

Northeastern University

CS 5100 Foundations of Artificial Intelligence

Homework and PA 1

NAME: **PARSHVA TIMBADIA**

EMAIL: timbadia.p@northeastern.edu

NUID: **001091783**

Starting Point	Part A	Part B	Part C
NE(3,5)	5.3	7.4	7.4
SW(7,1)	3.9	6	6.6

Above results are tested and the screenshot for the same is attached below. Also, I am attaching some of the function which I think are the backbone of the entire vacuum agent.

Moreover, the above values are the maximum (which I was able to get, it may even be greater or less for Part A) after running the function **multiple time**. This is because I have added the **RANDOM FUNCTION**. For instance, in the Task 1 the agent is not having the idea of the grid and make moves in random direction. For the next task, the agent will first make a greedy decision but when it gets surrounded by the same value it will make random decision. For the last one, it's the same as the above the only difference is it will make random choice when surrounded by all the visited nodes or the same dirt value nodes.

TO RUN THE CODE: I have commented the few lines in the end of the code you can uncomment it to run the function and retrieve the dirt collect value.

```

#Now defining a class vaccum that would help moving around and cleaning
COLLECT=0 #Indicates the amount of DIRT Collected

def UP():
    global INITIAL_y, COLLECT
    if INITIAL_y > 0:
        INITIAL_y = INITIAL_y -1

    print("U: ", COLLECT)

def DOWN():
    global INITIAL_y, COLLECT
    if INITIAL_y < len(DIRT)-1:
        INITIAL_y = INITIAL_y +1

    print("D: ", COLLECT)

def LEFT():
    global INITIAL_x, COLLECT
    if INITIAL_x > 0:
        INITIAL_x = INITIAL_x - 1
    print("L: ", COLLECT)

def RIGHT():
    global INITIAL_x, COLLECT
    if INITIAL_x < len(DIRT[0])-1:
        INITIAL_x = INITIAL_x + 1
    print("R: ", COLLECT)

def CLEAN(): #Cleans the tile and makes the value at that point as ZERO
    global INITIAL_y, INITIAL_x,DIRT, COLLECT

    COLLECT+= DIRT[INITIAL_y][INITIAL_x]
    DIRT[INITIAL_y][INITIAL_x]=0

    print('S: ', COLLECT)

```

The above snapshot is the code for moving the vacuum around the GRID and also the CLEAN() function helps to suck the DIRT and make the count of the DIRT collected.

```

def successor(INITIAL_y, INITIAL_x, DIRT):
    #Dont Change Anything Here
    ...
    Function that adds the elements/Dirt grid around in the successor list.
    ...

    successor=[]

    if INITIAL_y > 0:
        successor.append((DIRT[INITIAL_y -1][INITIAL_x], "up")) #Going UP

    if INITIAL_y < len(DIRT)-1:
        successor.append((DIRT[INITIAL_y+1][INITIAL_x], "down")) #Going Down

    if INITIAL_x > 0:
        successor.append((DIRT[INITIAL_y][INITIAL_x-1], "left")) #Going Left

    if INITIAL_x < len(DIRT[0])-1:
        successor.append((DIRT[INITIAL_y][INITIAL_x +1], "right")) #Going Right

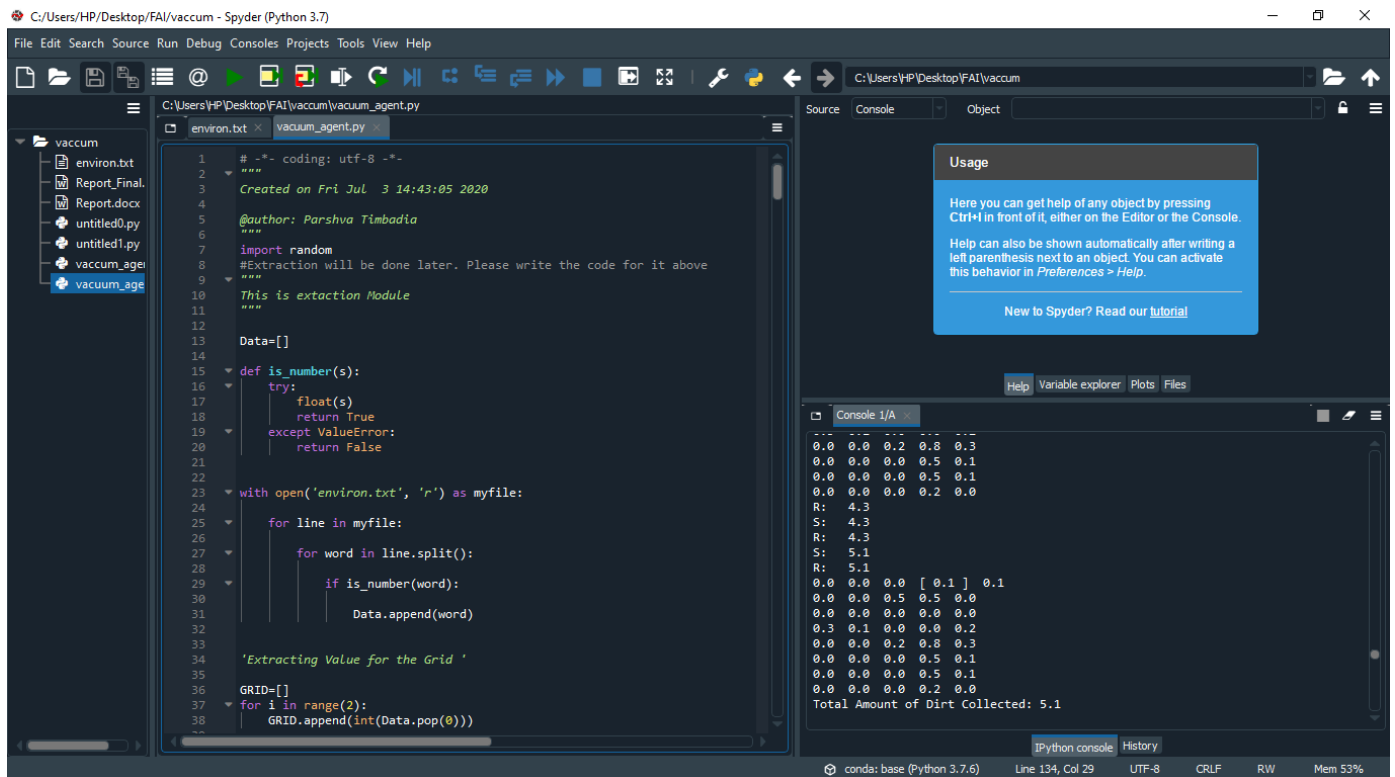
    return successor

