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Assignment no.3

Write a python program for sparse matrix realization and operations on it -

Transpose, Fast Transpose and addition of two matrices

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def accept\_matrix\_input(m):

print("Enter the order of the matrix (row, col): ")

r = int(input("==> Row = "))

c = int(input("==> column = "))

print("Enter the elements of the matrix: ")

for i in range(r):

a = []

for j in range(c):

a.append(int(input()))

m.append(a)

print("Matrix accepted successfully.")

def display\_matrix(m, r, c):

print(f"Matrix ({r}, {c}): ")

for i in range(r):

print("\t\t", end=' ')

for j in range(c):

print("{0: <3}".format(m[i][j]), end=' ')

print()

def convert\_to\_sparse\_representation(m, r, c, s):

a = [r, c, 0]

t = 0

s.append(a)

for i in range(r):

for j in range(c):

if m[i][j] != 0:

a = [i, j, m[i][j]]

s.append(a)

t += 1

s[0][2] = t

print("Converted Successfully to sparse Representation")

def display\_sparse\_matrix(s, string):

print(f"{string} sparse Matrix: ")

print("\t\t Row Col Val")

print("\t\t======================")

print(f"\t\t| {s[0][0]} {s[0][1]} {s[0][2]} | ")

print("\t\t======================")

for i in range(1, s[0][2] + 1):

print(f"\t\t| {s[i][0]} {s[i][1]} {s[i][2]} | ")

print("\t\t======================")

def addition(mat1, mat2):

result = []

i = 0

j = 0

while i < len(mat1) and j < len(mat2):

if mat1[i][0] == mat2[j][0] and mat1[i][1] == mat2[j][1]:

a = mat1[i][2] + mat2[j][2]

result.append([mat1[i][0].mat1[i][1], a])

i += 1

j += 1

else:

if mat1[i][0] >= mat2[j][0]:

result.append([mat2[j][0], mat2[j][1], mat2[j][2]])

j += 1

else:

result.append([mat2[i][0], mat2[i][1], mat2[i][2]])

i += 1

result[0][2] -= 1

print(result)

def fast\_transpose\_of\_sparse\_matrix(s, t):

a = [s[0][1], s[0][0], s[0][2]]

t.append(a)

for i in range(s[0][2]):

t.append([0, 0, 0])

count = []

for i in range(s[0][1]):

count.append(0)

for i in range(1, (s[0][2] + 1)):

c = s[i][1]

count[c] = count[c] + 1

pos = [1]

for c in range(1, s[0][1]):

pos.append(pos[c - 1] + count[c - 1])

for i in range(1, s[0][2] + 1):

c = s[i][1]

k = pos[c]

t[k][0] = s[i][1]

t[k][1] = s[i][0]

t[k][2] = s[i][2]

pos[c] = pos[c] + 1

print("Fast Transpose done successfully.")

def main():

while True:

print("===> [1]. Sparse Matrix Realization")

print("===> [2]. Fast Transpose of Sparse Matrix")

print("===> [3]. Spare Matrix Addition")

print("===> [4]. Exit")

ch = int(input("Enter your choice: "))

if ch == 4:

print("Exiting Program! Thank You")

break

elif ch == 1:

m = []

print("Input Normal Sparse Matrix")

accept\_matrix\_input(m)

r = len(m)

c = len(m[0])

print("Normal First Sparse ", end=' ')

display\_matrix(m, r, c)

s1 = []

convert\_to\_sparse\_representation(m, r, c, s1)

display\_sparse\_matrix(s1, "First")

elif ch == 2:

display\_sparse\_matrix(s1, "First")

s2 = []

fast\_transpose\_of\_sparse\_matrix(s1, s2)

print("Fast Transpose Resultant")

display\_sparse\_matrix(s2, "Fast Transpose Resultant")

elif ch == 3:

m1 = []

m2 = []

print("Input First Sparse Matrix")

accept\_matrix\_input(m1)

r = len(m1)

c = len(m1[0])

print("Normal First Sparse ", end=' ')

display\_matrix(m1, r, c)

print("Input Second Sparse Matrix")

accept\_matrix\_input(m2)

r = len(m2)

c = len(m2[0])

print("Normal First Sparse ", end=' ')

display\_matrix(m2, r, c)

addition(m1, m2)

else:

print("Invalid Input! Try again")

if \_\_name\_\_ == '\_\_main\_\_':

main()