

Section E

Unit #1

Lerp
Game



Section E Unit #1 lerp game

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Introduction to Unit #1 lerp game

We are going to make what should be quite a simple game although it is far from simple as you will see. You will move around the canvas using the arrow keys to collect targets without being caught by a circle following you around.

This uses the `lerp()` function which measures the distance between two points and incrementally closes that distance in units supplied by you. The bigger the units/steps/increments the faster it approaches you. It is worked out as a percentage so as it get closer the rate it moves decreases and stops when the distance is zero.



Sketch E1.1 the enemy

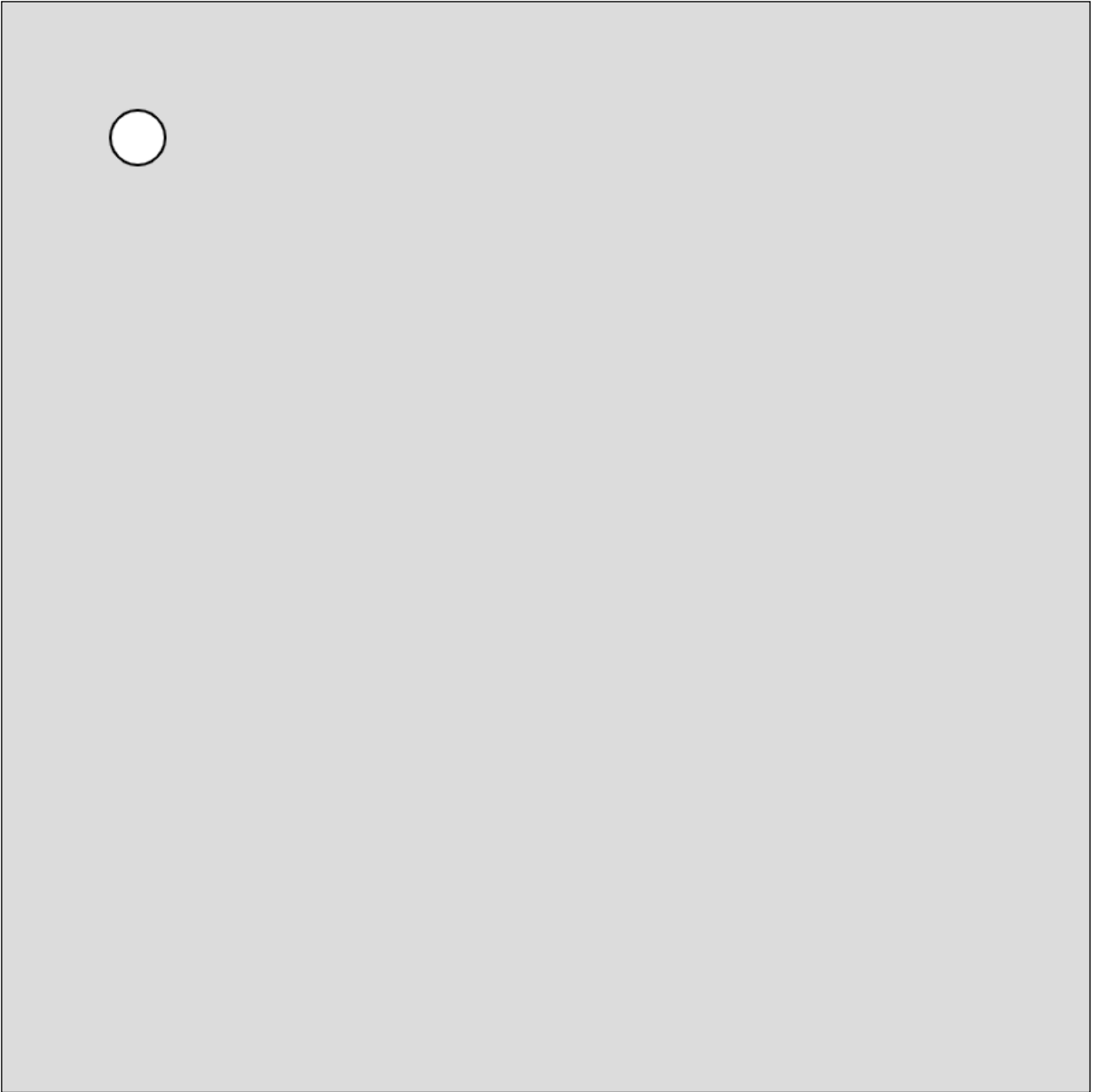
Create two variables for the enemy xEnemy and yEnemy and draw the enemy who will come after you

```
let xEnemy = 50
let yEnemy = 50

function setup()
{
  createCanvas(400, 400)
}

function draw()
{
  background(220)
  circle(xEnemy, yEnemy, 20)
}
```

