一字棋——a-B剪枝算法

代码：

#include "iostream"

using namespace std;

int num = 0;

int p,q;

int QP[3][3]; //保À¡ê存ä?棋?盘¨¬数ºy据Y的Ì?数ºy组Á¨¦

int con[3][3]; //记?录?棋?盘¨¬状Á¡ä态¬?

const int depth = 3;//搜?索¡Â树º¡Â的Ì?最Á?大ä¨®深¦?度¨¨是º?3

void Init(){ //初?始º?化¡¥棋?盘¨¬状Á¡ä态¬?，ê?0表À¨ª示º?为a空?

for(int i=0;i<3;i++)

for(int j=0;j<3;j++)

con[i][j]=0;

}

void printQP(){ //打ä¨°印®?棋?盘¨¬

for(int i=0;i<3;i++){

for(int j=0;j<3;j++){

cout<<con[i][j]<<'\t';

cout<<endl;

}

}

}

void UserInput(){ //用®?户¡ì输º?入¨?（ê¡§用®?户¡ì落?棋?）ê?

int chess,x,y;

L1: cout<<"Please input your chess(xy):";

cin>>chess;

x=chess/10;

y=chess%10;

if(x>0 && x<4 && y>0 && y<4 && con[x-1][y-1]==0)

con[x-1][y-1]= -1;

else{

cout<<"Input error!";

goto L1;

}

}

int checkWin(){ //检¨¬查¨¦是º?否¤?有®D人¨?赢®?棋?

for(int i=0;i<3;i++){

if(con[i][0]==1 && con[i][1]==1 && con[i][2]==1)

return 1;

if(con[i][0]==-1 && con[i][1]==-1 && con[i][2]==-1)

return -1;

}

for(int i=0;i<3;i++){

if(con[0][i]==1 && con[1][i]==1 && con[2][i]==1)

return 1;

if(con[0][i]==-1 && con[1][i]==-1 && con[2][i]==-1)

return -1;

}

if((con[0][0]==1 &&con[1][1]==1 && con[2][2]==1) || (con[0][2]==1 && con[1][1]==1 && con[2][0]==1))

return 1;

if((con[0][0]== -1 &&con[1][1]== -1 && con[2][2]== -1) || (con[0][2]== -1 && con[1][1]== -1 && con[2][0]== -1))

return -1;

return 0;

}

int value(){ //判D断?当Ì¡À前¡ã棋?盘¨¬的Ì?状Á¡ä态¬?

int p=0;

int q=0;

//电Ì?脑?

for(int i=0;i<3;i++){

for(int j=0;j<3;j++){

if(con[i][j] == 0){

QP[i][j]=1;

}

else QP[i][j]= con[i][j];

}

}

for(int i=0;i<3;i++)

p=p+(QP[i][0]+QP[i][1]+QP[i][2])/3;

for(int i=0;i<3;i++)

p+=(QP[0][i]+QP[1][i]+QP[2][i])/3;

p+=(QP[0][0]+QP[1][1]+QP[2][2])/3;

p+=(QP[0][2]+QP[1][1]+QP[2][0])/3;

//人¨?

for(int i=0;i<3;i++){

for(int j=0;j<3;j++){

if(con[i][j] == 0){

QP[i][j]=-1;

}

else QP[i][j]= con[i][j];

}

}

for(int i=0;i<3;i++)

p=p+(QP[i][0]+QP[i][1]+QP[i][2])/3;

for(int i=0;i<3;i++)

p+=(QP[0][i]+QP[1][i]+QP[2][i])/3;

p+=(QP[0][0]+QP[1][1]+QP[2][2])/3;

p+=(QP[0][2]+QP[1][1]+QP[2][0])/3;

return p+q; //返¤¦Ì回?棋?盘¨¬状Á¡ä态¬?值¦Ì

}

int cut (int &val , int dep, bool max){//a一°?B剪?枝|的Ì?算?法¤¡§,val为a上¦?一°?层?的Ì?估¨¤计?值¦Ì,dep为a搜?索¡Â深¦?度¨¨,max记?录?上¦?一°?层?是º?否¤?为a极?大ä¨®层?

if (dep==depth||dep+num==9) //如¨?果?搜?索¡Â深¦?度¨¨达ä?到Ì?最Á?大ä¨®深¦?度¨¨，ê?或¨°者?深¦?度¨¨加¨®上¦?当Ì¡À前¡ã棋?子Á¨®数ºy已°?经-达ä?到Ì?9,直¡À接¨®调Ì¡Â用®?估¨¤计?函¡¥数ºy

return value () ;

int i, j, flag, temp ; //flag记?录?本À?层?的Ì?极?值¦Ì，ê?temp记?录?下?层?求¨®得Ì?的Ì?估¨¤计?值¦Ì

//out记?录?

bool out=false ;//是º?否¤?剪?枝|，ê?初?始º?为afalse

/\*if(CheckWin ()==1) . //如¨?果?计?算?机¨²赢®?了¢?，ê?就¨ª置?上¦?一°?层?的Ì?估¨¤计?值¦Ì为a无T穷?(用®?很¨¹大ä¨®的Ì?值¦Ì代ä¨²表À¨ª无T穷?)

val =10000 ;

return 0;

}\*/

if(max){ //如¨?果?上¦?一°?层?是º?极?大ä¨®层?,本À?层?则¨°需¨¨要°a是º?极?小?层?，ê?记?录?flag为a无T穷?大ä¨®;反¤¡ä之?，ê?则¨°为a记?录?为a负o无T穷?大ä¨®

flag=10000 ;

} //flag记?录?本À?层?节¨²点Ì?的Ì?极?值¦Ì

else{

flag = -10000 ;

for(i=0;i<3 && !out ;i++){ //双? 重?循-环¡¤，ê?遍À¨¦历¤¨²棋?盘¨¬所¨´有®D位?置?

for(j=0;j<3 && !out;j++){

if (con[i][j]==0){//如¨?果?该?位?置?上¦?没?有®D棋?子Á¨®

if (max){ //并¡é且¨°上¦?一°?层?为a极?大ä¨®层?,即¡ä本À?层?为a极?小?层?,轮?到Ì?用®?户¡ì玩ª?家¨°走Á?了¢?

con[i][j]=-1; //该?位?置?填¬?上¦?用®?户¡ì玩ª?家¨°棋?子Á¨®

if (checkWin()==-1){ //如¨?果?用®?户¡ì玩ª?家¨°赢®?了¢?

temp=-10000; //置?棋?盘¨¬估¨¤计?值¦Ì为a负o无T穷?

}

else{

temp=cut(flag,dep+1,!max);

}

if(temp<flag){ //如¨?果?下?一°?步?棋?盘¨¬的Ì?估¨¤计?值¦Ì小?于®¨²本À?层?节¨²点Ì?的Ì?极?值¦Ì，ê?置?本À?层?极?值¦Ì为a更¨¹小?的Ì?那?个?

flag=temp;}

if (flag<=val) { //如¨?果?本À? 层?的Ì?极?值¦Ì已°?经-小?于®¨²上¦?一°?层?的Ì?估¨¤计?值¦Ì，ê?则¨°不?需¨¨要°a搜?索¡Â下?去¨£¤，ê?剪?枝|

out=true ;

}

}

else{ //如¨?果?上¦?一°?层?为a极?小?层?，ê?本À?层?为a极?大ä¨®层?,轮?到Ì?计?算?机¨²走Á?。¡ê

con[i][j]=1 ;//该?位?置?填¬?上¦?计?算?机¨²棋?子Á¨®

if (checkWin()==1){ //如¨?果?计?算?机¨²赢®?了¢?

temp = 10000 ;}//置?棋?盘¨¬估¨¤计?值¦Ì为a无T穷?}

else{

temp=cut(flag,dep+1,!max);

}

if(temp>flag){ //如¨?果?下?一°?步?棋?盘¨¬的Ì?估¨¤计?值¦Ì小?于®¨²本À?层?节¨²点Ì?的Ì?极?值¦Ì，ê?置?本À?层?极?值¦Ì为a更¨¹小?的Ì?那?个?

flag=temp;}

if (flag>=val){ //如¨?果?本À? 层?的Ì?极?值¦Ì已°?经-小?于®¨²上¦?一°?层?的Ì?估¨¤计?值¦Ì，ê?则¨°不?需¨¨要°a搜?索¡Â下?去¨£¤，ê?剪?枝|

out=true ;

}

}

con[i][j]=0;//把ã?模¡ê拟a下?的Ì?棋?还1原-，ê?回?溯Y

}

}

}

}

if (max){ //根¨´据Y上¦?一°?层?是º?否¤?为a极?大ä¨®层?，ê?用®?本À?层?的Ì?极?值¦Ì修T改?上¦?一°?层?的Ì?估¨¤计?值¦Ì

if (flag>val){

val =flag ;

}

}

else{

if (flag<val){

val =flag ;}}

return flag; //函¡¥数ºy返¤¦Ì回? 的Ì?是º?本À?层?的Ì?极?值¦Ì

}

int main(){//主¡Â程¨¬序¨°

int m= -10000, val= -10000, dep=1; //m用®?来¤¡ä存ä?放¤?最Á?大ä¨®的Ì?val

int x\_pos,y\_pos; //记?录?最Á?佳?走Á?步?的Ì?坐Á?标À¨º

Init () ;

cout<<"Qipan:" <<endl ;

printQP () ;

char IsFirst ;

cout<<"Do you want do first ? (y/n) ";

cin>>IsFirst;

while (IsFirst !='y' &&IsFirst !='n'){

cout<<" ERROR ! "<<"Do you want first?(y/n) ";

cin>>IsFirst;

}

if (IsFirst=='n'){//汁-算?机¨²先¨¨走Á?

L5: for(int x=0;x<3;x++){

for(int y=0;y<3;y++){

if (con[x][y]==0){

con[x][y]=1;

cut(val,dep,1);//计?算?机¨²试º?探¬?性?走Á?一°?步?棋?，ê?改?变À?棋?盘¨¬状Á¡ä态¬?，ê?在¨²该?状Á¡ä态¬?下?计?算?棋?盘¨¬估¨¤计?值¦Ì

if (checkWin()==1){

cout<<" The computer put the qiziat:"<<x+1<<y+1<<endl;

printQP();

cout<<"The computer WIN ! GAME0VER. "<< endl;

return 0;

}

if (val>m){ //m要°a记?录?通ª¡§过y试º?探¬?求¨®得Ì?的Ì?棋?盘¨¬状Á¡ä态¬?的Ì?最Á?大ä¨®估¨¤计?值¦Ì

m=val;

x\_pos=x,y\_pos=y;

}

val= -10000 ;

con [x][y]=0;

}

}

}

con[x\_pos][y\_pos]=1 ;

val= -10000;

m= -10000;

dep=1;

cout <<"The computer put the qiziat:"<<x\_pos+1<<y\_pos+1<<endl ;

printQP ();

num++ ;

value () ;

if (p==0){

cout<<" DOWN GAME!"<<endl ;

return 0;

}

UserInput () ;//玩ª?家¨°走Á?一°?步?棋?

printQP () ;

cout<<endl ;

num++;

value () ;

if (p==0){

cout<<"DOWN GAME!" <<endl ;

return 0;

}

if (checkWin ()==-1){

cout<< " Conguatulations ! You Win !GAME OVER."<<endl ;

return 0;

}

goto L5;

}

else{ //人¨?先¨¨走Á?

L4: UserInput();

printQP () ;

cout<<endl ;

num++;

value () ;

if (q==0){

cout<<"DOWN GAME!"<<endl ;

return 0;

}

if (checkWin ()==-1){

cout <<" You Win ! GAME OVER."<<endl;

return 0;

}

for (int x=0;x<3;x++){

for (int y=0;y<3;y++){

if (con[x][y]==0){

con[x][y]=1;

cut (val,dep, 1);

if (checkWin ()==1){

cout <<"The computer put the qiziat:"<<x+1<<y+1<<endl ;

cout <<" The computer WIN ! GAME0VER. " <<endl ;

return 0;

}

if (val >m){

m=val ;

x\_pos=x;

y\_pos=y;

}

val= -10000 ;

con[x][y]=0;

}

}

}

con[x\_pos][y\_pos]=1;

val= -10000 ;

m= -10000 ;

dep=1 ;

cout <<"The computer put the qiziat:"<<x\_pos+1<<y\_pos+1<<endl ;

printQP () ;

cout<<endl ;

num++ ;

value () ;

if (q==0){

cout<<"Down Game!"<<endl;

return 0;

}

goto L4;

}

return 0;

}

程序运行：

