Q1.

import numpy as np

from numpy.linalg import inv

def HW2\_Q1():

i = 0

flag = 0

#d, c, b, a

trans\_matrix = np.matrix([[ 1, 0, 0, 0], #d

[ 0, 1, 0, 0], #c

[.45, 0, .35, .2], #b

[ .3, .3, .1, .3]]) #a

i\_matrix = np.matrix([[trans\_matrix[0,0], trans\_matrix[0,1]],

[trans\_matrix[1,0], trans\_matrix[1,1]]])

q\_matrix = np.matrix([[trans\_matrix[2,2], trans\_matrix[2,3]],

[trans\_matrix[3,2], trans\_matrix[3,3]]])

r\_matrix = np.matrix([[trans\_matrix[2,0], trans\_matrix[2,0]],

[trans\_matrix[3,1], trans\_matrix[3,1]]])

f\_matrix = (i\_matrix - q\_matrix)

f\_matrix = inv(f\_matrix)

fr\_matrix = f\_matrix \* r\_matrix

lim\_trans\_matrix = np.matrix([[trans\_matrix[0,0], trans\_matrix[0,1], trans\_matrix[0,2], trans\_matrix[0,3]],

[trans\_matrix[1,0], trans\_matrix[1,1], trans\_matrix[1,2], trans\_matrix[1,3]],

[fr\_matrix[0,0], fr\_matrix[0,1], 0, 0],

[fr\_matrix[1,0], fr\_matrix[1,1], 0, 0]])

print(trans\_matrix)

print(lim\_trans\_matrix)

stable\_lim\_trans\_matrix = np.matrix([[.25, 0, 0, 0],

[ 0, .15, 0, 0],

[ 0, 0, .3, 0],

[ 0, 0, 0, .3]]) \* lim\_trans\_matrix

stable\_matrix = np.matrix([[.25, 0, 0, 0],

[ 0, .15, 0, 0],

[ 0, 0, .3, 0],

[ 0, 0, 0, .3]]) \* trans\_matrix

print(stable\_lim\_trans\_matrix)

while flag == 0:

if((round(stable\_matrix[2, 0], 2) == round(stable\_lim\_trans\_matrix[2, 0], 2))):

flag = 1

else:

stable\_matrix = stable\_matrix \* trans\_matrix

i = i + 1

print(stable\_matrix, "at", i, "th iteration.")

HW2\_Q1()

Output==========================================================================

runfile('C:/Users/NAO/Desktop/EE381/HW2/HW2\_Q1.py', wdir='C:/Users/NAO/Desktop/EE381/HW2')

[[ 1. 0. 0. 0. ]

[ 0. 1. 0. 0. ]

[ 0.45 0. 0.35 0.2 ]

[ 0.3 0.3 0.1 0.3 ]]

[[ 1. 0. 0. 0. ]

[ 0. 1. 0. 0. ]

[ 0.86206897 0.86206897 0. 0. ]

[ 0.55172414 0.55172414 0. 0. ]]

[[ 0.25 0. 0. 0. ]

[ 0. 0.15 0. 0. ]

[ 0.25862069 0.25862069 0. 0. ]

[ 0.16551724 0.16551724 0. 0. ]]

[[ 0.25 0. 0. 0. ]

[ 0. 0.15 0. 0. ]

[ 0.25579273 0.04013314 0.00186942 0.00220472]

[ 0.16383963 0.13373978 0.00110236 0.00131824]] at 5 th iteration.