Our nemesis





Sketch E1.2 you are the goody

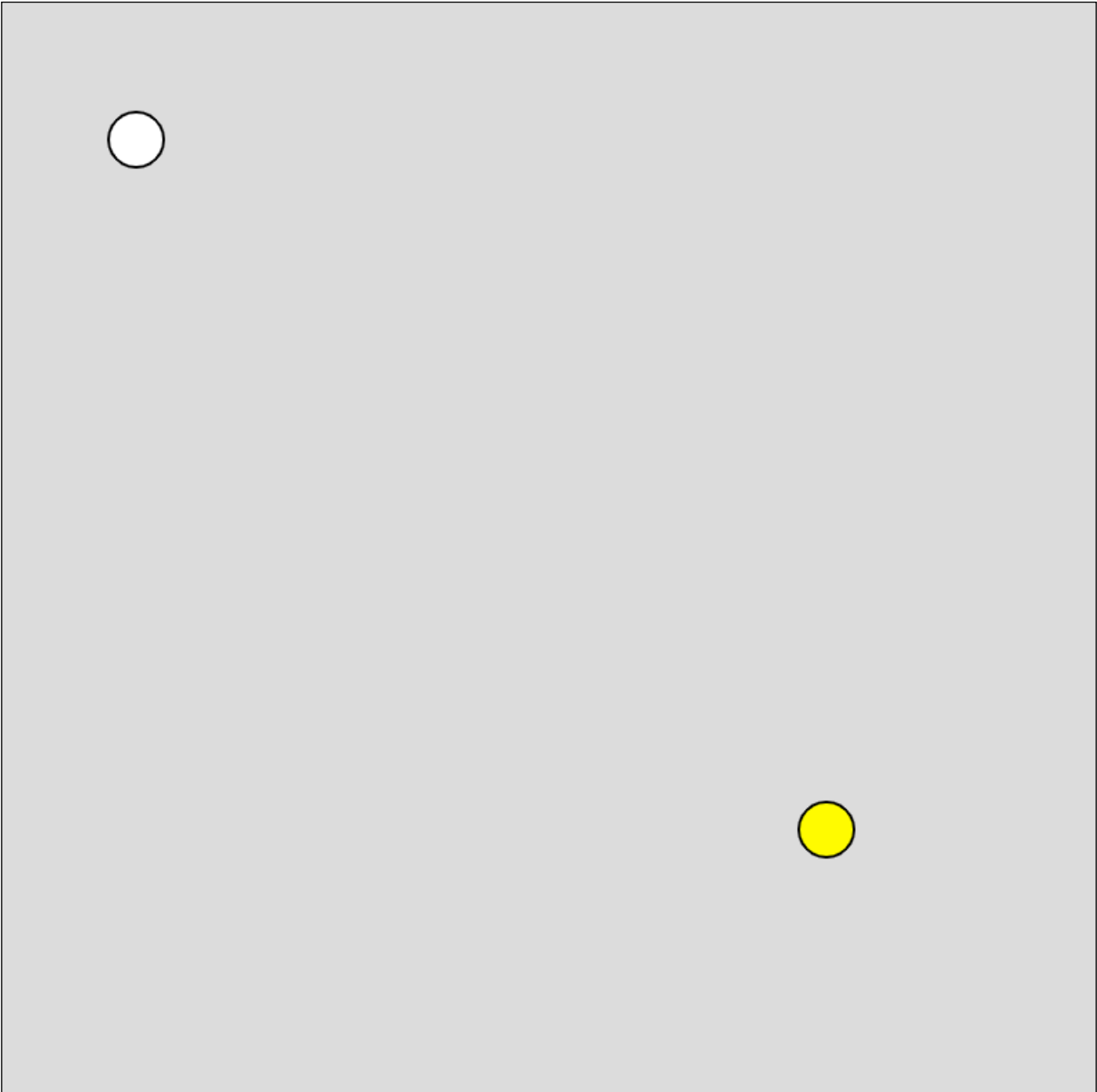
Now we add you the goodie and you are in yellow

```
let xEnemy = 50
let yEnemy = 50
let xGood = 300
let yGood = 300

function setup()
{
  createCanvas(400, 400)
}

function draw()
{
  background(220)
  fill('white')
  circle(xEnemy, yEnemy, 20)
  fill('yellow')
  circle(xGood, yGood, 20)
}
```

And you





Sketch E1.3 seeking you out

We can now demonstrate the lerp() function, the enemy will seek you out gradually slowing down as it gets closer.

```
let xEnemy = 50
let yEnemy = 50
let xGood = 300
let yGood = 300

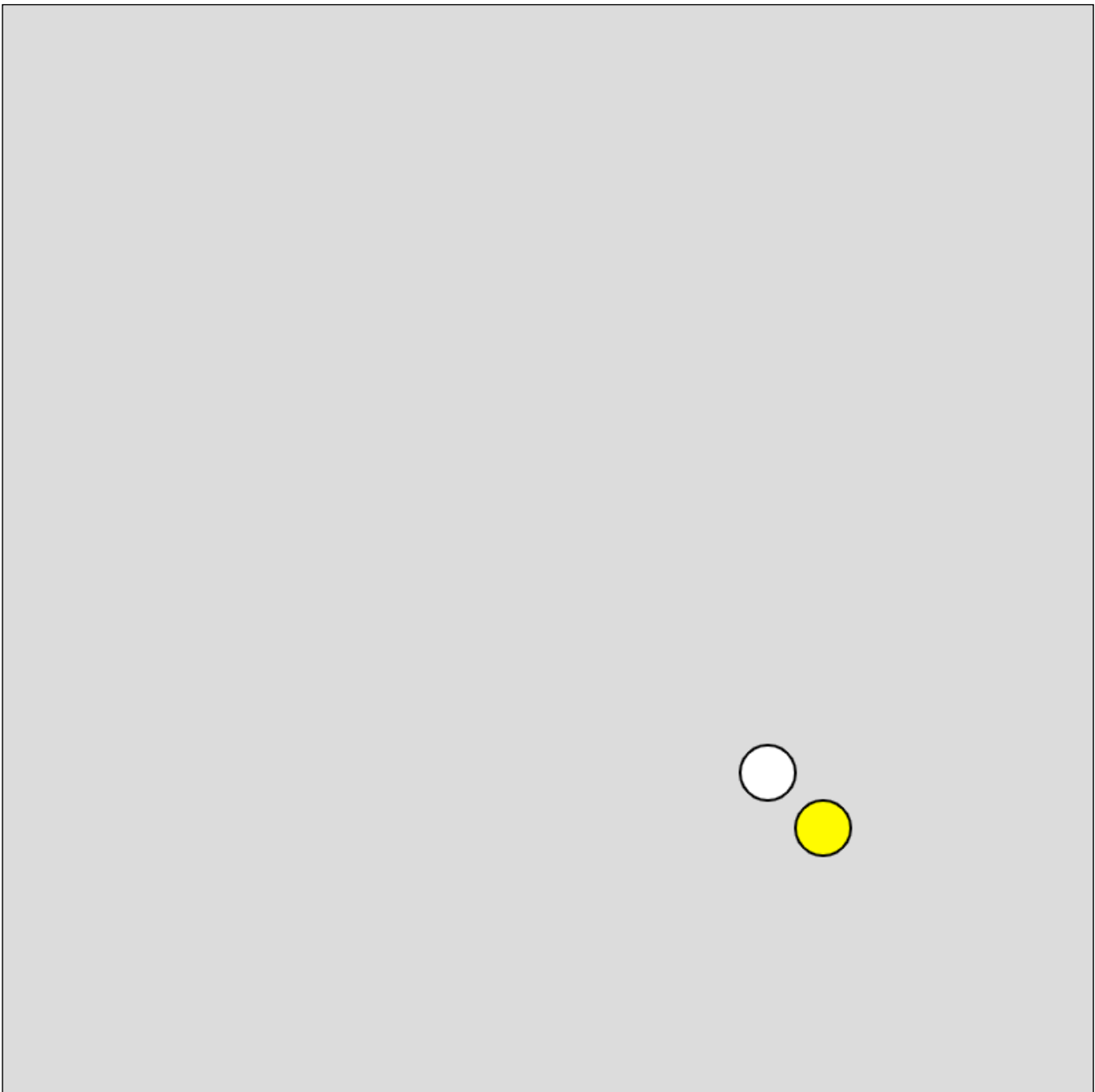
function setup()
{
  createCanvas(400, 400)
}

function draw()
{
  background(220)
  fill('white')
  xEnemy = lerp(xEnemy, xGood, 0.01)
  yEnemy = lerp(yEnemy, yGood, 0.01)
  circle(xEnemy, yEnemy, 20)
  fill('yellow')
  circle(xGood, yGood, 20)
}
```


Challenges

1. Play around with the lerp() incremental variable, change form 0.01 to 0.1
2. Also give the x and the y different values

It's coming for you





Sketch E1.4 the arrow keys (part 1)

However we want to escape the clutches of our arch enemy, so we are going to use the arrow keys to move you around. We will start with the left arrow key. Try it (first click on the canvas **and then** press the left arrow key)

```
let xEnemy = 50
let yEnemy = 50
let xGood = 300
let yGood = 300

function setup()
{
  createCanvas(400, 400)
}

function draw()
{
  background(220)
  fill('white')
  xEnemy = lerp(xEnemy, xGood, 0.01)
  yEnemy = lerp(yEnemy, yGood, 0.01)
  circle(xEnemy, yEnemy, 20)
  fill('yellow')
  circle(xGood, yGood, 20)

  if (keyIsDown(LEFT_ARROW))
  {
    xGood -= 5
  }
}
```




the arrow keys (part 2)

Now let us add the other keys and keep away from the enemy

```
let xEnemy = 50
let yEnemy = 50
let xGood = 300
let yGood = 300

function setup()
{
  createCanvas(400, 400)
}

function draw()
{
  background(220)
  fill('white')
  xEnemy = lerp(xEnemy, xGood, 0.01)
  yEnemy = lerp(yEnemy, yGood, 0.01)
  circle(xEnemy, yEnemy, 20)
  fill('yellow')
  circle(xGood, yGood, 20)

  if (keyIsDown(LEFT_ARROW))
  {
    xGood -= 5
  }

  if (keyIsDown(RIGHT_ARROW))
  {
    xGood += 5
  }
}
```

```
if (keyIsDown(UP_ARROW))
{
    yGood -= 5
}
if (keyIsDown(DOWN_ARROW))
{
    yGood += 5
}
}
```



Sketch E1.5 off the edge

The problem is that you can disappear off the edge. We could do one of two things 1. Put a barrier so you can't escape beyond the canvas or 2. Reappear on the opposite side. We will go with the second option because it is easier to play.

