An example with 5x5 matrices which are not Normal matrices

It runs for 2 iterations showing that the collection is S.U.S

Printing salient results of each iteration

The given input collection of p=1, 2-tuples (A_l,B_l)

Displaying 2 decimal places

A_1

1.48 + 0.51j	-0.87 + 1.44j	0.68 + -0.67j	-0.05 + -0.05j	0.31 + -0.19j
-0.49 + -0.51j	0.44 + 2.80j	0.70 + -0.75j	0.10 + -0.22j	0.73 + -0.50j
-0.36 + -0.09j	-0.15 + 1.50j	2.00 + 0.47j	0.02 + -0.22j	0.15 + -0.59j
-0.79 + 0.78j	0.70 + 1.21j	1.09 + -0.44j	0.02 + 0.59j	0.70 + -1.09j
-0.10 + -0.86j	0.02 + 1.76j	0.15 + -0.14j	0.16 + -0.17j	1.07 + 0.63j

B_1

1.24 + 0.56j	0.05 + 0.10j	0.82 + 0.18j	0.55 + 0.08j	-0.06 + 0.15j
0.10 + 0.40j	0.80 + 0.56j	-1.18 + 0.45j	-0.79 + 0.91j	0.32 + -0.97j
0.94 + 0.24j	-0.65 + 0.21j	1.06 + 0.22j	-0.42 + -0.25j	1.40 + -0.66j
-0.13 + 0.28j	0.07 + -0.70j	-0.81 + 2.07j	1.18 + 2.43j	-2.54 + -0.09j
-0.04 + 0.41j	0.58 + -0.39j	-0.33 + 0.43j	-0.46 + 0.09j	0.72 + 1.23j

Iteration: 1

U-Induced Partition: [5]

Not in Pre-Solution form

Please refer Definition 3

Reason: A^l_ii/B^l_ii , the l,i,j of A^l_ij which fail's the criterion as follows:

l = 1 ,i = 1 ,j = 1

l^th partitioned matrix of collection from where sub-matrices (S,R) are picked for Diagonalization

A_1

1.48+0.51j	-0.87+1.44j	0.68+-0.67j	-0.05+-0.05j	0.31+-0.19j
-0.49+-0.51j	0.44+2.80j	0.70+-0.75j	0.10+-0.22j	0.73+-0.50j
-0.36+-0.09j	-0.15+1.50j	2.00+0.47j	0.02+-0.22j	0.15+-0.59j
-0.79+0.78j	0.70+1.21j	1.09+-0.44j	0.02+0.59j	0.70+-1.09j
-0.10+-0.86j	0.02+1.76j	0.15+-0.14j	0.16+-0.17j	1.07+0.63j

B_1

1.24+0.56j	0.05+0.10j	0.82+0.18j	0.55+0.08j	-0.06+0.15j
0.10+0.40j	0.80+0.56j	-1.18+0.45j	-0.79+0.91j	0.32+-0.97j
0.94+0.24j	-0.65+0.21j	1.06+0.22j	-0.42+-0.25j	1.40+-0.66j
-0.13+0.28j	0.07+-0.70j	-0.81+2.07j	1.18+2.43j	-2.54+-0.09j
-0.04+0.41j	0.58+-0.39j	-0.33+0.43j	-0.46+0.09j	0.72+1.23j

S

1.48 + 0.51j	-0.87 + 1.44j	0.68 + -0.67j	-0.05 + -0.05j	0.31 + -0.19j
-0.49 + -0.51j	0.44 + 2.80j	0.70 + -0.75j	0.10 + -0.22j	0.73 + -0.50j
-0.36 + -0.09j	-0.15 + 1.50j	2.00 + 0.47j	0.02 + -0.22j	0.15 + -0.59j
-0.79 + 0.78j	0.70 + 1.21j	1.09 + -0.44j	0.02 + 0.59j	0.70 + -1.09j
-0.10 + -0.86j	0.02 + 1.76j	0.15 + -0.14j	0.16 + -0.17j	1.07 + 0.63j

R

1.24 + 0.56j 0.05 + 0.10j 0.82 + 0.18j 0.55 + 0.08j -0.06 + 0.15j

0.10 + 0.40j 0.80 + 0.56j -1.18 + 0.45j -0.79 + 0.91j 0.32 + -0.97j

0.94 + 0.24j -0.65 + 0.21j 1.06 + 0.22j -0.42 + -0.25j 1.40 + -0.66j

-0.13 + 0.28j 0.07 + -0.70j -0.81 + 2.07j 1.18 + 2.43j -2.54 + -0.09j

-0.04 + 0.41j 0.58 + -0.39j -0.33 + 0.43j -0.46 + 0.09j 0.72 + 1.23j

Setting up an Equivalent Problem

U `blocks further', New partition

Refer Theorem 2, Proof item number/s: 1

[1, 1, 1, 1, 1]

Iteration: 2

U-Induced Partition: [1, 1, 1, 1, 1]

In Solution form:

U-Induced Graph:

Note: path is seq of l_i_j triples (A_ij non-zero in l^th matrix)

{'part_no': 1, 'clsses': [1], 'paths': {'1_2': ['1_1_2'], '1_3': ['1_1_3'], '1_4': ['1_1_4'], '1_5': ['1_1_5']}, 'c(i)':

{1: 1, 2: 1, 3: 1, 4: 1, 5: 1}, '1': [1, 2, 3, 4, 5]}

Please Refer Definition 5 and Theorem 1

U_sol

1.00 + 0.00j 0.00 + 0.00j 0.00 + 0.00j 0.00 + 0.00j 0.00 + 0.00j

0.00 + 0.00j 0.93 + -0.37j 0.00 + 0.00j 0.00 + 0.00j 0.00 + 0.00j

0.00 + 0.00j 0.00 + 0.00j -1.00 + -0.06j 0.00 + 0.00j 0.00 + 0.00j

0.00 + 0.00j 0.00 + 0.00j 0.00 + 0.00j -0.59 + 0.81j 0.00 + 0.00j

0.00 + 0.00j 0.00 + 0.00j 0.00 + 0.00j 0.00 + 0.00j 0.26 + -0.96j

U_sol checked

The collection is S.U.S i.e Simultaneously Unitarily Similar !

U (U_found) that solves the original (given) problem

U_found

-0.03 + -0.40j 0.01 + 0.07j -0.05 + -0.57j 0.04 + 0.50j 0.04 + 0.51j

-0.27 + 0.46j -0.06 + -0.17j 0.00 + -0.19j -0.33 + -0.42j 0.13 + 0.58j

0.09 + -0.50j 0.05 + 0.38j -0.06 + -0.30j -0.24 + -0.60j 0.24 + -0.18j

-0.08 + 0.04j -0.07 + 0.77j -0.08 + 0.48j -0.05 + 0.09j -0.09 + 0.37j

0.23 + 0.50j 0.31 + 0.34j -0.30 + -0.48j 0.16 + -0.03j -0.35 + -0.16j

The U that was used to set-up the problem, algorithm found a different U ?

U_usd

0.40 + 0.00j -0.07 + -0.00j 0.57 + 0.00j -0.51 + -0.00j -0.51 + -0.00j

-0.44 + -0.31j 0.17 + -0.04j 0.19 + 0.02j 0.45 + -0.30j -0.59 + 0.08j

0.49 + 0.13j -0.38 + 0.02j 0.30 + -0.03j 0.61 + -0.19j 0.16 + 0.25j

-0.03 + -0.08j -0.77 + -0.13j -0.47 + -0.12j -0.09 + -0.06j -0.36 + -0.12j

-0.51 + 0.19j -0.37 + 0.28j 0.50 + -0.26j 0.01 + 0.16j 0.19 + -0.34j