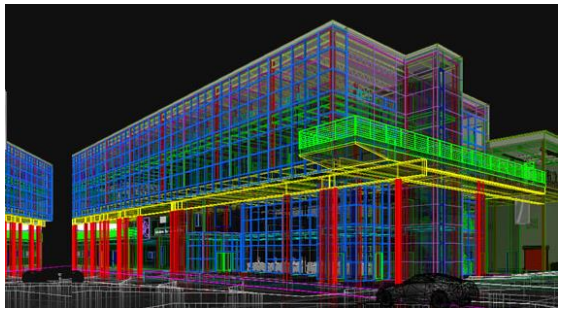
CHAPTER 11.
자바스크립트와 캔버스로 게임 만들기

캔버스

- 캔버스는 <canvas> 요소로 생성
- 캔버스는 HTML 페이지 상에서 사각형태의 영역
- 실제 그림은 자바스크립트를 통하여 코드로 그려야 한다.



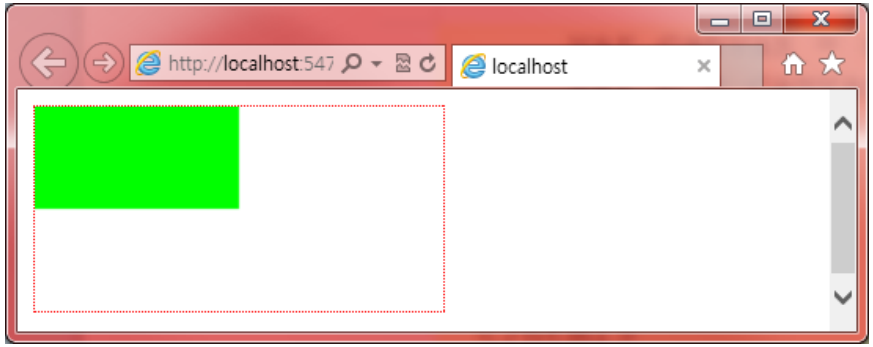
컨텍스트 객체

- **컨텍스트(context) 객체 :** 자바스크립트에서 물감과 붓의 역할을 한다.

```
var canvas = document.getElementById("myCanvas");
var context = canvas.getContext("2d");
```

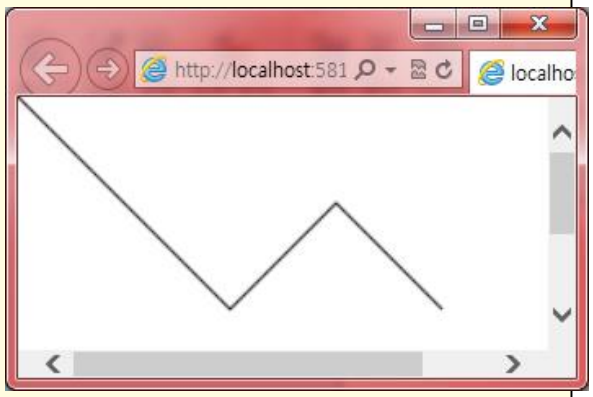
예제

```
<!DOCTYPE html>
<html>

<body>

    <canvas id="myCanvas" width="200" height="100"
        style="border: 1px dotted red"></canvas>
    <script>

        var canvas = document.getElementById("myCanvas");
        var context = canvas.getContext("2d");
        context.fillStyle = "#00FF00";
        context.fillRect(0, 0, 100, 50);
    </script>

</body>
</html>
```



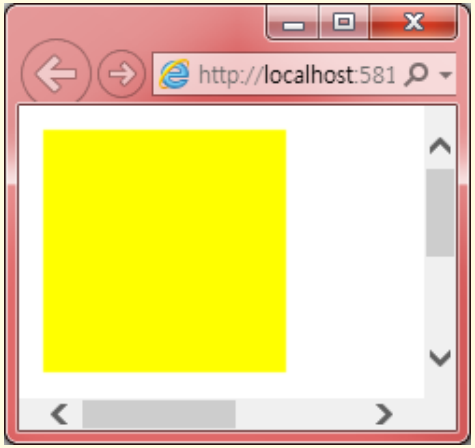
직선 그리기 예제

```
<!DOCTYPE HTML>
<html>
  <head>
    <style>
      body {
        margin: 0px;
        padding: 0px;
      }
    </style>
  </head>
  <body>
    <canvas id="myCanvas" width="300" height="200"></canvas>
    <script>
        var canvas = document.getElementById('myCanvas');
        var context = canvas.getContext('2d');

        context.beginPath();
        context.moveTo(0, 0);
        context.lineTo(100, 100);
        context.lineTo(150, 50);
        context.lineTo(200, 100);
        context.stroke();
    </script>
  </body>
</html>
```



