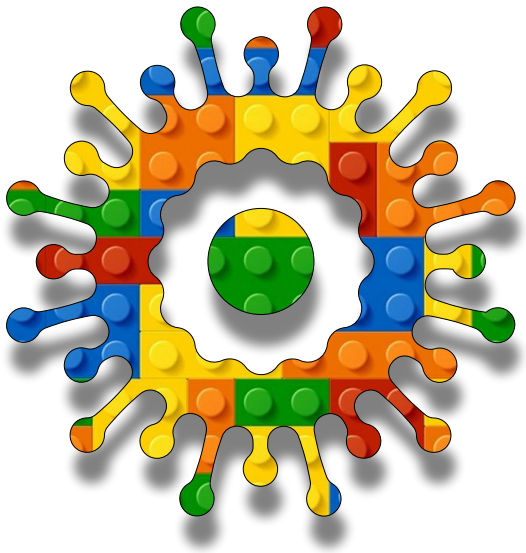
Artificial Intelligence Module B Unit #6 body segments



Content

Module B Unit #6 body segmentation

Introduction to pretrained body segmentation

The ml5.js BodySegmentation provides two models, `SelfieSegmentation` and `BodyPix`. The `SelfieSegmentation` model focuses on segmenting the human subject from the background. The `BodyPix` model is primarily used for detailed body part segmentation (e.g., distinguishing between different limbs) in images and videos. Although `BodyPix` can also perform person/background segmentation, it is more computationally intensive.
The ml5.js `BodySegmentation` is built on top of the `TensorFlow.js BodyPix model` and the `MediaPipe Selfie Segmentation model`.

It provides the following functionalities:

🀄 Real-time person/background segmentation:
The `SelfieSegmentation` model can segment people from the background in real time, and is designed to be lightweight. The `BodyPix` model can also be used for this purpose, but is more computationally intensive.

🀄 Real-time body part segmentation:
The `BodyPix` model can segment 24 body parts in real time.

🀄 The parts list with reference number:

```
LEFT_FACE: 0
RIGHT_FACE: 1
LEFT_UPPER_ARM_FRONT: 2
LEFT_UPPER_ARM_BACK: 3
RIGHT_UPPER_ARM_FRONT: 4
RIGHT_UPPER_ARM_BACK: 5
LEFT_LOWER_ARM_FRONT: 6
LEFT_LOWER_ARM_BACK: 7
RIGHT_LOWER_ARM_FRONT: 8
RIGHT_LOWER_ARM_BACK: 9
LEFT_HAND: 10
RIGHT_HAND: 11
TORSO_FRONT: 12
TORSO_BACK: 13
LEFT_UPPER_LEG_FRONT: 14
```

```
LEFT_UPPER_LEG_BACK: 15
RIGHT_UPPER_LEG_FRONT: 16
RIGHT_UPPER_LEG_BACK: 17
LEFT_LOWER_LEG_FRONT: 18
LEFT_LOWER_LEG_BACK: 19
RIGHT_LOWER_LEG_FRONT: 20
RIGHT_LOWER_LEG_BACK: 21
LEFT_FOOT: 22
RIGHT_FOOT: 23
```

We will be using BodyPix for this unit.

Sketch B6.1 our basic sketch

Here we have created our video and flipped it as per usual.

```
let video

function setup()
{
  createCanvas(640, 480)
  video = createCapture(VIDEO, {flipped: true})
  video.size(640, 480)
  video.hide()
}

function draw()
{
  background(220)
  image(video, 0, 0)
}
```

Notes

You should have a video of you in the canvas area.

Sketch B6.2 preload

Loading the pre-trained `bodySegmentation` model in ml5.js.

```
let video
let body

async function setup()
{
  body = await ml5.bodySegmentation('BodyPix')
  createCanvas(640, 480)
  video = createCapture(VIDEO, {flipped: true})
  video.size(640, 480)
  video.hide()
}

function draw()
{
  background(220)
  image(video, 0, 0)
}
```

🗒️ Notes

Only the video of you.

🛠️ Code Explanation

`body = ml5.bodySegmentation('BodyPix')`	Loading the bodySegmentation pretrained model, BodyPix version

Sketch B6.3 masking the body parts

We want the options to mask the body parts.

```
let video
let body
let options = { maskType: 'parts'}

async function setup()
{
  body = await ml5.bodySegmentation('BodyPix', options)
  createCanvas(640, 480)
  video = createCapture(VIDEO, {flipped: true})
  video.size(640, 480)
  video.hide()
}

function draw()
{
  background(220)
  image(video, 0, 0)
}
```

🗒️ Notes

Still just the video of you.

🛠️ Code Explanation

`let options = { maskType: 'parts'}`	We want it to identify and mask over the main body parts

Sketch B6.4 start detecting your body parts

Using the function `detectStart()` and having the callback `gotResults()`.

```
let video
let body
let options = { maskType: 'parts'}

async function setup()
{
  body = await ml5.bodySegmentation('BodyPix', options)
  createCanvas(640, 480)
  video = createCapture(VIDEO, {flipped: true})
  video.size(640, 480)
  video.hide()
  body.detectStart(video, gotResults)
}

function draw()
{
  background(220)
  image(video, 0, 0)
}
```

📝 Notes

As you might guess, we get an error message because we haven't created the `gotResults()` function yet.

Sketch B6.5 gotResults()

Now we add the `gotResults()` function. This includes a variable called `segmentation` (made-up name) to hold the results. We need this when we draw the segmented version of you.

```
let video
let body
let options = { maskType: 'parts'}
let segmentation

async function setup()
{
  body = await ml5.bodySegmentation('BodyPix', options)
  createCanvas(640, 480)
  video = createCapture(VIDEO, {flipped: true})
  video.size(640, 480)
  video.hide()
  body.detectStart(video, gotResults)
}

function draw()
{
  background(220)
  image(video, 0, 0)
}

function gotResults(results)
{
  segmentation = results
}
```

Notes

Next, we want to draw the segmented version of you.

Sketch B6.6 detecting your segments

If we have detected your segments, then it will draw them; otherwise, nothing will happen. Also, include webgl backend and flip the segmented image.

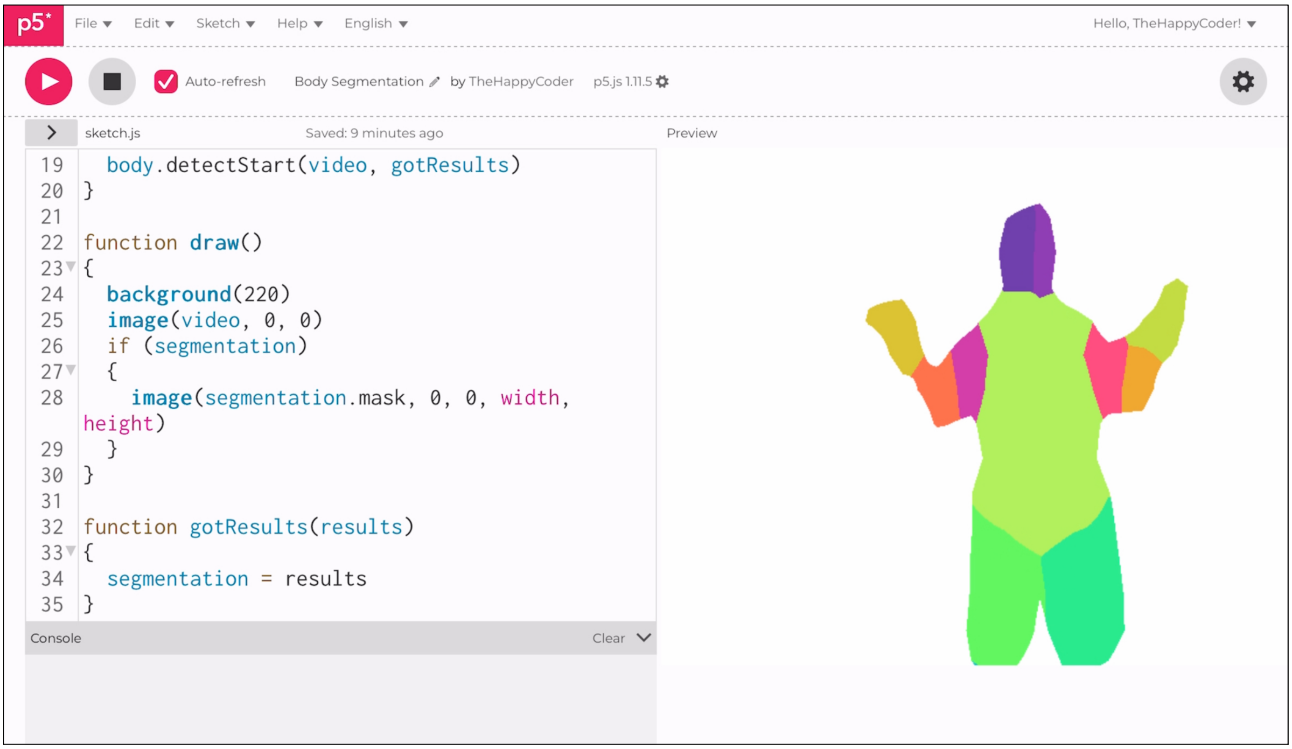
```
let video
let body
let options = { maskType: 'parts', flipped: true}
let segmentation

async function setup()
{
  ml5.setBackend('webgl')
  body = await ml5.bodySegmentation('BodyPix', options)
  createCanvas(640, 480)
  video = createCapture(VIDEO, {flipped: true})
  video.size(640, 480)
  video.hide()
  body.detectStart(video, gotResults)
}

function draw()
{
  background(220)
  image(video, 0, 0)
  if (segmentation)
  {
    image(segmentation.mask, 0, 0, width, height)
  }
}

function gotResults(results)
```

```
{
  segmentation = results
}
```

🗒️ Notes

You should get something like the figure below. It was far from perfect, but maybe a better camera or processor (use CPU or GPU for the backend) might yield better results.

Figure B6.6


p5*
File
Edit
Sketch
Help
English
Hello, TheHappyCoder!
Auto-refresh
Body Segmentation
by TheHappyCoder
p5.js 1.11.5
sketch.js
Saved: 9 minutes ago
Preview
19 body.detectStart(video, gotResults)
20 }
21
22 function draw()
23 {
24 background(220)
25 image(video, 0, 0)
26 if (segmentation)
27 {
28 image(segmentation.mask, 0, 0, width,
height)
29 }
30 }
31
32 function gotResults(results)
33 {
34 segmentation = results
35 }
Console
Clear

Sketch B6.7 selecting a body part

We can highlight and play with our body parts; this is just an illustration or suggestion for how you might use it.

```
let video
let body
let options = { maskType: 'parts', flipped: true}
let segmentation

async function setup()
{
  ml5.setBackend('webgl')
  body = await ml5.bodySegmentation('BodyPix', options)
  createCanvas(640, 480)
  video = createCapture(VIDEO, {flipped: true})
  video.size(640, 480)
  video.hide()
  body.detectStart(video, gotResults)
}

function draw()
{
  background(220)
  image(video, 0, 0)
  if (segmentation)
  {
    let parts = body.getPartsId()
    let gridSize = 10
    for (let x = 0; x < video.width; x += gridSize)
    {
      for (let y = 0; y < video.height; y += gridSize)
      {
```

```
        if (segmentation.data[y * video.width + x] ==
parts.TORSO_FRONT)
        {
          fill(255, 0, 0)
          noStroke()
          circle(x, y, gridSize)
        }
      }
    }
  }
}

function gotResults(results)
{
  segmentation = results
}
```