We add another function called `edges()` to facilitate this. We call it in `draw()`.

```
let xEnemy = 50
let yEnemy = 50
let xGood = 300
let yGood = 300

function setup()
{
  createCanvas(400, 400)
}

function draw()
{
  background(220)
  fill('white')
  xEnemy = lerp(xEnemy, xGood, 0.01)
  yEnemy = lerp(yEnemy, yGood, 0.01)
  circle(xEnemy, yEnemy, 20)
  fill('yellow')
  circle(xGood, yGood, 20)

  if (keyIsDown(LEFT_ARROW))
  {
    xGood -= 5
  }
}
```

```
if (keyIsDown(RIGHT_ARROW))
{
    xGood += 5
}
if (keyIsDown(UP_ARROW))
{
    yGood -= 5
}
if (keyIsDown(DOWN_ARROW))
{
    yGood += 5
}
edges()
}
```

```
function edges()
{
    if (xGood > width)
    {
        xGood = 0
    }
    if (xGood < 0)
    {
        xGood = width
    }
    if (yGood > height)
    {
        yGood = 0
    }
    if (yGood < 0)
    {
        yGood = height
    }
}
```

}



Sketch E1.6 targets

We need targets for you to accumulate as part of the game without being caught by the enemy. We will store them in two arrays for their x and y values. Although we will create 20 of them (in `setup()`) we will only display 5 of them (in `draw()`).

```
let xEnemy = 50
let yEnemy = 50
let xGood = 300
let yGood = 300
let xTarget = []
let yTarget = []

function setup()
{
  createCanvas(400, 400)
  for (let i = 0; i < 20; i++)
  {
    xTarget[i] = random(width)
    yTarget[i] = random(height)
  }
}

function draw()
{
  background(220)
  for (let i = 0; i < 5; i++)
  {
    fill('red')
    circle(xTarget[i], yTarget[i], 20)
  }
  fill('white')
```

```

xEnemy = lerp(xEnemy, xGood, 0.01)
yEnemy = lerp(yEnemy, yGood, 0.01)
circle(xEnemy, yEnemy, 20)
fill('yellow')
circle(xGood, yGood, 20)

if (keyIsDown(LEFT_ARROW))
{
  xGood -= 5
}
if (keyIsDown(RIGHT_ARROW))
{
  xGood += 5
}
if (keyIsDown(UP_ARROW))
{
  yGood -= 5
}
if (keyIsDown(DOWN_ARROW))
{
  yGood += 5
}
edges()
}

function edges()
{
  if (xGood > width)
  {
    xGood = 0
  }
  if (xGood < 0)
  {

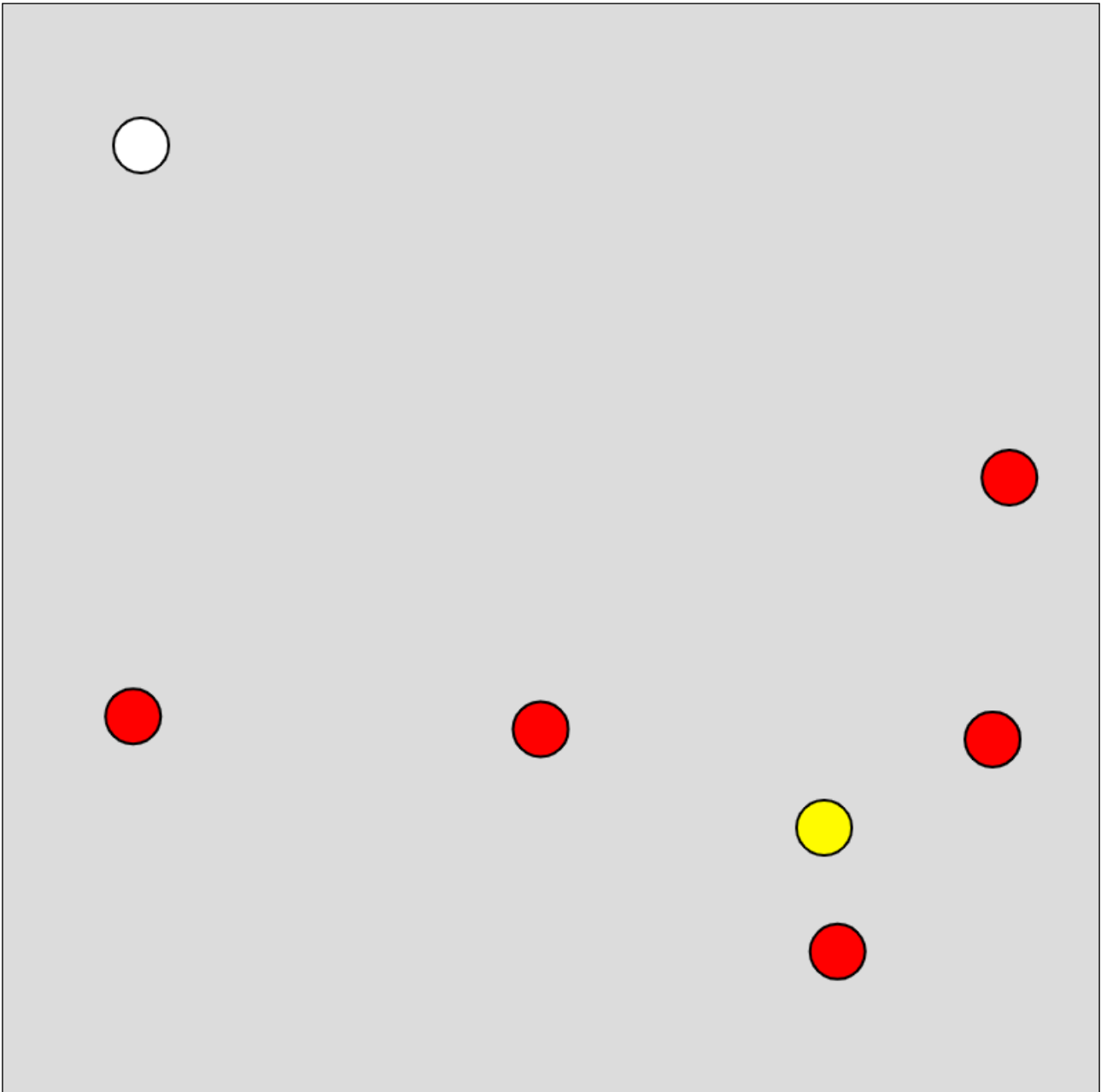
```

```
xGood = width
}
if (yGood > height)
{
    yGood = 0
}
if (yGood < 0)
{
    yGood = height
}
}
```

Notes

The idea is that you collect them before you get caught, so we need to work out when you have caught one of the targets. We use `dist()` function.

Our 5 red targets





Sketch E1.7 measuring the distance

We create an empty array to store the distances between you and the targets. It is constantly updating as you move around the canvas.

```
let xEnemy = 50
let yEnemy = 50
let xGood = 300
let yGood = 300
let xTarget = []
let yTarget = []
let tDist = []

function setup()
{
  createCanvas(400, 400)
  for (let i = 0; i < 20; i++)
  {
    xTarget[i] = random(width)
    yTarget[i] = random(height)
  }
}

function draw()
{
  background(220)
  for (let i = 0; i < 5; i++)
  {
    fill('red')
    circle(xTarget[i], yTarget[i], 20)
    tDist[i] = dist(xGood, yGood, xTarget[i], yTarget[i])
  }
  fill('white')
```

```

xEnemy = lerp(xEnemy, xGood, 0.01)
yEnemy = lerp(yEnemy, yGood, 0.01)
circle(xEnemy, yEnemy, 20)
fill('yellow')
circle(xGood, yGood, 20)

if (keyIsDown(LEFT_ARROW))
{
  xGood -= 5
}
if (keyIsDown(RIGHT_ARROW))
{
  xGood += 5
}
if (keyIsDown(UP_ARROW))
{
  yGood -= 5
}
if (keyIsDown(DOWN_ARROW))
{
  yGood += 5
}
edges()
}

function edges()
{
  if (xGood > width)
  {
    xGood = 0
  }
  if (xGood < 0)
  {

```

```
    xGood = width
  }
  if (yGood > height)
  {
    yGood = 0
  }
  if (yGood < 0)
  {
    yGood = height
  }
}
```

Notes

We can now see if at any time you are within 20 pixels from centre to centre to a target.



Sketch E1.8 removing the targets

We are then going to remove that target from the array, you will notice that it replaces it with another target from the array. When you run out of targets you should get an error message.

```
let xEnemy = 50
let yEnemy = 50
let xGood = 300
let yGood = 300
let xTarget = []
let yTarget = []
let tDist = []

function setup()
{
  createCanvas(400, 400)
  for (let i = 0; i < 20; i++)
  {
    xTarget[i] = random(width)
    yTarget[i] = random(height)
  }
}

function draw()
{
  background(220)
  for (let i = 0; i < 5; i++)
  {
    fill('red')
    circle(xTarget[i], yTarget[i], 20)
    tDist[i] = dist(xGood, yGood, xTarget[i], yTarget[i])
    if(tDist[i] < 20)
```

```

    {
      xTarget.splice([i], 1)
      yTarget.splice([i], 1)
    }
  }
  fill('white')
  xEnemy = lerp(xEnemy, xGood, 0.01)
  yEnemy = lerp(yEnemy, yGood, 0.01)
  circle(xEnemy, yEnemy, 20)
  fill('yellow')
  circle(xGood, yGood, 20)

  if (keyIsDown(LEFT_ARROW))
  {
    xGood -= 5
  }
  if (keyIsDown(RIGHT_ARROW))
  {
    xGood += 5
  }
  if (keyIsDown(UP_ARROW))
  {
    yGood -= 5
  }
  if (keyIsDown(DOWN_ARROW))
  {
    yGood += 5
  }
  edges()
}

function edges()
{

```

```
if (xGood > width)
{
    xGood = 0
}
if (xGood < 0)
{
    xGood = width
}
if (yGood > height)
{
    yGood = 0
}
if (yGood < 0)
{
    yGood = height
}
}
```



Sketch E1.9 error message

To get round the error message because it is trying to draw a circle that has been deleted from that index we have a check if the xTarget or yTarget value is null. Also stop the loop on the last circle

```
let xEnemy = 50
let yEnemy = 50
let xGood = 300
let yGood = 300
let xTarget = []
let yTarget = []
let tDist = []

function setup()
{
  createCanvas(400, 400)
  for (let i = 0; i < 20; i++)
  {
    xTarget[i] = random(width)
    yTarget[i] = random(height)
  }
}

function draw()
{
  background(220)
  for (let i = 0; i < 5; i++)
  {
    if (xTarget[i] != null || yTarget[i] != null)
    {
      fill('red')
      circle(xTarget[i], yTarget[i], 20)
    }
  }
}
```

```

    tDist[i] = dist(xGood, yGood, xTarget[i], yTarget[i])
    if(tDist[i] < 20)
    {
        xTarget.splice([i], 1)
        yTarget.splice([i], 1)
    }
}

}

fill('white')
xEnemy = lerp(xEnemy, xGood, 0.01)
yEnemy = lerp(yEnemy, yGood, 0.01)
circle(xEnemy, yEnemy, 20)
fill('yellow')
circle(xGood, yGood, 20)

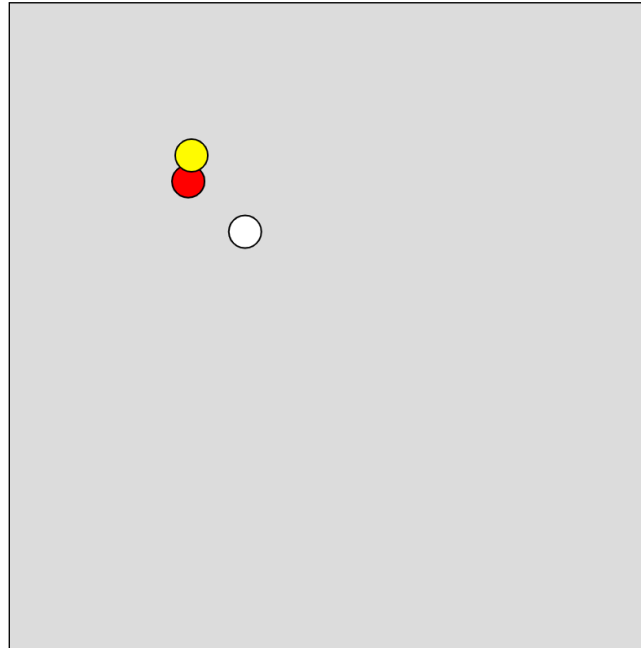
if (keyIsDown(LEFT_ARROW))
{
    xGood -= 5
}
if (keyIsDown(RIGHT_ARROW))
{
    xGood += 5
}
if (keyIsDown(UP_ARROW))
{
    yGood -= 5
}
if (keyIsDown(DOWN_ARROW))
{
    yGood += 5
}
edges()

```

```
if (xTarget.length <= 0)
{
  noLoop()
}
}
```

```
function edges()
{
  if (xGood > width)
  {
    xGood = 0
  }
  if (xGood < 0)
  {
    xGood = width
  }
  if (yGood > height)
  {
    yGood = 0
  }
}
```

Now there is no error message and everything stops when you have caught the last target





Sketch E1.10 you have won

When we reach the point where you have caught all the targets you want a sign that says you have won. So instead of just a `noLoop()` we change the canvas.

```
let xEnemy = 50
let yEnemy = 50
let xGood = 300
let yGood = 300
let xTarget = []
let yTarget = []
let tDist = []

function setup()
{
  createCanvas(400, 400)
  for (let i = 0; i < 20; i++)
  {
    xTarget[i] = random(width)
    yTarget[i] = random(height)
  }
}

function draw()
{
  background(220)
  for (let i = 0; i < 5; i++)
  {
    if (xTarget[i] != null || yTarget[i] != null)
    {
      fill('red')
      circle(xTarget[i], yTarget[i], 20)
    }
  }
}
```



```

    tDist[i] = dist(xGood, yGood, xTarget[i], yTarget[i])
    if(tDist[i] < 20)
    {
        xTarget.splice([i], 1)
        yTarget.splice([i], 1)
    }
}
}

fill('white')
xEnemy = lerp(xEnemy, xGood, 0.01)
yEnemy = lerp(yEnemy, yGood, 0.01)
circle(xEnemy, yEnemy, 20)
fill('yellow')
circle(xGood, yGood, 20)

if (keyIsDown(LEFT_ARROW))
{
    xGood -= 5
}
if (keyIsDown(RIGHT_ARROW))
{
    xGood += 5
}
if (keyIsDown(UP_ARROW))
{
    yGood -= 5
}
if (keyIsDown(DOWN_ARROW))
{
    yGood += 5
}
edges()