사각형 예제

```
<!DOCTYPE HTML>
<html>
<head>
    <style>
        body {
            margin: 0px;
            padding: 0px;
        }
    </style>
</head>
<body>
    <canvas id="myCanvas" width="300" height="200"></canvas>
    <script>
        var canvas = document.getElementById('myCanvas');
        var context = canvas.getContext('2d');

        context.beginPath();
        context.rect(10, 10, 100, 100);
        context.fillStyle = "yellow";

        context.fill();
    </script>
</body>
</html>
```

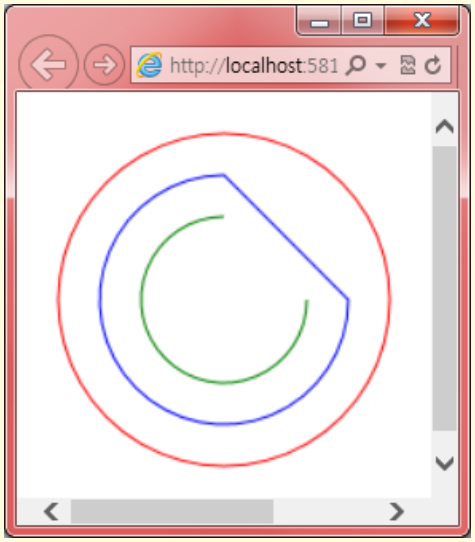


원 예제

```
<!DOCTYPE HTML>
<html>
<head>
    <style>
        body {
            margin: 0px;
            padding: 0px;
        }
    </style>
</head>
```

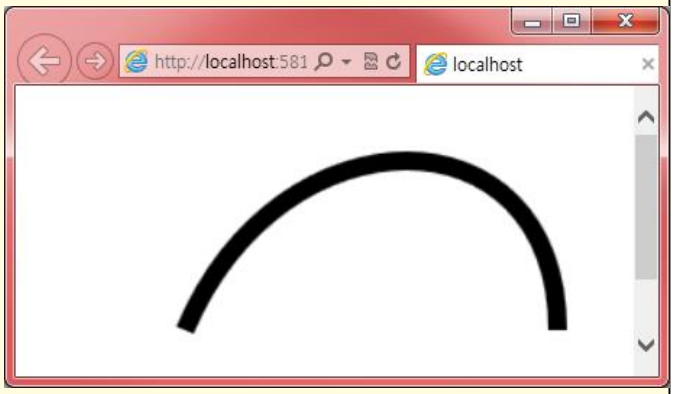
원 예제

```
<body>
   <canvas id="myCanvas" width="300" height="200"></canvas>
    <script>
        var canvas = document.getElementById('myCanvas');
        var context = canvas.getContext('2d');

        context.beginPath();
        context.arc(100, 100, 80, 0, 2.0 * Math.PI, false);
        context.strokeStyle = "red";
        context.stroke();

        context.beginPath();
        context.arc(100, 100, 60, 0, 1.5 * Math.PI, false);
        context.closePath();
        context.strokeStyle = "blue";
        context.stroke();

        context.beginPath();
        context.arc(100, 100, 40, 0, 1.5 * Math.PI, false);
        context.strokeStyle = "green";
        context.stroke();

    </script>
</body>
</html>
```



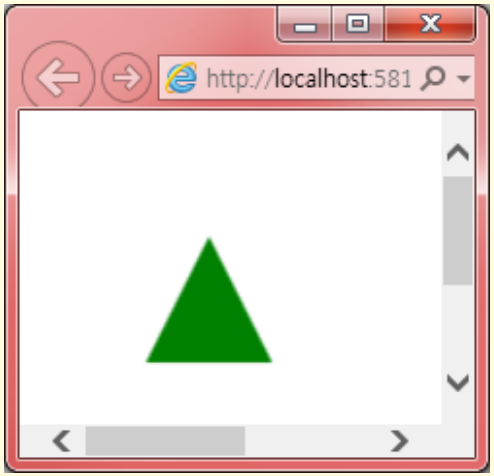
커브 예제

```
<!DOCTYPE HTML>
<html>
<head>
   <style>
      body {
         margin: 0px;
         padding: 0px;
      }
   </style>
</head>
<body>
   <canvas id="myCanvas" width="300" height="200"></canvas>
 <script>
    var canvas = document.getElementById('myCanvas');
    var context = canvas.getContext('2d');

    context.beginPath();
    context.moveTo(90, 130);
    context.bezierCurveTo(140, 10, 288, 10, 288, 130);
    context.lineWidth = 10;

    context.strokeStyle = 'black';
    context.stroke();
</script>
</body>
</html>
```



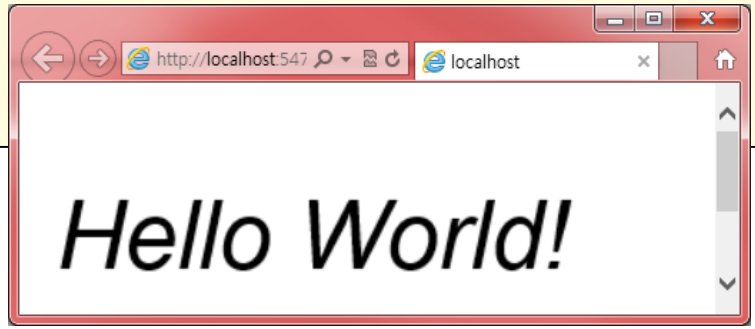
도형 예제

```
<!DOCTYPE HTML>
<html>
<head>
   <style>
      body {
         margin: 0px;
         padding: 0px;
      }
   </style>
</head>
<body>
   <canvas id="myCanvas" width="300" height="200"></canvas>
 <script>
    var canvas = document.getElementById('myCanvas');
    var context = canvas.getContext('2d');

    context.beginPath();
    context.moveTo(50, 100);
    context.lineTo(75, 50);
    context.lineTo(100, 100);
    context.closePath();
    context.fillStyle = "green";
    context.fill();
</script>
</body>
</html>
```



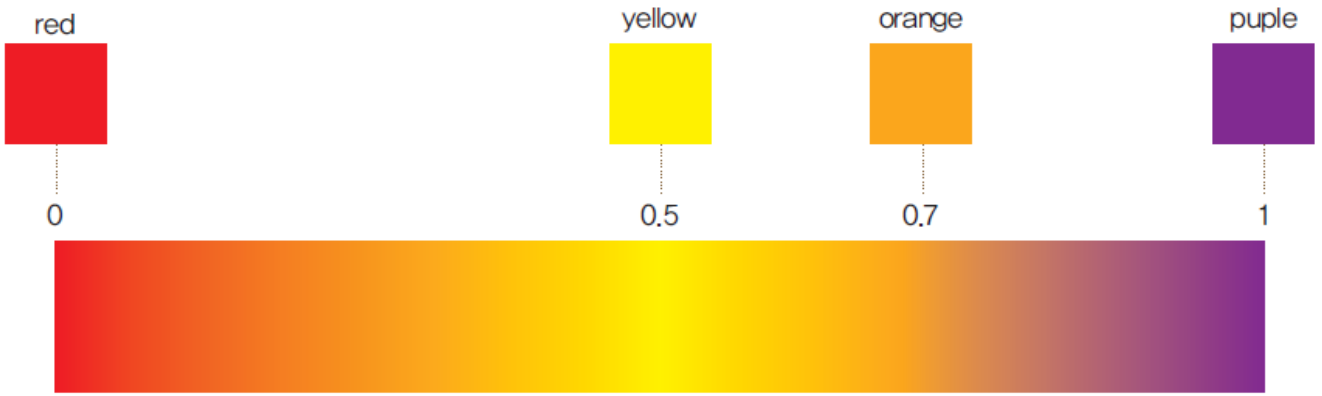
텍스트 예제

```
<!DOCTYPE HTML>
<html>
<head>
   <style>
      body {
         margin: 0px;
         padding: 0px;
      }
   </style>
</head>
<body>
   <canvas id="myCanvas" width="300" height="200"></canvas>
 <script>
    var canvas = document.getElementById('myCanvas');
    var context = canvas.getContext('2d');

    context.font = 'italic 38pt Arial'
    context.fillText('Hello World!', 20, 100);
</script>
</body>
</html>
```



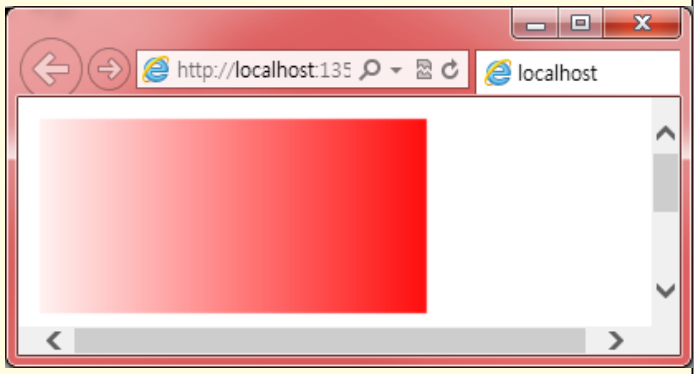
그라디언트

- createLinearGradient(x, y, x1, y1) - 선형 그라디언트를 생성한다.
- createRadialGradient(x, y, r, x1, y1, r1) - 원형 그라디언트를 생성한다.



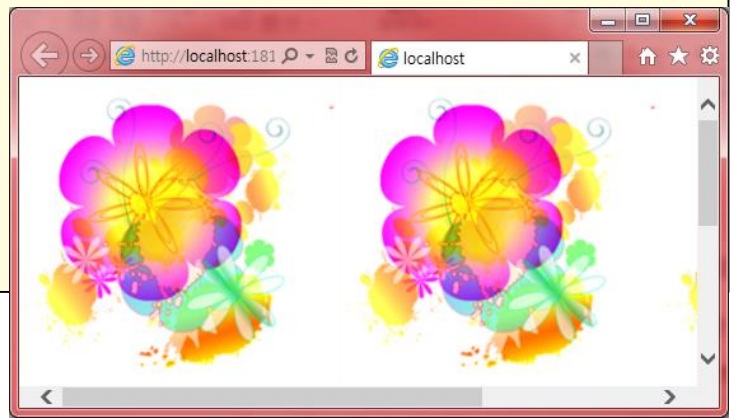
선형 그라디언트 예제

```
<!DOCTYPE HTML>
<html>
<head>
   <style>
      body {
         margin: 0px;
         padding: 0px;
      }
   </style>
</head>
<body>
   <canvas id="myCanvas" width="300" height="200"></canvas>
  <script>
      var canvas = document.getElementById('myCanvas');
      var context = canvas.getContext('2d');

      var gradient = context.createLinearGradient(0, 0, 200, 0);
      gradient.addColorStop(0, "white");
      gradient.addColorStop(1, "red");

      context.fillStyle = gradient;
      context.fillRect(10, 10, 180, 90);
   </script>
</body>
</html>
```



패턴 채우기

```
<!DOCTYPE HTML>
<html>
<head>
..
</head>
<body>
   <canvas id="myCanvas" width="300" height="200"></canvas>
  <script>
      var canvas = document.getElementById("myCanvas");
      var context = canvas.getContext("2d");

      var image = new Image();
      image.src = "pattern.png";
      image.onload = function () {
         var pattern = context.createPattern(image, "repeat");

         context.rect(0, 0, canvas.width, canvas.height);
         context.fillStyle = pattern;
         context.fill();
      };
   </script>
</body>
</html>
```



이미지 그리기

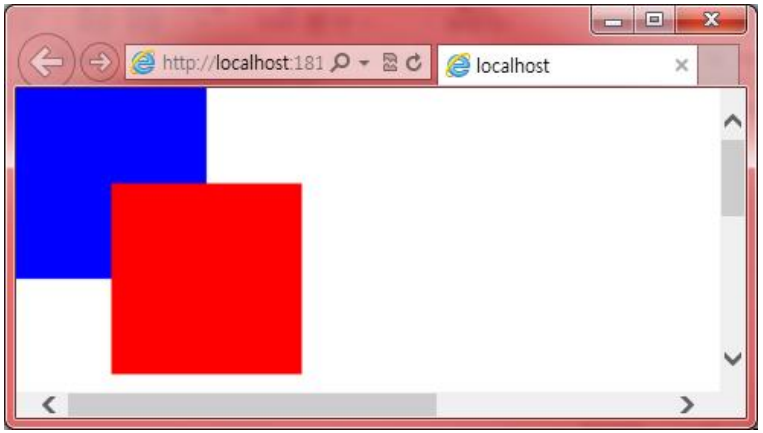
```
<body>
    <canvas id="myCanvas" width="600" height="400"></canvas>
    <script>
        var canvas = document.getElementById("myCanvas");
        var context = canvas.getContext("2d");
        var image = new Image();
        image.src = "html5_logo.png";


            image.onload = function () {
                context.drawImage(image, 0, 0);
            };

    </script>
</body>
```

도형 변환

- 평행이동(translation)
- 신축(scaling)
- 회전(rotation)
- 밀림(shear)
- 반사(mirror)
- 행렬을 이용한 일반적인 변환

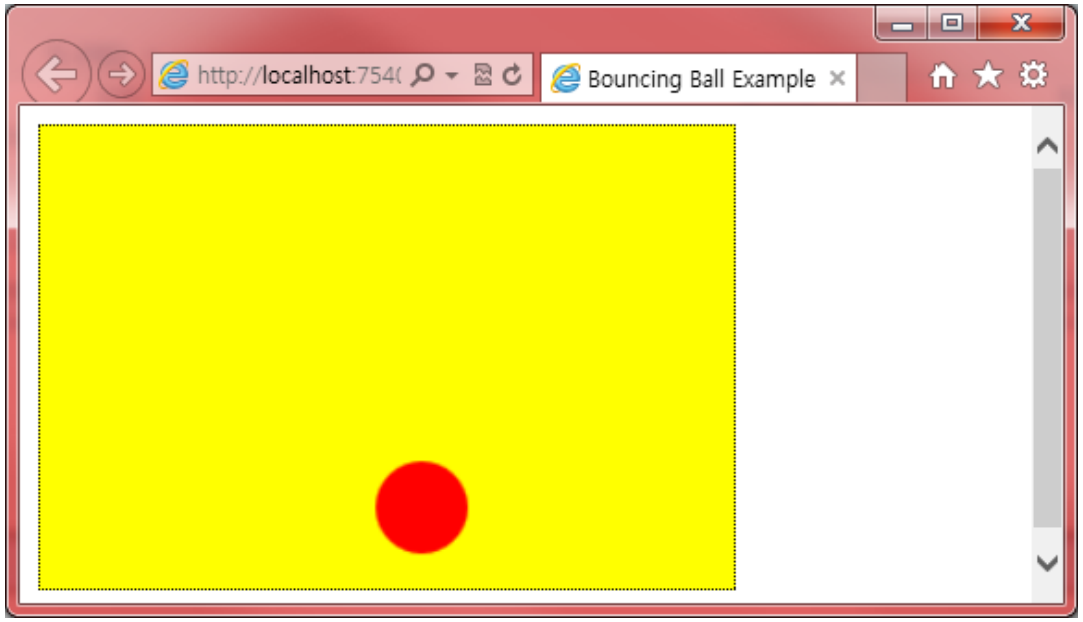
평행이동

```
<body>
    <canvas id="myCanvas" width="600" height="400"></canvas>
    <script>
        var canvas = document.getElementById('myCanvas');
        var context = canvas.getContext('2d');

        context.fillStyle = "blue";

                context.fillRect(0, 0, 100, 100);

        context.translate(50, 50);
        context.fillStyle = "red";
        context.fillRect(0, 0, 100, 100);
    </script>
</body>
```



애니메이션

- Bouncing Ball 예제



Bouncing Ball 예제

```
<!DOCTYPE html>
<html>
<head>
   <title>Bouncing Ball Example</title>
   <style>
      canvas {
         background: yellow;
         border: 1px dotted black;
      }
   </style>
```

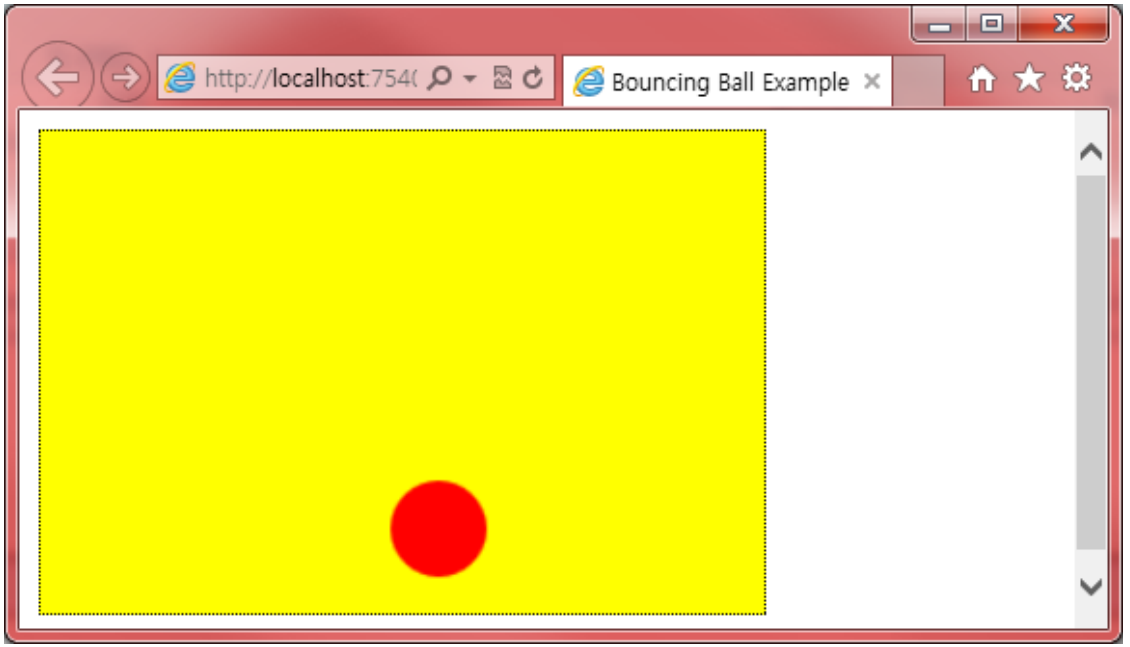
Bouncing Ball 예제

```
<script>
        var context;
        var dx = 5;
        var dy = 5;
        var y = 100;
        var x = 100;
        function draw() {
            var canvas = document.getElementById('myCanvas');
            var context = canvas.getContext('2d');
            context.clearRect(0, 0, 300, 200);
            context.beginPath();
            context.fillStyle = "red";
            context.arc(x, y, 20, 0, Math.PI * 2, true);
            context.closePath();
            context.fill();
            if (x < (0 + 20) || x > (300 - 20))
                dx = -dx;
            if (y < (0 + 20) || y > (200 - 20))
                dy = -dy;
            x += dx;
            y += dy;
        }
        setInterval(draw, 10);
    </script>
</head>
```

