程式設計 期中專題

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系統設計

* Header files :

<cmath> - 使用exp運算

<time.h> - 使用time作為random seed

* Max parameters :

定義const int max\_n, max\_m, max\_point, max\_T, max\_k作為各項參數最大值

* Definition :

定義各項變數、function header

void SimulatedAnnealing : 主要演算法、結果輸出

void SearchForNewSolution : 決定如何產生新路線、更新新路線

void UpdateSolution : 根據threat回傳結果決定是否採用新路線

int LengthOfRoute : 計算點數 i.e.轉折次數

double threat : 計算威脅

* int main : 設定time作為random seed、輸入資料、呼叫SimulatedAnnealing執行演算法

演算法

**模擬退火法(simulated annealing) :**

此為一種機率演算法，用來在一定時間內尋找搜尋空間內的近似最優解，因這次題目中所有路線的可能性過多，無法一一窮舉並計算其威脅(必TLE)

**初始化 :**

生成一可行的解(起點到終點，無轉折)、定義T=max\_T為初始溫度

**過程 :**

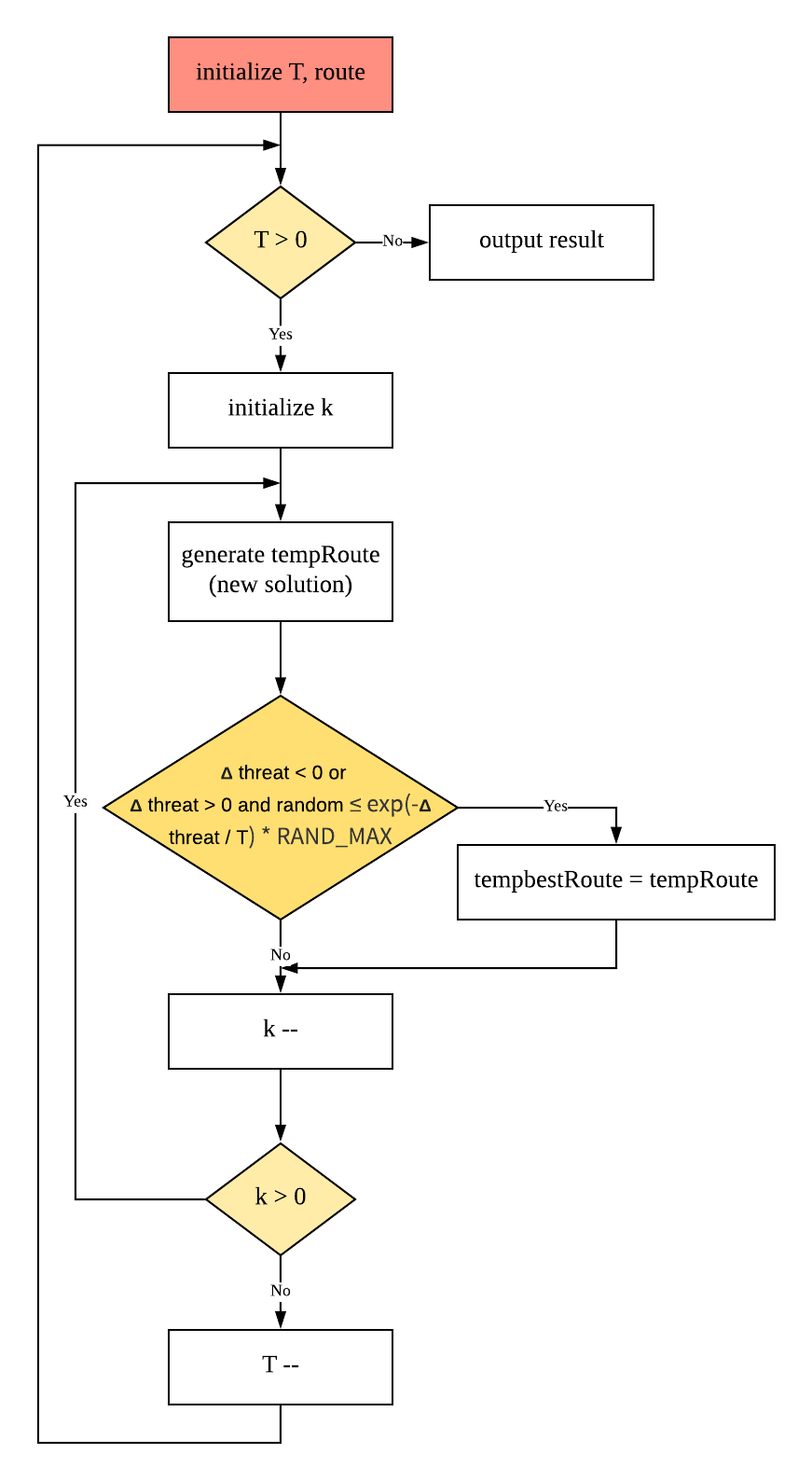
1. 產生新解，本次使用random挑選增加一點、減少一點、改變一點其中一方法，在其中一(用random挑選)路段附近進行變化，便於後續計算
2. 計算threat函數差，並判斷是否被接受。在此我們採用metropolis準則，若Δthreat < 0，則直接採用新解，否則以一機率性exp(Δthreat / T)評估是否接受新解
3. 當新解被接受，以新解代替當前解進行下次試驗，否則以原當前解繼續進行試驗