```

When you catch them all



```
if (xTarget.length <= 0)
{
  background('blue')
  textSize(100)
  fill('white')
  textAlign(CENTER, CENTER)
  text('you won', width/2, height/2)
  noLoop()
}
}

function edges()
{
  if (xGood > width)
  {
    xGood = 0
  }
  if (xGood < 0)
  {
```

```
    xGood = width
  }
  if (yGood > height)
  {
    yGood = 0
  }
  if (yGood < 0)
  {
    yGood = height
  }
}
```



Sketch E1.11 you have lost

But what if you get caught by the enemy! We create a variable to measure that distance called `eDist` for short

```
let xEnemy = 50
let yEnemy = 50
let xGood = 300
let yGood = 300
let xTarget = []
let yTarget = []
let tDist = []
let eDist

function setup()
{
  createCanvas(400, 400)
  for (let i = 0; i < 20; i++)
  {
    xTarget[i] = random(width)
    yTarget[i] = random(height)
  }
}

function draw()
{
  background(220)
  for (let i = 0; i < 5; i++)
  {
    if (xTarget[i] != null || yTarget[i] != null)
    {
      fill('red')
      circle(xTarget[i], yTarget[i], 20)
    }
  }
}
```

```

    tDist[i] = dist(xGood, yGood, xTarget[i], yTarget[i])
    if(tDist[i] < 20)
    {
        xTarget.splice([i], 1)
        yTarget.splice([i], 1)
    }
}
}

fill('white')
xEnemy = lerp(xEnemy, xGood, 0.01)
yEnemy = lerp(yEnemy, yGood, 0.01)
circle(xEnemy, yEnemy, 20)
fill('yellow')
circle(xGood, yGood, 20)

if (keyIsDown(LEFT_ARROW))
{
    xGood -= 5
}
if (keyIsDown(RIGHT_ARROW))
{
    xGood += 5
}
if (keyIsDown(UP_ARROW))
{
    yGood -= 5
}
if (keyIsDown(DOWN_ARROW))
{
    yGood += 5
}
edges()

```

```
if (xTarget.length <= 0)
{
  background('blue')
  textSize(100)
  fill('white')
  textAlign(CENTER, CENTER)
  text('you won', width/2, height/2)
  noLoop()
}
```

```
eDist = dist(xEnemy, yEnemy, xGood, yGood)
if (eDist < 20)
{
  background('green')
  textSize(100)
  fill('white')
  textAlign(CENTER, CENTER)
  text('you lost', width/2, height/2)
  noLoop()
}
```

```
}
```

```
function edges()
{
  if (xGood > width)
  {
    xGood = 0
  }
  if (xGood < 0)
  {
    xGood = width
  }
  if (yGood > height)
  {
```

```
yGood = 0
}
if (yGood < 0)
{
  yGood = height
}
}
```

What happens if you get caught



you lost



Sketch E1.12 increase the speed

We are going to give the enemy's speed a variable name `enemySpeed` and set it to 0.01, but during the game that speed will increase incrementally each time you catch a target. You will notice that it speeds up quite a lot by the end.

```
let xEnemy = 50
let yEnemy = 50
let xGood = 300
let yGood = 300
let xTarget = []
let yTarget = []
let tDist = []
let eDist

let enemySpeed = 0.01

function setup()
{
  createCanvas(400, 400)
  for (let i = 0; i < 20; i++)
  {
    xTarget[i] = random(width)
    yTarget[i] = random(height)
  }
}

function draw()
{
  background(220)
  for (let i = 0; i < 5; i++)
  {
    if (xTarget[i] != null || yTarget[i] != null)
```



```

{
  fill('red')
  circle(xTarget[i], yTarget[i], 20)
  tDist[i] = dist(xGood, yGood, xTarget[i], yTarget[i])
  if(tDist[i] < 20)
  {
    xTarget.splice([i], 1)
    yTarget.splice([i], 1)
    enemySpeed += 0.001
  }
}
}

fill('white')
xEnemy = lerp(xEnemy, xGood, enemySpeed)
yEnemy = lerp(yEnemy, yGood, enemySpeed)
circle(xEnemy, yEnemy, 20)
fill('yellow')
circle(xGood, yGood, 20)

if (keyIsDown(LEFT_ARROW))
{
  xGood -= 5
}
if (keyIsDown(RIGHT_ARROW))
{
  xGood += 5
}
if (keyIsDown(UP_ARROW))
{
  yGood -= 5
}
if (keyIsDown(DOWN_ARROW))