Bouncing Ball 예제

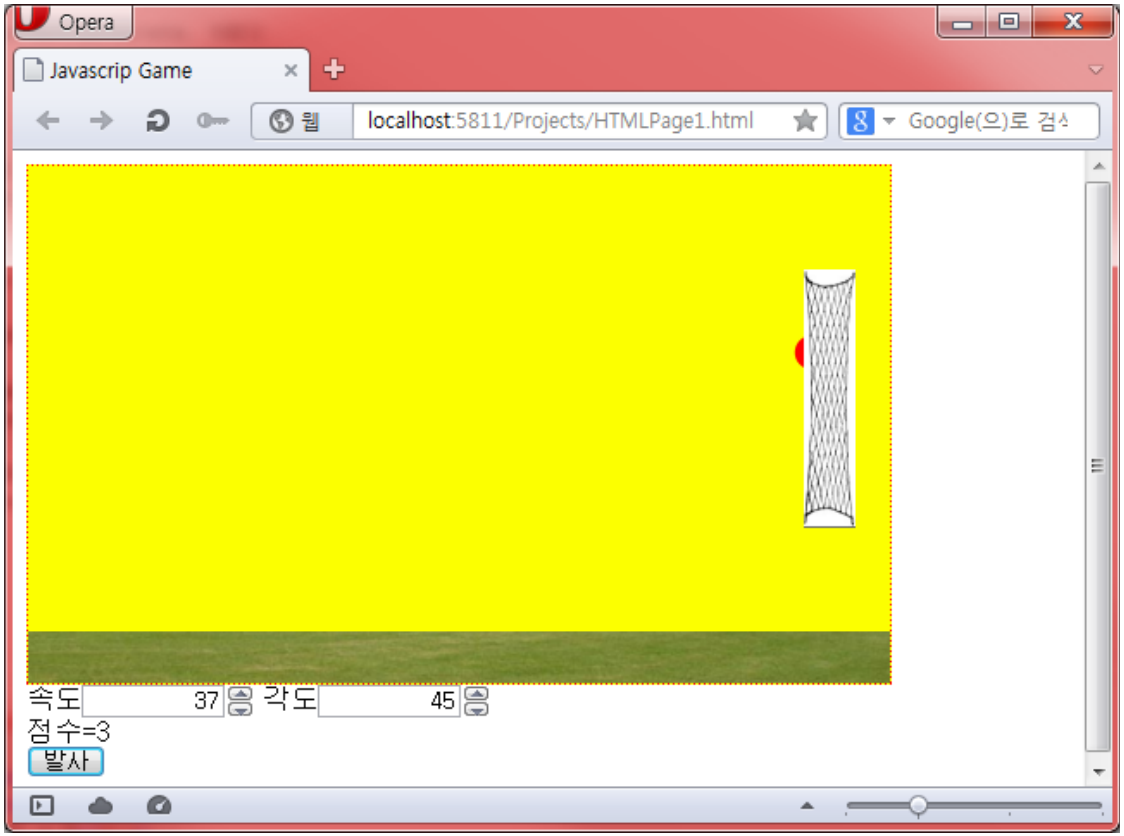
```
<body>
    <canvas id="myCanvas" width="300" height="200"></canvas>
</body>
</html>
```

웹브라우저로 보기



간단한 게임 제작

- 앵그리 버드와 유사한 다음과 같은 게임을 제작



간단한 게임 만들기

```
<html>
<head>
   <title>Javascript Game</title>
   <style>
      canvas {
         border: 1px dotted red;          /* 캔버스에 경계선을 그려준다. */
         background-color: #fcff00;       /* 캔버스의 배경색을 지정한다. */
      }
   </style>
   <script>
      var context;                        /* 컨텍스트 객체*/
      var velocity;                       /* 사용자가 입력한 공의 초기속도 */
      var angle;                          /* 사용자가 입력한 공의 초기각도 */
      var ballV;                          /* 공의 현재 속도 */
      var ballVx;                         /* 공의 현재 x방향 속도 */
      var ballVy;                         /* 공의 현재 y방향 속도 */
      var ballX = 10;                     /* 공의 현재 x방향 위치 */
      var ballY = 250;                    /* 공의 현재 y방향 위치 */
      var ballRadius = 10;                /* 공의 반지름 */
      var score = 0;                      /* 점수 */
```