**退火方案 :**

在某T下，一定數量k(有效)操作完成，降低T在新的T下進行另一批試驗

**停止準則 :**

T降至0時，結束試驗並以當下解為最終解

**流程圖 :**

Pseudo code

max\_n is 1000

max\_m is 10000

max\_point is 100

max\_T is 10000

max\_k is 1

let n be map size

let m be threat point amount

let w be turing cost

let d be max distance

initialize array X, Y, R, P

let sx, sy, ex, ey be coordinate of start and end points

define SimulatedAnnealing

define SearchForNewSolution ( X, Y, &T )

define UpdateSolution ( tempbestRouteX, tempbestRouteY, tempRouteX, tempRouteY, T )

define LengthOfRoute ( route )

define threat ( routeX, routeY )

main function

set time as seed of rand

input X, Y, R, P

input sx, sy, ex,ey

call SimulatedAnnealing

SimulatedAnnealing

define routeX, routeY

assign value of sx to first element of routeX

assign value of sy to first element of routeY

assign value of ex to second element of routeX

assign value of ey to second element of routeY

assign -1 to other values of routeX, routeY

assign max\_T to temperature T

while T is larger than 0

call SearchForNewSolution

assign return value of LengthOfRoute to len

output turns

output turn coordinates

SearchForNewSolution

assign max\_k to k

declare array tempbestRouteX, tempbestRouteY

copy X to tempbestRouteX, Y to tempbestRouteY

randomly assign number between 0~14 to choose

if choose is 0~2 and points does not equal to max\_point

for k larger than 0, k minus

declare tempRouteX, tempRouteY

copy X to tempRouteX, Y to tempRouteY

randomly choose a segment between a th, a+1th point, then

randomly choose a coordinate near that segment

if coordinate of new point is not same as a th, a+1 th point

insert coordinate into tempRouteX, tempRouteY

call UpdateSolution

T minus

if choose is 3~10 and points does not equal to 2

for k larger than 0, k minus

declare tempRouteX, tempRouteY

copy X to tempRouteX, Y to tempRouteY

randomly choose a th point, then shift points after a th point left and

delete the last point

call UpdateSolution

T minus

if choose is 11~14 and points does not equal to 2

for k larger than 0, k minus

declare tempRouteX, tempRouteY

copy X to tempRouteX, Y to tempRouteY

randomly choose a th point, then randomly choose a coordinate

between a-1 th, a+1 th point and change a th point

call UpdateSolution

T minus

copy tempbestRouteX, tempbestRouteY to X, Y

UpdateSolution

if threat of tempRoute is less than tempbestRoute

copy tempRouteX, tempRouteY to tempbestRouteX, tempbestRouteY

else

assign the difference of threat of tempRoute and tempbestRoute to deltathreat

if random no more than exp((-deltathreat) / T) \* RAND\_MAX

copy tempRouteX, tempRouteY to tempbestRouteX, tempbestRouteY

LengthOfRoute

count points

return points value

threat

分工方式

黃心 : 主程式撰寫、威脅函數撰寫

黃煒勛 : Github repository 建置&管理、程式排版&註解、書面報告

黃靖翔 : 威脅函數撰寫

呂皓恩 :

心得感想

黃心 :

黃煒勛 :

黃靖翔 :

呂皓恩 :