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Lab Exercise on Hill Climbing

Hill Climb problem: When a mountain is encountered, your robot shall walk uphill towards the top of the mountain. The mountain has a roadway to reach the top. Assume the shape of the mountain represents with sine function and there are no obstacles on the roadway. Implement a hill climbing-based search algorithm to simulate the robot to detect the top. Assume starting place of the robot on the mountain is at sin(0.1) and each step covers the following

1. h= 0.2 meters
2. h= 0.01 *f^1(x), where f^1(x) is the derivative of f(x)

Code

1]

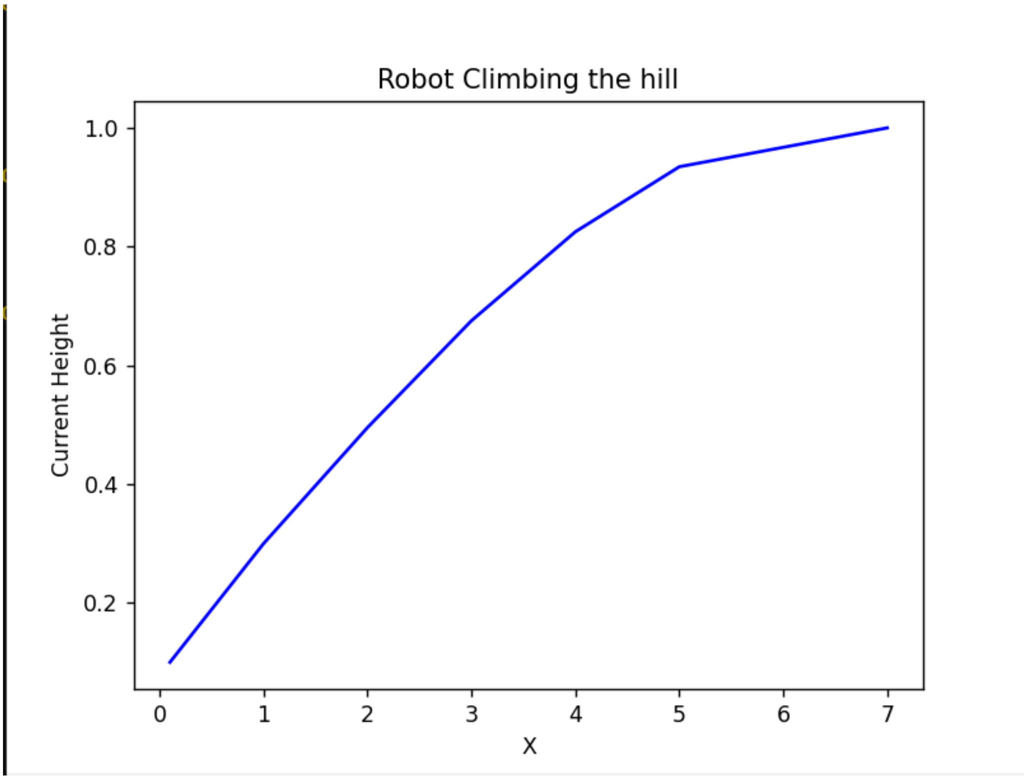
```
import numpy as np
import math as mt
import matplotlib.pyplot as plt

cur = mt.sin(0.1)
step,i = 0.2,0
end = 1
t = 0
x,y=[cur],[cur]

print("x"+str(i)+" : "+str(cur))

while cur <= end:
    cur = np.sin(cur) + step
    i+=1
    if cur < end:
      t = cur
      print("x"+str(i)+" : "+str(cur))
      x.append(i)
      y.append(cur)
x.append(i+1)
y.append(end)
print("Closest Possible Point to the end = 1 \n"+str(t))
```

```python
plt.title("Robot Climbing the hill")
plt.ylabel("Current Height")
plt.xlabel("X")
plt.plot(x,y,color = "blue")
plt.show()
```

Output

```
Ghost@Sandbox MINGW64 ~/Desktop/Apps/Ass:
$ python index.py
x0 : 0.09983341664682815
x1 : 0.29966766413213347
x2 : 0.4952026977662868
x3 : 0.6752100092029489
x4 : 0.8250612585908452
x5 : 0.9345893483118375
Closest Possible Point to the end = 1
0.9345893483118375
```

Graph of the Path



2]

```python
import numpy as np
import matplotlib.pyplot as plt

cur = np.sin(0.1)
i = 0
end = 1
t = 0
x,y=[cur],[cur]

print("x"+str(i)+" : "+str(cur))

while cur <= end:
    cur +=  0.01 * np.cos(cur)
    i+=1
    if cur < end:
      t = cur
      print("x"+str(i)+" : "+str(cur))
      x.append(i)
      y.append(cur)

print("Closest Possible Point to the end = 1 \n"+str(t))
plt.title("Robot Climbing the hill")
plt.ylabel("Current Height")
plt.xlabel("X")
plt.plot(x,y,color = "blue")
plt.show()
```

Output

```
$ python index.py
x0 : 0.09983341664682815
x1 : 0.10978362446740378
x2 : 0.11972342274767497
x3 : 0.12965183982321868
x4 : 0.13956790949385417
x5 : 0.1494706714841346
x6 : 0.15935917189689455
x7 : 0.16923246365934533
x8 : 0.17908960696122542
x9 : 0.18892966968453115
x10 : 0.19875172782437028
x11 : 0.2085548659005
x12 : 0.2183381773591309
```

```
x107 : 0.9705144465306433
x108 : 0.9761631974984526
x109 : 0.9817652464320781
x110 : 0.9873208029034795
x111 : 0.9928300805735097
x112 : 0.998293297028852
Closest Possible Point to the end = 1
0.998293297028852
```

Graph of the Path