간단한 게임 만들기

```
var image = new Image();                    /* 이미지 객체 생성 */
image.src = "lawn.png";                     /* 이미지 파일 이름 설정 */
var backimage = new Image();
backimage.src = "net.png";
var timer;                                          /* 타이머 객체 변수 */

/* 공을 화면에 그린다. */
function drawBall() {
    context.beginPath();
    context.arc(ballX, ballY, ballRadius, 0, 2.0 * Math.PI, true);
    context.fillStyle = "red";
    context.fill();
}

/* 배경을 화면에 그린다. */
function drawBackground() {
    context.drawImage(image, 0, 270);
    context.drawImage(backimage, 450, 60);
}
/* 전체 화면을 그리는 함수 */
function draw() {
    context.clearRect(0, 0, 500, 300);      /* 화면을 지운다. */
    drawBall();
    drawBackground();
}
```

간단한 게임 만들기

```
/* 초기화를 담당하는 함수 */
function init() {
    ballX = 10;
    ballY = 250;
    ballRadius = 10;
    context = document.getElementById('canvas').getContext('2d');
    draw();
}

/* 사용자가 발사 버튼을 누르면 호출된다. */
function start() {
    init();
    velocity = Number(document.getElementById("velocity").value);
    angle = Number(document.getElementById("angle").value);
    var angleR = angle * Math.PI / 180;

    ballVx = velocity * Math.cos(angleR);
    ballVy = -velocity * Math.sin(angleR);

    draw();
    timer = setInterval(calculate, 100);
    return false;
}
```

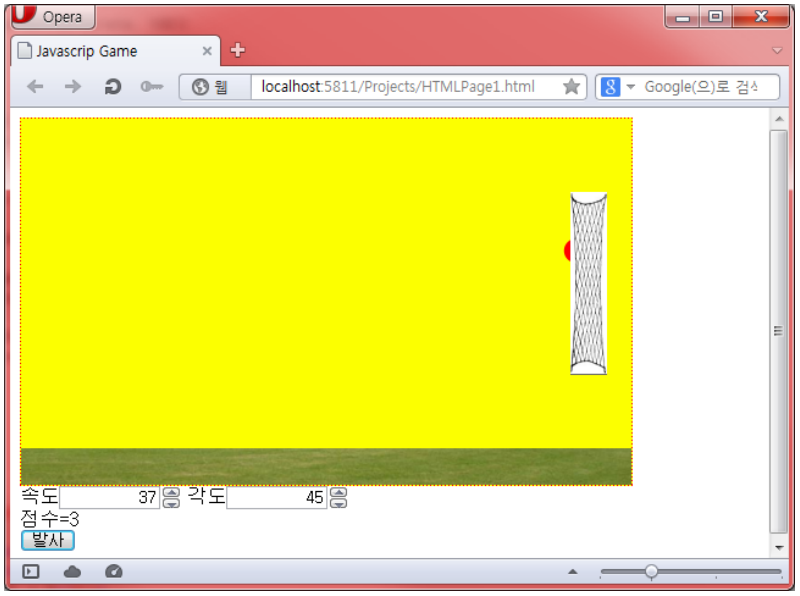
간단한 게임 만들기

```
/* 공의 현재 속도와 위치를 업데이트한다. */
        function calculate() {
            ballVy = ballVy + 1.98;

            ballX = ballX + ballVx;
            ballY = ballY + ballVy;

            /* 공이 목표물에 맞았으면 */
            if ((ballX >= 450) && (ballX <= 480) && (ballY >= 60) && (ballY <= 210)) {
                score++;
                document.getElementById("score").innerHTML = "점수=" + score;
                clearInterval(timer);
            }
            /* 공이 경계를 벗어났으면 */
            if (ballY >= 300 || ballY < 0) {
                clearInterval(timer);
            }
            draw();
        }
    </script>
</head>
```

간단한 게임 만들기

```
<body onload="init();">
    <canvas id="canvas" width="500" height="300"></canvas>
    <div id="control">
        속도<input id="velocity" value="30" type="number" min="0" max="100"
step="1" />
        각도<input id="angle" value="45" type="number" min="0" max="90" step="1"
/>
        <div id="score">점수 = 0</div>
        <button onclick="start()">발사</button>
    </div>
</body>
</html>
```

웹브라우저로 보기



Q & A