

Maglev Hockey

JavaScript Final Project

0516218 軒轅照雯



系統

- 環境：MacOS
- 工具：Sublime Text 2
- 瀏覽器：Safari
- 程式庫：利用 canvas 繪圖





- 架構：



遊戲規則

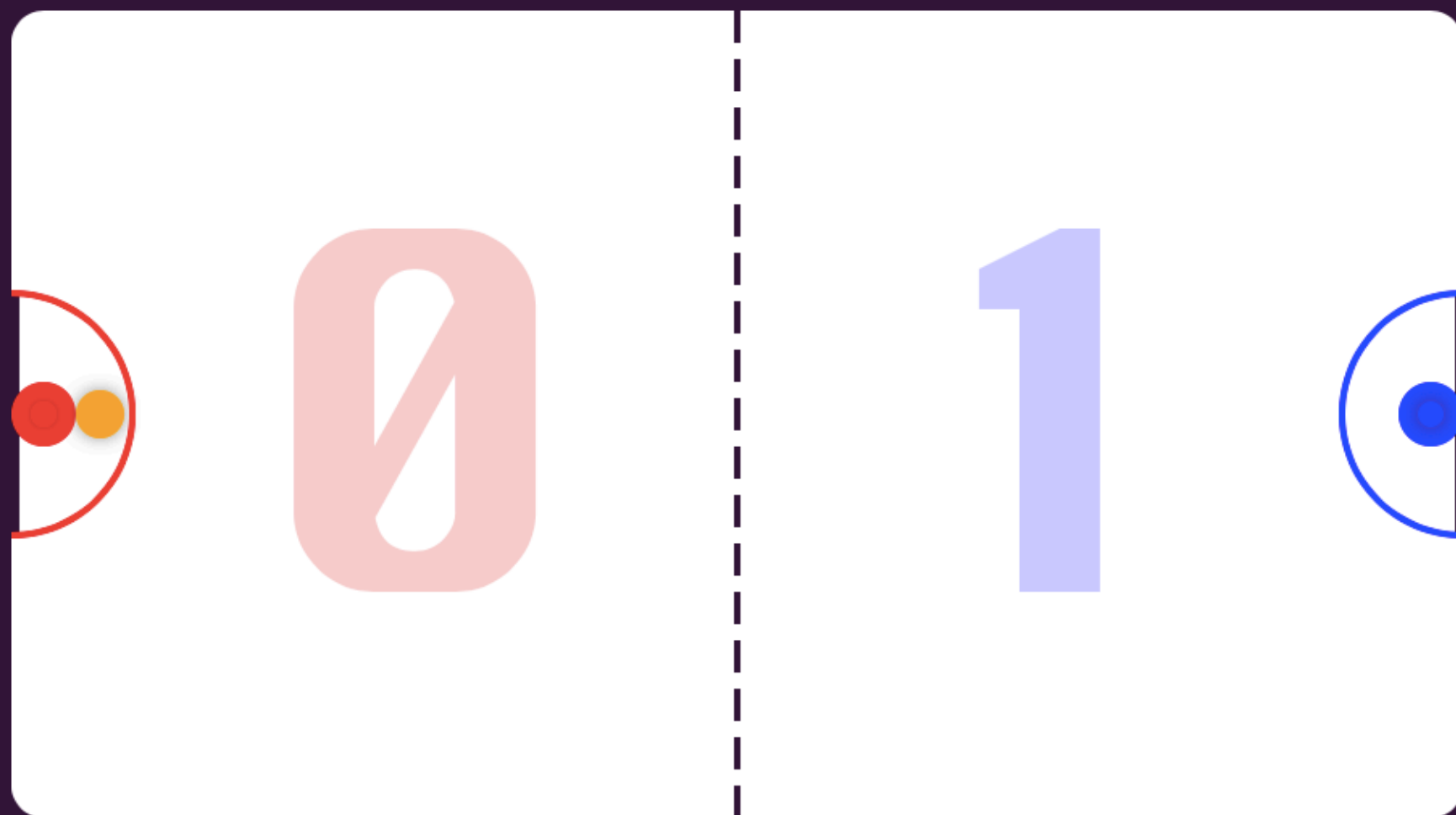
- 2人
- 每位玩家都可以上下左右移動，但不得超越中間線
- 將輪盤射入對方的洞即可得分
- 其中一方得分後，將由失分者發球
- 限時兩分鐘內，得分較多者即可獲勝