```

```

{
  yGood += 5
}
edges()
if (xTarget.length <= 0)
{
  background('blue')
  textSize(100)
  fill('white')
  textAlign(CENTER, CENTER)
  text('you won', width/2, height/2)
  noLoop()
}
eDist = dist(xEnemy, yEnemy, xGood, yGood)
if (eDist < 20)
{
  background('green')
  textSize(100)
  fill('white')
  textAlign(CENTER, CENTER)
  text('you lost', width/2, height/2)
  noLoop()
}
}

function edges()
{
  if (xGood > width)
  {
    xGood = 0
  }
  if (xGood < 0)
  {

```

```
    xGood = width
  }
  if (yGood > height)
  {
    yGood = 0
  }
  if (yGood < 0)
  {
    yGood = height
  }
}
```



Sketch E1.13 a bit more menacing

Let's make the enemy a little more menacing

```
let xEnemy = 50
let yEnemy = 50
let xGood = 300
let yGood = 300
let xTarget = []
let yTarget = []
let tDist = []
let eDist
let enemySpeed = 0.01
let r = 0

function setup()
{
  createCanvas(400, 400)
  for (let i = 0; i < 20; i++)
  {
    xTarget[i] = random(width)
    yTarget[i] = random(height)
  }
}

function draw()
{
  background(220)
  for (let i = 0; i < 5; i++)
  {
    if (xTarget[i] != null || yTarget[i] != null)
    {
```

```
fill('red')
circle(xTarget[i], yTarget[i], 20)
tDist[i] = dist(xGood, yGood, xTarget[i], yTarget[i])
if(tDist[i] < 20)
{
  xTarget.splice([i], 1)
  yTarget.splice([i], 1)
  enemySpeed += 0.001
}
}
```

```
fill('black')
xEnemy = lerp(xEnemy, xGood, enemySpeed)
yEnemy = lerp(yEnemy, yGood, enemySpeed)
push()
strokeWeight(2)
translate(xEnemy, yEnemy)
rotate(r)
circle(0, 0, 10)
line(-10, 0, 10, 0)
line(0, -10, 0, 10)
r += 0.9
pop()
```

```
fill('yellow')
circle(xGood, yGood, 20)

if (keyIsDown(LEFT_ARROW))
{
  xGood -= 5
}

if (keyIsDown(RIGHT_ARROW))
{
```

```

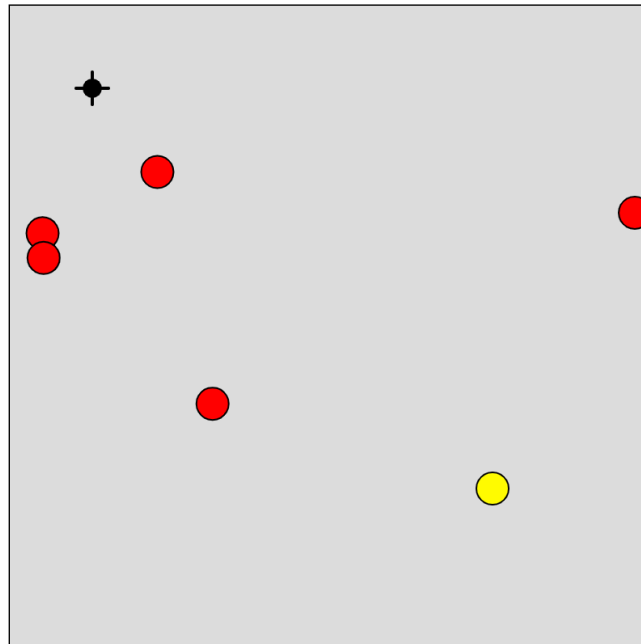
    xGood += 5
  }
  if (keyIsDown(UP_ARROW))
  {
    yGood -= 5
  }
  if (keyIsDown(DOWN_ARROW))
  {
    yGood += 5
  }
  edges()
  if (xTarget.length <= 0)
  {
    background('blue')
    textSize(100)
    fill('white')
    textAlign(CENTER, CENTER)
    text('you won', width/2, height/2)
    noLoop()
  }
  eDist = dist(xEnemy, yEnemy, xGood, yGood)
  if (eDist < 20)
  {
    background('green')
    textSize(100)
    fill('white')
    textAlign(CENTER, CENTER)
    text('you lost', width/2, height/2)
    noLoop()
  }
}

function edges()

```

```
{
  if (xGood > width)
  {
    xGood = 0
  }
  if (xGood < 0)
  {
    xGood = width
  }
  if (yGood > height)
  {
    yGood = 0
  }
  if (yGood < 0)
  {
    yGood = height
  }
}
```

The enemy now spins round as it advances



Challenges

1. Change the background
2. Make the enemy move increasingly faster
3. Have the targets move around
4. Add a png image for the targets, you and the enemy
5. You could have a score at the top
6. You could have lives
7. Instead of reappearing on the opposite side you could stop at the edge