

Layout-Optimization-SQP-1

June 26, 2022

```
[1]: %load_ext autoreload
      %autoreload 2
```

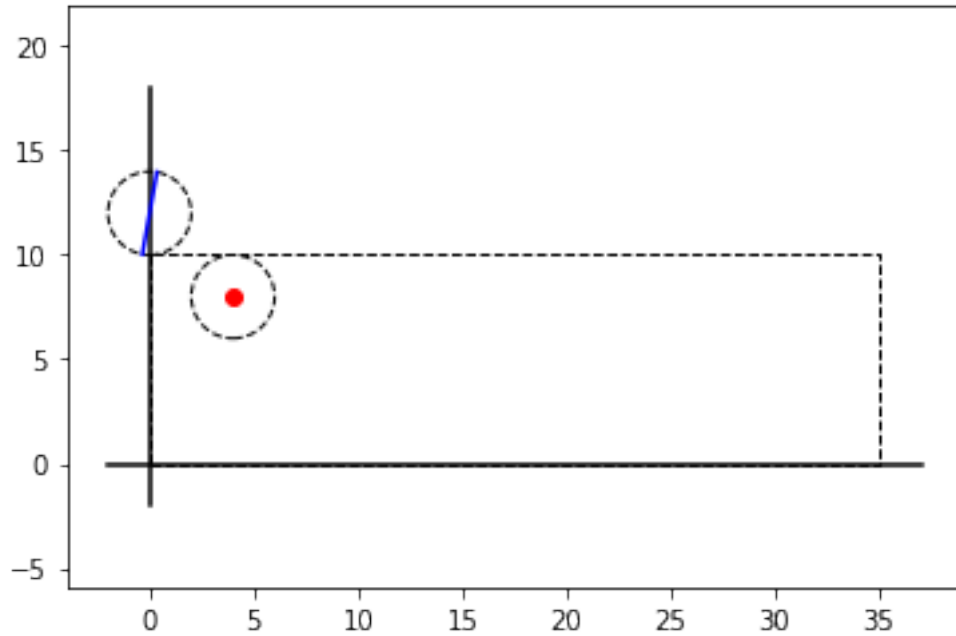
```
[2]: import numpy as np
      from scipy import optimize
      import sys

      sys.path.insert(1, '../src')
      from plant import Plant
      import utils
      from optimization1 import *
```

```
[3]: hypo_plant = utils.load("../data/plants/tiny-plant.json")
      basic_layout = np.array([[4, 8]])
      plant = Plant(hypo_plant, basic_layout)
      ## check result:
      print(plant.valid_layout)
      print(utils.get_energy(plant))
      plant.draw()
```

