**Player vs Player:**

**Player 1:**

#include <stdio.h>

#include <string.h>

#include <fcntl.h>

#include <sys/stat.h>

#include <sys/types.h>

#include <unistd.h>

#include <stdbool.h>

#include <stdlib.h>

#include <time.h>

#include <pthread.h>

clock\_t tStart,t\_End;

double timeT;

void initialize(char game[][3]){

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

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

game[i][j]='\_';

}

void \*getTime(void \*p)

{

timeT= (double)(time(&t\_End) - tStart);

}

void print(char game[][3]){

system("@cls||clear");

printf("\n");

printf(" 0 1 2");

printf("\n");

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

printf("%d",i);

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

printf(" %c",game[i][j]);

printf(" ");

}

printf("\n");

}

}

bool isTie(char game[][3]){

int c = 0;

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

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

if(game[i][j]!='\_'){

c++;

}

}

}

if(c==9){

return true;

}

return false;

}

bool valid(char game[][3],int x,int y){

if(game[x][y]=='\_' && x<3 && x>=0 && y<3 && y>=0){

return true;

}

return false;

}

bool check\_win(char game[][3],char player){

bool win=false;

if(game[0][0] == player && game[1][1] == player && game[2][2] == player)

{win = true;}

if(game[0][0] == player && game[1][0] == player && game[2][0] == player)

{win = true;}

if(game[0][2] == player && game[1][2] == player && game[2][2] == player)

{win = true;}

if(game[0][0] == player && game[0][1] == player && game[0][2] == player)

{win = true;}

if(game[1][0] == player && game[1][1] == player && game[1][2] == player)

{win = true;}

if(game[2][0] == player && game[2][1] == player && game[2][2] == player)

{win = true;}

if(game[2][0] == player && game[1][1] == player && game[0][2] == player)

{win = true;}

if(game[0][1] == player && game[2][1] == player && game[1][1] == player)

{win = true;}

return win;

}

int main()

{

int fd;

char \* myfifo = "/tmp/myfile";

mkfifo(myfifo, 0666);

char tictactoe[3][3];

int x,y;

bool finish = false;

initialize(tictactoe);

print(tictactoe);

pthread\_t tid;

while (!finish)

{

time(&tStart);

printf("Enter x: ");

scanf("%d",&x);

printf("Enter y: ");

scanf("%d",&y);

while(!valid(tictactoe,x,y)){

printf("Invalid Input/n Enter x:");

scanf("%d",&x);

printf("Enter y: ");

scanf("%d",&y);

}

pthread\_create(&(tid),NULL,getTime,NULL);

pthread\_join(tid,NULL);

tictactoe[x][y]='X';

print(tictactoe);

printf("Time taken: %.2fs\n",timeT);

fd = open(myfifo, O\_WRONLY);

write(fd, &x,sizeof(x));

write(fd, &y,sizeof(y));

close(fd);

if(check\_win(tictactoe,'X')){

printf("You Win!");

printf("\n");

finish=true;}

else if(isTie(tictactoe)){

printf("Its a Tie!");

printf("\n");

finish=true;

}

else{

printf("Player 1's Turn");

fd = open(myfifo, O\_RDONLY);

read(fd,&x,sizeof(x));

read(fd,&y,sizeof(y));

close(fd);

tictactoe[x][y]='O';

print(tictactoe);

if(check\_win(tictactoe,'O')){

printf("Player 2 Wins!!");

printf("\n");

finish=true;}

else if(isTie(tictactoe)){

printf("Its a Tie!");

printf("\n");

finish=true;

}

}

}

return 0;

}

**Player 2:**

#include <stdio.h>

#include <string.h>

#include <fcntl.h>

#include <sys/stat.h>

#include <sys/types.h>

#include <unistd.h>

#include <stdbool.h>

#include <stdlib.h>

#include <time.h>

#include <pthread.h>

clock\_t tStart,t\_End;

double timeT;

void initialize(char game[][3]){

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

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

game[i][j]='\_';

}

void \*getTime(void \*p)

{

timeT= (double)(time(&t\_End) - tStart);

}

void print(char game[][3]){

system("@cls||clear");

printf("\n");

printf(" 0 1 2");

printf("\n");

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

printf("%d",i);

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

printf(" %c",game[i][j]);

printf(" ");

}

printf("\n");

}

}

bool isTie(char game[][3]){

int c = 0;

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

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

if(game[i][j]!='\_'){

c++;

}

}

}

if(c==9){

return true;

}

return false;

}

bool valid(char game[][3],int x,int y){

if(game[x][y]=='\_' && x<3 && x>=0 && y<3 && y>=0){

return true;

}

return false;

}

bool check\_win(char game[][3],char player){

bool win=false;

if(game[0][0] == player && game[1][1] == player && game[2][2] == player)

{win = true;}

if(game[0][0] == player && game[1][0] == player && game[2][0] == player)

{win = true;}

if(game[0][2] == player && game[1][2] == player && game[2][2] == player)

{win = true;}

if(game[0][0] == player && game[0][1] == player && game[0][2] == player)

{win = true;}

if(game[1][0] == player && game[1][1] == player && game[1][2] == player)

{win = true;}

if(game[2][0] == player && game[2][1] == player && game[2][2] == player)

{win = true;}

if(game[2][0] == player && game[1][1] == player && game[0][2] == player)

{win = true;}

if(game[0][1] == player && game[2][1] == player && game[1][1] == player)

{win = true;}

return win;