操作方式

- Player 1（左）：W-上 / S-下 / A-左 / D-右
- Player 2（右）：-上 / -下 / -左 / -右
- 發球：移動滑鼠選擇發球方向，按下左鍵即可發球

MAGLEV HOCKEY

01 : 48



程式說明

- Plane()
- Ball()
- Paddle(x, y, player)
- Event Listeners: key down, key up, mouse move, mouse click
- score(player)
- hit(x, y)
- countDown
- draw()

- Plane

```
/*plane*/
let container=document.createElement("div");
container.id="container";
document.body.appendChild(container);
let plane=document.createElement("canvas");
plane.id="plane";
plane.width=planeWidth;
plane.height=planeHeight;
container.appendChild(plane);
let c=plane.getContext("2d");
```

```
function Plane(){
    //plane: 圓角矩形
    c.shadowOffsetx=0;
    c.shadowOffsety=0;
    c.shadowBlur=0;
    c.fillStyle="white";
    c.beginPath();
    c.moveTo(planeRadius, 0); c.lineTo(planeWidth-planeRadius, 0);
    c.arc(planeWidth-planeRadius, planeRadius, planeRadius, Math.PI*3/2, 0, false);
    c.lineTo(planeWidth, planeHeight-planeRadius);
    c.arc(planeWidth-planeRadius, planeHeight-planeRadius, planeRadius, 0, Math.PI/2, false);
    c.lineTo(planeRadius, planeHeight);
    c.arc(planeRadius, planeHeight-planeRadius, planeRadius, Math.PI/2, Math.PI, false);
    c.lineTo(0, planeRadius);
    c.arc(planeRadius, planeRadius, planeRadius, Math.PI, Math.PI*3/2, false);
    c.fill();
    c.closePath();
```

```
//場中虚線
c.lineWidth=4;
c.strokeStyle="#341539";
c.beginPath();
for(let i=0;i<17;i++){
    c.moveTo(planeWidth/2, 30*i);
    c.lineTo(planeWidth/2, 30*i+20);
}
c.stroke();
c.closePath();
```



```
//得分洞
//p1 hole
c.lineWidth=10;
c.strokeStyle="#341539";
c.beginPath();
c.moveTo(0, planeHeight/2-holeWidth/2);
c.lineTo(0, planeHeight/2+holeWidth/2);
c.stroke();
c.closePath();
c.strokeStyle="red";
c.lineWidth=4;
c.beginPath();
c.arc(0, planeHeight/2, holeWidth/2, Math.PI*3/2, Math.PI/2, false);
c.stroke();
c.closePath();

//p2 hole
c.lineWidth=10;
c.strokeStyle="#341539";
c.beginPath();
c.moveTo(planeWidth, planeHeight/2-holeWidth/2);
c.lineTo(planeWidth, planeHeight/2+holeWidth/2);
c.stroke();
c.closePath();
c.strokeStyle="blue";
c.lineWidth=4;
c.beginPath();
c.arc(planeWidth, planeHeight/2, holeWidth/2, Math.PI*3/2, Math.PI/2, true);
c.stroke();
c.closePath();
```

```
//score
c.font = "300px Krungthep, Helvetica, sans-serif";
//p1 score
c.fillStyle = "rgba(255, 0, 0, 0.2)";
c.fillText(p1, 150, 360);
//p2 score
c.fillStyle = "rgba(0, 0, 255, 0.2)";
c.fillText(p2, 550, 360);
```

- Ball

```
/*ball*/  
function Ball(){  
  c.shadowColor="#999999";  
  c.shadowOffsetx=5;  
  c.shadowOffsety=5;  
  c.shadowBlur=10;  
  
  c.fillStyle="orange";  
  c.beginPath();  
  c.arc(ball_x, ball_y, ballRadius, 0, Math.PI*2, true);  
  c.fill();  
  c.closePath();  
}  
  
ball_dx=rand(3, 7); //initialization  
ball_dy=rand(3, 7);
```

- Paddle

```
/*paddles*/  
function Paddle(x, y, player){  
  c.fillStyle=paddleColor[player];  
  c.shadowOffsetx=0;  
  c.shadowOffsety=0;  
  c.shadowBlur=0;  
  
  c.beginPath();  
  c.arc(x, y, paddleRadius, 0, Math.PI*2, true);  
  c.fill();  
  c.closePath();  
  //握把  
  c.shadowColor="#999999";  
  c.shadowOffsetx=5;  
  c.shadowOffsety=5;  
  c.shadowBlur=10;  
  c.beginPath();  
  c.arc(x, y, paddleRadius-12, 0, Math.PI*2, true);  
  c.fill();  
  c.closePath();  
}
```

- Event Listener: key down, key up

```
/*paddle movement*/
document.addEventListener("keydown", function(e){
    e=e||window.event;
    //player2
    if(e.key=="ArrowLeft"){
        p2_left=true;
        //p2_y=Math.min(p2_y+5, planeHeight-paddleRadius);
    }else if(e.key=="ArrowRight"){
        p2_right=true;
        //p2_y=Math.max(p2_y-5, 0);
    }else if(e.key=="ArrowUp"){
        p2_up=true;
    }else if(e.key=="ArrowDown"){
        p2_down=true;
    }
    //player1
    if(e.key=="a"){
        p1_left=true;
        //p1_y=Math.max(p1_y-5, 0);
    }else if(e.key=="d"){
        p1_right=true;
        //p1_y=Math.min(p1_y+5, planeHeight-paddleRadius);
    }else if(e.key=="w"){
        p1_up=true;
    }else if(e.key=="s"){
        p1_down=true;
    }
});
```

```
document.addEventListener("keyup", function(e){
    e=e||window.event;
    //p2
    if(e.key=="ArrowLeft"){
        p2_left=false;
    }else if(e.key=="ArrowRight"){
        p2_right=false;
    }else if(e.key=="ArrowUp"){
        p2_up=false;
    }else if(e.key=="ArrowDown"){
        p2_down=false;
    }
    //p1
    if(e.key=="a"){
        p1_left=false;
    }else if(e.key=="d"){
        p1_right=false;
    }else if(e.key=="w"){
        p1_up=false;
    }else if(e.key=="s"){
        p1_down=false;
    }
});
```

- Event Listener: mouse move, mouse down

```
/*發球*/
document.addEventListener("mousemove", function(e){
    if(game_time>0){
        if(p1_go || p2_go){
            e=e||window.event;
            let x=e.pageX-270-ball_x, y=e.pageY-145-ball_y, len=Math.sqrt(x**2+y**2);
            c.lineWidth=4;
            c.strokeStyle="gray";
            c.beginPath();
            c.moveTo(ball_x, ball_y);
            c.lineTo(ball_x+x*50/len, ball_y+y*50/len);
            c.stroke();
            c.closePath();
        }
    }
});

document.addEventListener("mousedown", function(e){
    if(game_time>0){
        if(p1_go || p2_go){
            e=e||window.event;
            let x=e.pageX-270-ball_x, y=e.pageY-145-ball_y, len=Math.sqrt(x**2+y**2), strength=rand(5,7);
            ball_dx=x*strength/len;
            ball_dy=y*strength/len;
            p1_go=false;
            p2_go=false;
        }
    }
});
```