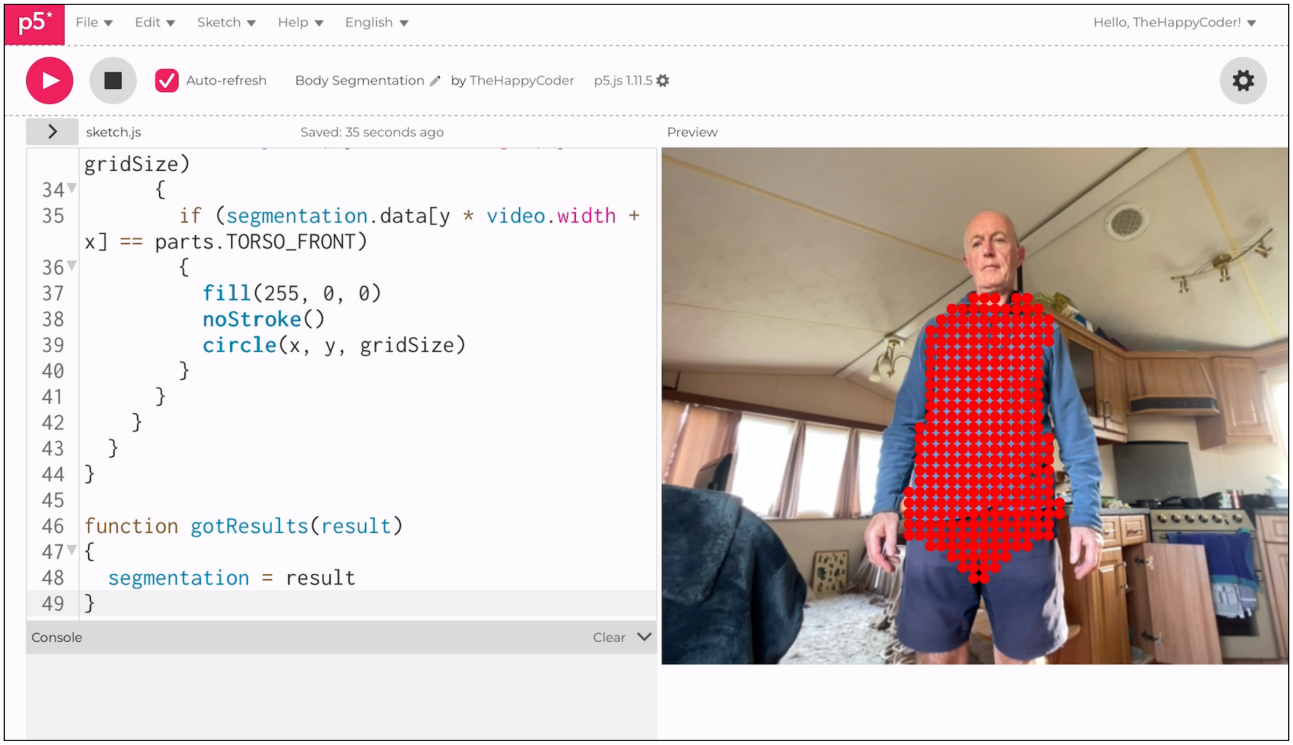
🗒️ Notes

You will cover your torso with lots of red dots.

🌻 Challenge

Try another part of your body.

Figure B6.7


p5*
File
Edit
Sketch
Help
English
Hello, TheHappyCoder!
Auto-refresh
Body Segmentation
by TheHappyCoder
p5.js 1.11.5
sketch.js
Saved: 35 seconds ago
Preview
gridSize)
{
if (segmentation.data[y * video.width +
x] == parts.TORSO_FRONT)
{
fill(255, 0, 0)
noStroke()
circle(x, y, gridSize)
}
}
}
}
}
function gotResults(result)
{
segmentation = result
}
Console
Clear