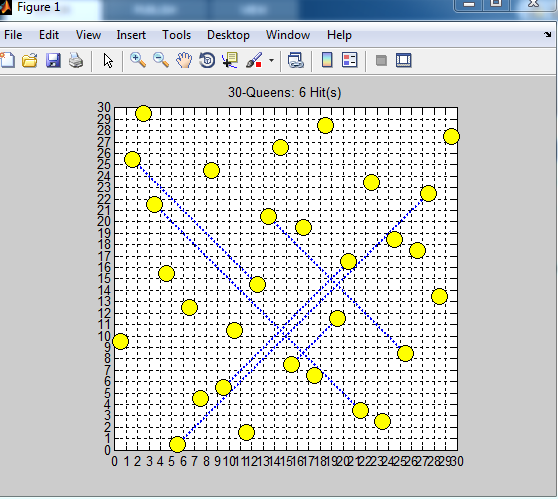
semilogy(nQueen-BestCost, 'LineWidth', 2);

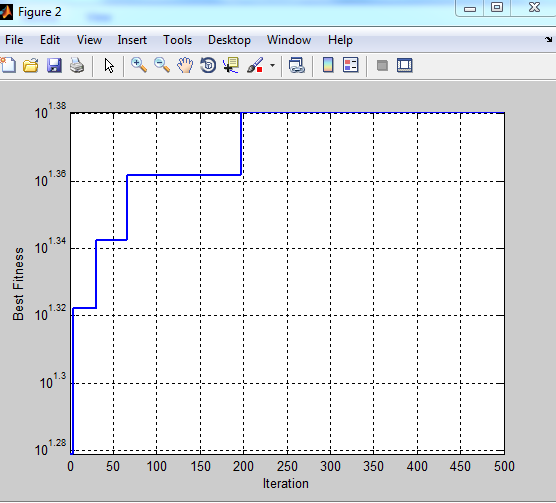
xlabel('Iteration');

ylabel('Best Fitness');

grid on;

**نتایج:**

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**Iteration 1: Best Fit = 19**

**Iteration 2: Best Fit = 19**

**Iteration 3: Best Fit = 19**

**Iteration 4: Best Fit = 21**

**Iteration 5: Best Fit = 21**

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**Iteration 464: Best Fit = 24**

**Iteration 465: Best Fit = 24**

**Iteration 466: Best Fit = 24**

**Iteration 467: Best Fit = 24**

**Iteration 468: Best Fit = 24**

**Iteration 469: Best Fit = 24**

**Iteration 470: Best Fit = 24**

**Iteration 471: Best Fit = 24**

**Iteration 472: Best Fit = 24**

**Iteration 473: Best Fit = 24**

**Iteration 474: Best Fit = 24**

**Iteration 475: Best Fit = 24**

**Iteration 476: Best Fit = 24**

**Iteration 477: Best Fit = 24**

**Iteration 478: Best Fit = 24**

**Iteration 479: Best Fit = 24**

**Iteration 480: Best Fit = 24**

**Iteration 481: Best Fit = 24**

**Iteration 482: Best Fit = 24**

**Iteration 483: Best Fit = 24**

**Iteration 484: Best Fit = 24**

**Iteration 485: Best Fit = 24**

**Iteration 486: Best Fit = 24**

**Iteration 487: Best Fit = 24**

**Iteration 488: Best Fit = 24**

**Iteration 489: Best Fit = 24**

**Iteration 490: Best Fit = 24**

**Iteration 491: Best Fit = 24**

**Iteration 492: Best Fit = 24**

**Iteration 493: Best Fit = 24**

**Iteration 494: Best Fit = 24**

**Iteration 495: Best Fit = 24**

**Iteration 496: Best Fit = 24**

**Iteration 497: Best Fit = 24**

**Iteration 498: Best Fit = 24**

**Iteration 499: Best Fit = 24**

**Iteration 500: Best Fit = 24**

**>> BestSol**

**BestSol =**

**Position: [1x30 double]**

**Cost: 6**

**Sol: [1x1 struct]**

**>> BestSol.Position**

**ans =**

**Columns 1 through 10**

**0.1658 0.7527 0.9970 0.6274 0.4906 0.0208 0.3259 0.0761 0.7139 0.0902**

**Columns 11 through 20**

**0.2296 0.0413 0.4098 0.5733 0.7727 0.1077 0.5579 0.1069 0.9517 0.2827**

**Columns 21 through 30**

**0.4946 0.0646 0.6662 0.0570 0.5322 0.1184 0.5099 0.6306 0.4061 0.9326**

**>>**