```

The above is the successor function that add the DIRT around the current vacuum position into the list and this function is used by GREEDY Approach and Optimal Approach.

SCREEN SHOTS OF THE ABOVE RESULTS:

PART A> 3, 5



The screenshot shows the Spyder Python IDE interface. The main editor displays the file `vacuum_agent.py` with the following code:

```
1  #-*- coding: utf-8 -*-
2  """
3  Created on Fri Jul  3 14:43:05 2020
4
5  @author: Parshva Timbadia
6
7  import random
8  #Extraction will be done later. Please write the code for it above
9
10 This is extraction Module
11 """
12
13 Data=[]
14
15 def is_number(s):
16     try:
17         float(s)
18         return True
19     except ValueError:
20         return False
21
22
23 with open('environ.txt', 'r') as myfile:
24     for line in myfile:
25         for word in line.split():
26             if is_number(word):
27                 Data.append(word)
28
29
30
31
32 'Extracting Value for the Grid '
33
34 GRID=[]
35
36 for i in range(2):
37     GRID.append(int(Data.pop(0)))
```

The console output shows the following data:

```
0.0 0.0 0.2 0.8 0.3
0.0 0.0 0.0 0.5 0.1
0.0 0.0 0.0 0.5 0.1
0.0 0.0 0.0 0.2 0.0
R: 4.3
S: 4.3
R: 4.3
S: 5.1
R: 5.1
0.0 0.0 0.0 [ 0.1 ] 0.1
0.0 0.0 0.5 0.5 0.0
0.0 0.0 0.0 0.0 0.0
0.3 0.1 0.0 0.0 0.2
0.0 0.0 0.2 0.8 0.3
0.0 0.0 0.0 0.5 0.1
0.0 0.0 0.0 0.5 0.1
0.0 0.0 0.0 0.2 0.0
Total Amount of Dirt Collected: 5.1
```

For this the maximum dirt I was able to collect was 5.3 after multiple runs but lost that result in search for the better one.

PART A> 7, 1

C:\Users\HP\Desktop\FAI\vaccum - Spyder (Python 3.7)

File Edit Search Source Run Debug Consoles Projects Tools View Help

C:\Users\HP\Desktop\FAI\vaccum\vaccum_agent.py

```
1  #- coding: utf-8 -*-
2  """
3  Created on Fri Jul 3 14:43:05 2020
4
5  @author: Parshva Timbadia
6
7  import random
8  #Extraction will be done later. Please write the code for it above
9
10 This is extraction Module
11 """
12
13 Data=[]
14
15 def is_number(s):
16     try:
17         float(s)
18         return True
19     except ValueError:
20         return False
21
22 with open('environ.txt', 'r') as myfile:
23     for line in myfile:
24         for word in line.split():
25             if is_number(word):
26                 Data.append(word)
27
28 'Extracting Value for the Grid '
29
30 GRID=[]
31 for i in range(2):
32     GRID.append(int(Data.pop(0)))
```

Usage

Here you can get help of any object by pressing **Ctrl+I** in front of it, either on the Editor or the Console.