- score

```
/*player score*/
function score(player){
  if(player==0){
    p1++;
    //p1_score.nodeValue=p1;
    //p2 start
    p2_go=true;
    ball_x=planeWidth-2*paddleRadius-ballRadius;
  }else if(player==1){
    p2++;
    //p2_score.nodeValue=p2;
    //p1 start
    p1_go=true;
    ball_x=2*paddleRadius+ballRadius;
  }

  ball_y=planeHeight/2;
  ball_dx=0;
  ball_dy=0;
  p1_x=p1reset_x;
  p1_y=preset_y;
  p2_x=p2reset_x;
  p2_y=preset_y;
  //restart
}
```

- hit

```
/*paddle hits the ball*/
function hit(x, y){
  if((ball_x-x)**2+(ball_y-y)**2<(paddleRadius+ballRadius)**2){ //hit
    ball_x-=Math.ceil(ball_dx/2);
    ball_y-=Math.ceil(ball_dy/2);
    //if((ball_x-x)**2+(ball_y-y)**2<(paddleRadius+ballRadius)**2) console.log('great!');
    let normalx=ball_x-x, normaly=ball_y-y, normallen=Math.sqrt(normalx**2+normaly**2),
    vectorlen=Math.sqrt(ball_dx**2+ball_dy**2), vectorx=ball_dx/vectorlen, vectory=ball_dy/vectorlen; //normalize
    normalx/=normallen; //normailize
    normaly/=normallen;
    let n_dot_i=normalx*vectorx+normaly*vectory;
    ball_dx=(vectorx-2*n_dot_i*normalx)*vectorlen; //reflect
    ball_dy=(vectory-2*n_dot_i*normaly)*vectorlen;
    return true;
  }
  else
    return false;
}
```


- countDown

```
/*time*/
let time_div=document.createElement("div");
time_div.id="time_div";
document.body.appendChild(time_div);
let time_h2=document.createElement("h2");
time_h2.id="score_h2";
time_div.appendChild(time_h2);
let time=document.createTextNode("02 : 00");
time_h2.appendChild(time);
```

```
let countDown=setInterval(function(){
    game_time-=1;
    let sec=game_time%60;
    if(game_time>=0){
        if(sec>9)
            time.nodeValue="0"+Math.floor(game_time/60)+" : "+sec;
        else
            time.nodeValue="0"+Math.floor(game_time/60)+" : 0"+sec;
    }else{
        clearInterval(countDown);
        clearInterval(timer);
        c.clearRect(0, 0, planeWidth, planeHeight);
        Plane();
        if(p1>p2){//p1 win
            c.translate(50, 480);
            c.rotate(-45 * Math.PI / 180);
            c.font = "italic 130px Krungthep";
            c.fillStyle = "red";
            c.fillText("WINNER", 0, 0);
            c.translate(400, 310);
            c.fillStyle = "blue";
            c.fillText("LOSER", 0, 0);
        }else if(p1<p2){//p2 win
            c.translate(120, 430);
            c.rotate(-45 * Math.PI / 180);
            c.font = "italic 130px Krungthep";
            c.fillStyle = "red";
            c.fillText("LOSER", 0, 0);
            c.translate(240, 310);
            c.fillStyle = "blue";
            c.fillText("WINNER", 0, 0);
        }else{//tie
            c.fillStyle="orange";
            c.beginPath();
            c.rect(0, planeHeight/2-150, planeWidth, 300);
            c.fill();
            c.closePath();
            c.font = "italic 250px Krungthep";
            c.fillStyle = "red";
            c.fillText("TIE", 245, 350);
        }
    }, 1000);
```

```

/*main*/
function draw(){
    c.clearRect(0, 0, planeWidth, planeHeight);
    Plane();
    Paddle(p1_x, p1_y, 0);
    Paddle(p2_x, p2_y, 1);
    Ball();

    ball_x+=ball_dx;
    ball_y+=ball_dy;

    /*check constraints*/
    //in hole
    if(ball_x<ballRadius && ball_y>planeHeight/2-holeWidth/2+ballRadius && ball_y<planeHeight/2+holeWidth/2-ballRadius){
        score(1); // in p1's hole p2 gets the point
    }else if(ball_x>planeWidth-ballRadius && ball_y>planeHeight/2-holeWidth/2+ballRadius &&
        ball_y<planeHeight/2+holeWidth/2-ballRadius){
        score(0); // in p2's hole p1 gets the point

    //boundaries
    }else if(ball_x<ballRadius || ball_x>planeWidth-ballRadius || ball_y<ballRadius || ball_y>planeHeight-ballRadius){
        //right left
        if(ball_x<ballRadius){
            ball_x=ballRadius;
            ball_dx*=-1;
        }else if(ball_x>planeWidth-ballRadius){
            ball_x=planeWidth-ballRadius;
            ball_dx*=-1;
        }
        //top bottom
        if(ball_y<ballRadius){
            ball_y=ballRadius;
            ball_dy*=-1;
        }else if(ball_y>planeHeight-ballRadius){
            ball_y=planeHeight-ballRadius;
            ball_dy*=-1;
        }
    }

    //paddle hit ball
    }else{
        if(!hit(p1_x, p1_y))
            hit(p2_x, p2_y);
    }
}