}

int main()

{

int fd;

char \* myfifo = "/tmp/myfile";

mkfifo(myfifo, 0666);

char tictactoe[3][3];

int x,y;

bool finish=false;

initialize(tictactoe);

print(tictactoe);

pthread\_t tid;

while (!finish)

{

printf("Player 2's Turn");

fd = open(myfifo, O\_RDONLY);

read(fd,&x,sizeof(x));

read(fd,&y,sizeof(y));

close(fd);

tictactoe[x][y]='X';

print(tictactoe);

if(check\_win(tictactoe,'X')){

printf("Player 1 Wins!");

printf("\n");

finish=true;

}

else if(isTie(tictactoe)){

printf("Its a Tie!");

printf("\n");

finish=true;

}

else{

time(&tStart);

printf("Enter x: ");

scanf("%d",&x);

printf("Enter y: ");

scanf("%d",&y);

while(!valid(tictactoe,x,y)){

printf("Invalid Input! Enter x:");

scanf("%d",&x);

printf("Enter y: ");

scanf("%d",&y);

}

pthread\_create(&(tid),NULL,getTime,NULL);

pthread\_join(tid,NULL);

tictactoe[x][y]='O';

fd = open(myfifo, O\_WRONLY);

write(fd, &x,sizeof(x));

write(fd, &y,sizeof(y));

close(fd);

print(tictactoe);

printf("Time taken: %.2fs\n",timeT);

if(check\_win(tictactoe,'O')){

printf("You Win!");

printf("\n");

finish=true;}

else if(isTie(tictactoe)){

printf("Its a Tie!");

printf("\n");

finish=true;

}

}

}

return 0;

}

**Computer:**

#include <stdio.h>

#include <string.h>

#include <fcntl.h>

#include <sys/stat.h>

#include <sys/types.h>

#include <unistd.h>

#include <stdbool.h>

#include <stdlib.h>

#include <time.h>

#include <time.h>

#include <pthread.h>

int x,y;

clock\_t tStart,t\_End;

double timeT;

void initialize(char game[][3]){

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

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

game[i][j]='\_';

}

void \*getTime(void \*p)

{

timeT= (double)(time(&t\_End) - tStart);

}

void print(char game[][3]){

system("@cls||clear");

printf("\n");

printf(" 0 1 2");

printf("\n");

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

printf("%d",i);

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

printf(" %c",game[i][j]);

printf(" ");

}

printf("\n");

}

}

bool isTie(char game[][3]){

int c = 0;

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

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

if(game[i][j]!='\_'){

c++;

}

}

}

if(c==9){

return true;

}

return false;

}

bool valid(char game[][3],int x,int y){

if(game[x][y]=='\_' && x<3 && x>=0 && y<3 && y>=0){

return true;

}

return false;

}

bool check\_win(char game[][3],char player){

bool win=false;

if(game[0][0] == player && game[1][1] == player && game[2][2] == player)

{win = true;}

if(game[0][0] == player && game[1][0] == player && game[2][0] == player)

{win = true;}

if(game[0][2] == player && game[1][2] == player && game[2][2] == player)

{win = true;}

if(game[0][0] == player && game[0][1] == player && game[0][2] == player)

{win = true;}

if(game[1][0] == player && game[1][1] == player && game[1][2] == player)

{win = true;}

if(game[2][0] == player && game[2][1] == player && game[2][2] == player)

{win = true;}

if(game[2][0] == player && game[1][1] == player && game[0][2] == player)

{win = true;}

if(game[0][1] == player && game[2][1] == player && game[1][1] == player)

{win = true;}

return win;

}

void Attack(char game[][3]){

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

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

if(game[i][j]=='\_'){

game[i][j]='O';

if(check\_win(game,'O')){

x=i;y=j;

game[i][j]='\_';

return;

}

game[i][j]='\_';

}

}

}

void Defend(char game[][3]){

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

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

if(game[i][j]=='\_'){

game[i][j]='X';

if(check\_win(game,'X')){

x=i;y=j;

game[i][j]='\_';

return;

}

game[i][j]='\_';

}

}

}

void getXY(char game[][3]){

x=-1;

y=-1;

Attack(game);

if(x==-1){

Defend(game);

if(x==-1)

{

do{

x=rand()%3;

y=rand()%3;

}while(game[x][y]!='\_');

}

}

}

int main()

{

int fd;

srand(time(0));

char \* myfifo = "/tmp/myfile";

mkfifo(myfifo, 0666);

char tictactoe[3][3];

bool finish=false;

initialize(tictactoe);

print(tictactoe);

pthread\_t tid;

while (!finish)

{

printf("Player 2's Turn");

fd = open(myfifo, O\_RDONLY);

read(fd,&x,sizeof(x));

read(fd,&y,sizeof(y));

close(fd);

tictactoe[x][y]='X';

print(tictactoe);

if(check\_win(tictactoe,'X')||isTie(tictactoe)){

finish=true;

}

else{

time(&tStart);

getXY(tictactoe);

tictactoe[x][y]='O';

pthread\_create(&(tid),NULL,getTime,NULL);

pthread\_join(tid,NULL);

fd = open(myfifo, O\_WRONLY);

write(fd, &x,sizeof(x));

write(fd, &y,sizeof(y));

close(fd);

print(tictactoe);

printf("Time taken: %.2fs\n",timeT);

if(check\_win(tictactoe,'0')||isTie(tictactoe)){

finish=true;

}

}

}

return 0;

}