Help can also be shown automatically after writing a left parenthesis next to an object. You can activate this behavior in **Preferences > Help**.

New to Spyder? Read our [tutorial](#)

Help Variable explorer Plots Files

Console 1/A

```
0.0 0.0 0.0 0.0 0.1
0.0 0.0 0.0 0.0 0.1
0.0 0.0 0.0 0.2 0.0
L: 3.5
S: 3.5
U: 3.5
S: 3.9
U: 3.9
0.0 0.5 0.8 0.1 0.1
0.1 0.0 [ 0.5 ] 0.5 0.5
0.3 0.5 0.0 0.3 0.2
0.3 0.1 0.0 0.0 0.2
0.0 0.0 0.0 0.0 0.3
0.0 0.0 0.0 0.0 0.1
0.0 0.0 0.0 0.0 0.1
0.0 0.0 0.0 0.2 0.0
Total Amount of Dirt Collected: 3.9
In [209]: runfile('C:/Users/HP/Desktop/FAI/vaccum/vaccum_agent.py', wdir='C:/Users/HP/Desktop/FAI/vaccum')
```

IPython console History

conda: base (Python 3.7.6) Line 134, Col 29 UTF-8 CRLF RW Mem 54%

PART B> (3,5)

C:\Users\HP\Desktop\FAI\vaccum - Spyder (Python 3.7)

File Edit Search Source Run Debug Consoles Projects Tools View Help

C:\Users\HP\Desktop\FAI\vaccum\untitled1.py

```
521
522
523
524 Matrix = DIRT
525
526 for i in range(len(Matrix)):
527     for j in range(len(Matrix[0])):
528         if i==INITIAL_y and j== INITIAL_x:
529             print("[", float(Matrix[i][j]), "]", end=" ")
530         else:
531             print(float(Matrix[i][j]), end=" ")
532     print()
533
534
535
536
537
538
539 TO RUN THE TASK 1: UNCOMMENT THE CODE BELOW
540
541
542 # Random(DIRT, MOVES, COLLECT)
543 # print("Total Amount of Dirt Collected:", COLLECT)
544
545
546 TO RUN THE TASK 2: UNCOMMENT THE CODE BELOW
547
548
549 Greedy(DIRT, MOVES, COLLECT)
550 print("Total Amount of Dirt Collected:", COLLECT)
551
552
553 TO RUN THE TASK 3: UNCOMMENT THE CODE BELOW
554
555
556
557
558
```

No documentation available

Help Variable explorer Plots Files

Console 1/A

```
0.0 0.0 0.0 0.5 0.1
0.0 0.0 0.0 0.2 0.0
S: 6.699999999999999
DOWN : 6.699999999999999
S: 7.199999999999999
DOWN : 7.199999999999999
S: 7.399999999999999
0.0 0.0 0.0 0.1 0.1
0.1 0.0 0.0 0.0 0.0
0.3 0.0 0.0 0.3 0.0
0.3 0.1 0.0 0.0 0.2
0.0 0.0 0.2 0.0 0.3
0.0 0.0 0.0 0.0 0.1
0.0 0.0 0.0 0.0 0.1
0.0 0.0 0.0 [ 0.0 ] 0.0
RIGHT : 7.399999999999999
Total Amount of Dirt Collected: 7.399999999999999
In [339]:
```

IPython console History

conda: base (Python 3.7.6) Line 545, Col 1 UTF-8 CRLF RW Mem 74%

PART B> (7,1)

The image shows the Spyder Python IDE interface. The main editor window displays a Python script with the following code:

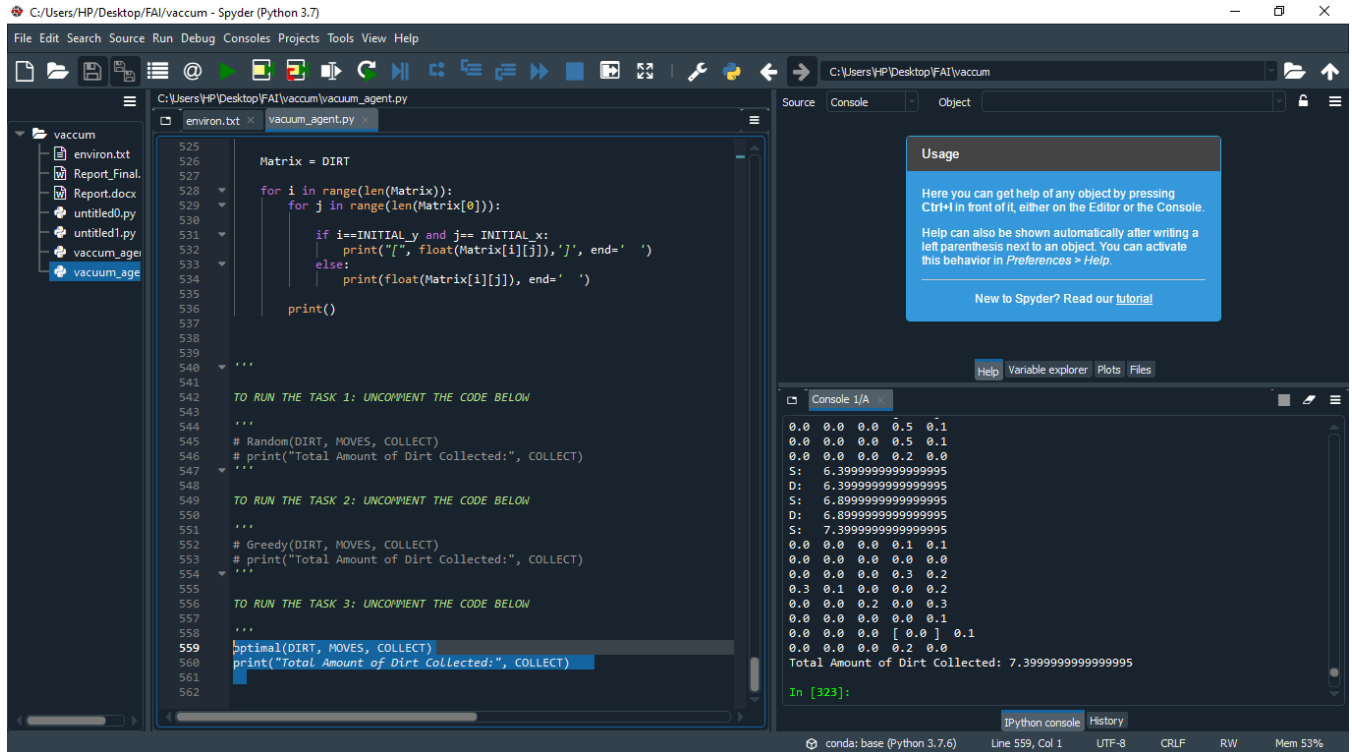
```
521 Matrix = DIRT
522
523
524
525 for i in range(len(Matrix)):
526     for j in range(len(Matrix[0])):
527
528         if i==INITIAL_y and j== INITIAL_x:
529             print("[", float(Matrix[i][j]), "]", end= ' ')
530         else:
531             print(float(Matrix[i][j]), end= ' ')
532
533     print()
534
535
536
537
538
539 TO RUN THE TASK 1: UNCOMMENT THE CODE BELOW
540
541
542 # Random(DIRTY, MOVES, COLLECT)
543 # print("Total Amount of Dirt Collected:", COLLECT)
544
545
546 TO RUN THE TASK 2: UNCOMMENT THE CODE BELOW
547
548
549 Greedy(DIRTY, MOVES, COLLECT)
550 print("Total Amount of Dirt Collected:", COLLECT)
551
552
553 TO RUN THE TASK 3: UNCOMMENT THE CODE BELOW
554
555
556
557
558
```

The console window on the right shows the output of the script:

```
0.0 0.0 0.0 0.0 0.1
0.0 0.0 0.0 0.0 0.1
0.0 0.0 0.0 0.2 0.0
DOWN : 5.499999999999999
S: 5.499999999999999
DOWN : 5.499999999999999
S: 5.999999999999999
0.0 0.0 0.0 0.1 0.1
0.1 0.0 0.0 0.5 0.5
0.3 [ 0.0 ] 0.0 0.3 0.2
0.3 0.1 0.0 0.0 0.2
0.0 0.0 0.2 0.0 0.3
0.0 0.0 0.0 0.0 0.1
0.0 0.0 0.0 0.0 0.1
0.0 0.0 0.0 0.2 0.0
LEFT : 5.999999999999999
Total Amount of Dirt Collected: 5.999999999999999
In [330]:
```

The status bar at the bottom indicates the environment is conda: base (Python 3.7.6), the cursor is at Line 545, Col 1, the encoding is UTF-8, the line ending is CRLF, the file is RW, and the memory usage is 74%.

PART C> (3,5)



PART C> (7,1)