```

```
/*paddle movement*/
if(!p2_go){
    if(p1_left){
        //p1_y=Math.max(p1_y-5, paddleRadius);
        p1_x=Math.max(p1_x-5, paddleRadius);
    }else if(p1_right){
        //p1_y=Math.min(p1_y+5, planeHeight-paddleRadius);
        p1_x=Math.min(p1_x+5, planeWidth/2-paddleRadius);
    }else if(p1_up){
        //p1_x=Math.min(p1_x+5, planeWidth/2-paddleRadius);
        p1_y=Math.max(p1_y-5, paddleRadius);
    }else if(p1_down){
        //p1_x=Math.max(p1_x-5, paddleRadius);
        p1_y=Math.min(p1_y+5, planeHeight-paddleRadius);
    }

    if(p1_go){
        ball_x=p1_x+paddleRadius+ballRadius;
        ball_y=p1_y;
    }
}

if(!p1_go){
    if(p2_left){
        //p2_y=Math.min(p2_y+5, planeHeight-paddleRadius);
        p2_x=Math.max(p2_x-5, planeWidth/2+paddleRadius);
    }else if(p2_right){
        //p2_y=Math.max(p2_y-5, paddleRadius);
        p2_x=Math.min(p2_x+5, planeWidth-paddleRadius);
    }else if(p2_up){
        //p2_x=Math.max(p2_x-5, planeWidth/2+paddleRadius);
        p2_y=Math.max(p2_y-5, paddleRadius);
    }else if(p2_down){
        //p2_x=Math.min(p2_x+5, planeWidth-paddleRadius);
        p2_y=Math.min(p2_y+5, planeHeight-paddleRadius);
    }

    if(p2_go){
        ball_x=p2_x-paddleRadius-ballRadius;
        ball_y=p2_y;
    }
}
```

```
/*bg*/  
if(p1_go || p2_go){  
    document.body.style.backgroundColor = "#341539";  
}else if(ball_x**2+(ball_y-planeHeight/2)**2<(holeWidth/2)**2){  
    document.body.style.backgroundColor = "red";  
}else if((ball_x-planeWidth)**2+(ball_y-planeHeight/2)**2<(holeWidth/2)**2){  
    document.body.style.backgroundColor = "blue";  
}else{  
    document.body.style.backgroundColor = "#341539";  
}
```

```
let timer=setInterval(draw, 10);
```

優化

- start 介面
- restart 介面
- 發球力道
- rounds 特效
- winner & loser 特效
- paddle 美化