True

13.847131224501961



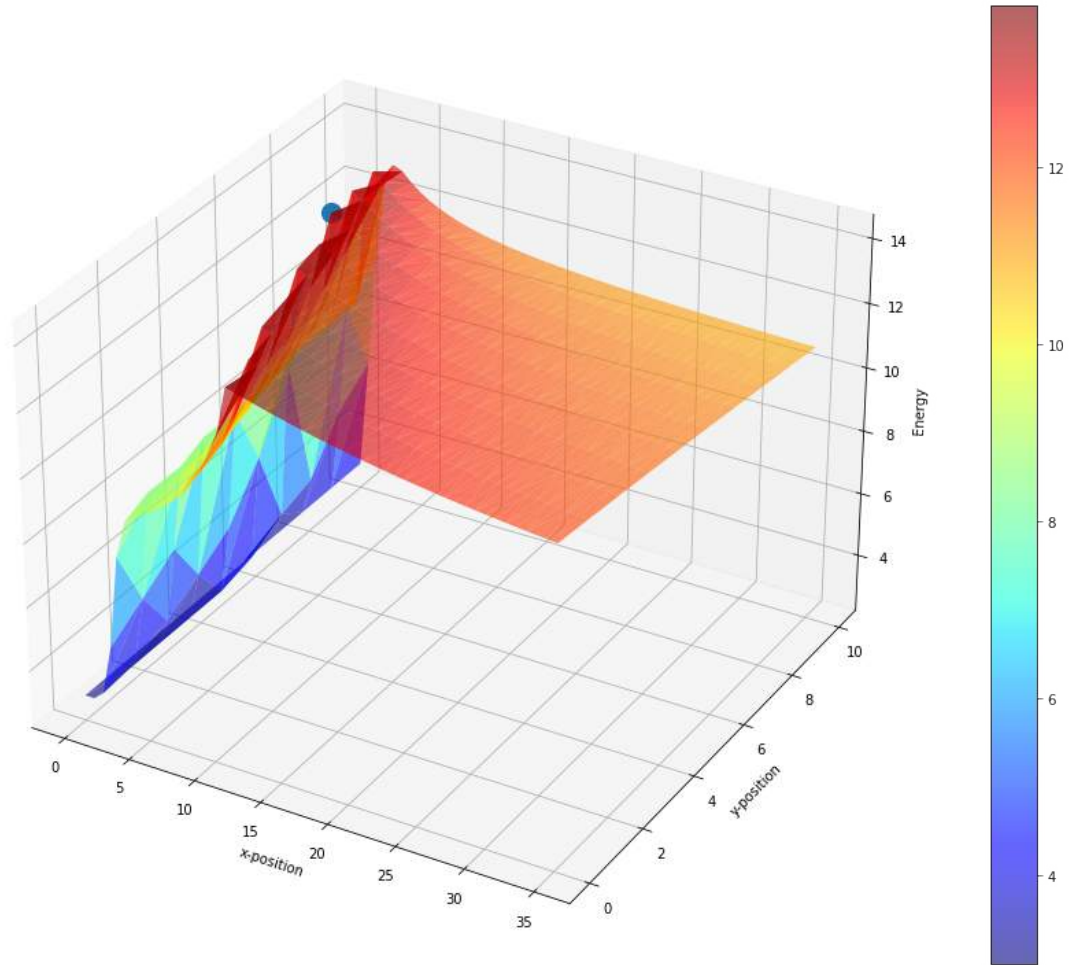
```
[4]: def f(x):
      plant.layout = np.array([[x[0], x[1]]])
      plant.set_layout()
      return -utils.get_energy(plant)
```

```
[5]: nx, ny = (50, 10)
      xs = np.linspace(plant.x_min, plant.x_max, nx)
      ys = np.linspace(plant.y_min, plant.y_max, ny)
      zs = evaluate_grid(xs, ys, f)
      points = get_points(xs, ys, zs)
      XYZ = get_XYZ(points, nx, ny)
```

```
[6]: xpts, ypts, zpts = points
      argmax_i = np.argmax(zs)
      xpts[argmax_i], ypts[argmax_i], zpts[argmax_i]
```

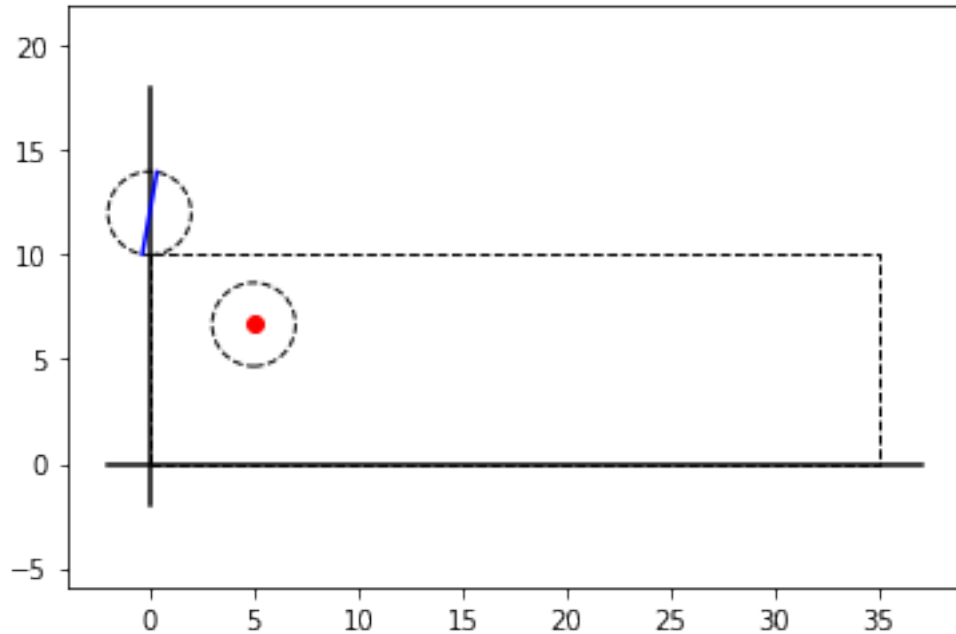
```
[6]: (5.0, 6.666666666666667, 13.93508109102266)
```

```
[7]: surface_plot(points)
```



```
[8]: plant.layout = np.array([[ xpts[argmax_i], ypts[argmax_i] ]])
      plant.set_layout()
      print(plant.valid_layout)
      print(utils.get_energy(plant))
      plant.draw()
```

```
True
13.93508109102266
```

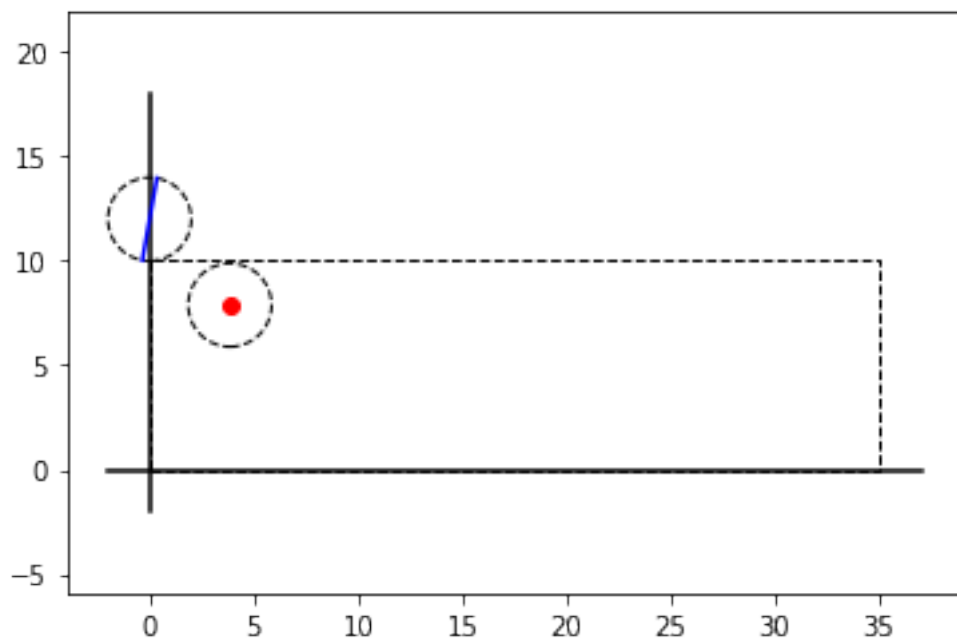


```
[9]: bounds = [(0, 35), (0, 10)]
x0 = np.array([4, 8])

result = optimize.minimize(f, x0, method="SLSQP", bounds=bounds)
print(result["x"])
print(result)

plant.layout = np.array([list(result["x"])])
plant.set_layout()
print(plant.valid_layout)
print(utils.get_energy(plant))
plant.draw()
```

```
[3.85286698 7.88559406]
  fun: -13.93940398337108
  jac: array([0.35773575, 0.33273721])
message: 'Optimization terminated successfully'
  nfev: 205
  nit: 28
  njev: 28
status: 0
success: True
       x: array([3.85286698, 7.88559406])
True
13.93940398337108
```



[]: