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Control Theory – Report 1

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1. Description of the Functions

- INIT DB - a script which cleans the MATLAB workspace, adds a full path to the current directory to the MATLAB search path, declares global variables such as database - a variable representing a database or A, B, C, D - certain auxiliary variables.

- READ F - a function, which reads parameters of dynamical systems from the ASCII file filename and then assigns them to suitable fields of the variable database

- READ K - a function, which allows to add a new dynamical system to a database using a keyboard.

- SAVE DB - a function, which saves the contents of a database to the ASCII file filename.

- CONTENTS DB - a function, which lists on a screen (with paging) the names of all the dynamical systems stored in a database

- SEARCH DB - a function, which lists on a screen (with paging) the names of all the systems in a database, that include the string of characters.

- SORT N - a function, which lists on a screen (with paging) the names of the systems from a database in the order of growing values of $||\text{matrix}||_2$, where matrix ∈ {'A', 'B', 'C', 'D'}.

- STABLE S - a function, which lists on a screen (with paging) the names of systems from a database that are asymptotically stable.

- IMPULSE I - a function, which implements a mathematical function $impulse\_i(t) = \begin{cases} a, \ for\ 0 \le t \le \frac{1}{a} \\ 0, otherwise \end{cases}$

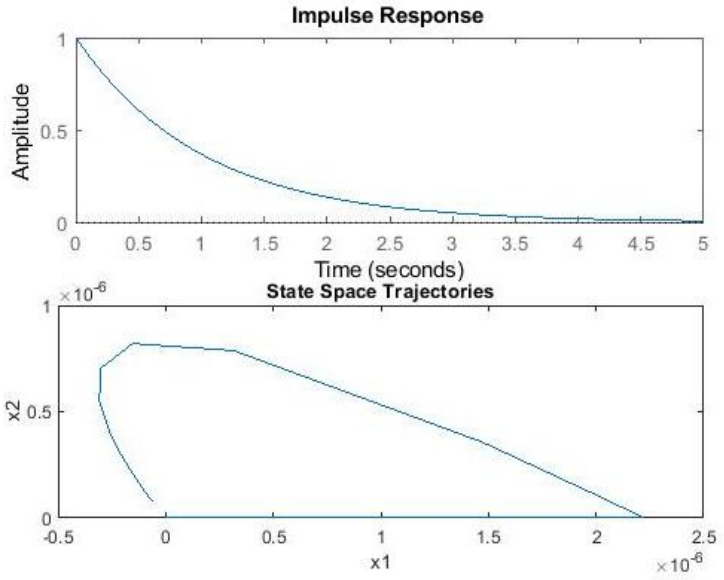
- DYNAMICS - a function representing a differential equation $\dot{x} = Ax + Bu$, where u(t) = impulse i(t). A, B are global variables.

- PLOTS - a function, which displays a figure with two plots, one above the other. The first plot shows the output of the system name on the time interval [0, tf] for zero initial conditions and the impulse i input signal. The plot should be titled by the system name. The second plot shows state space trajectories provided the number of state variables is equal to 2 or 3. If this condition is not met then a message should appear, instead of a figure, with the information dim x > 3 or dim x < 2.

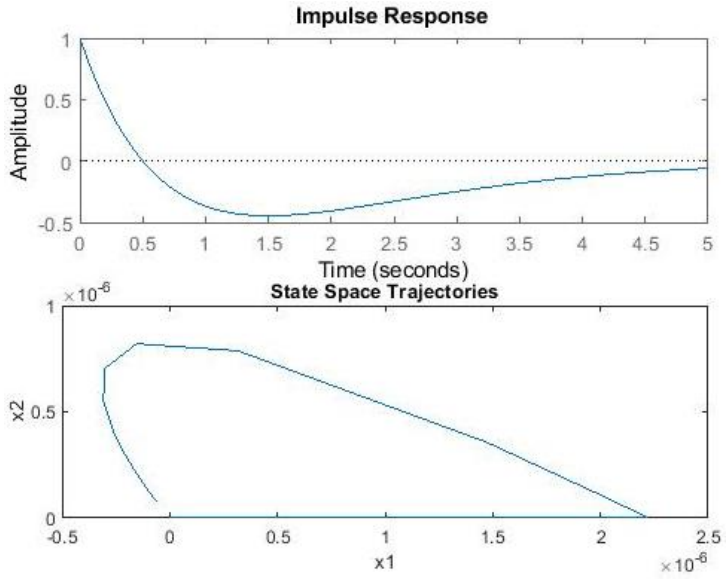
2. Results

The stable systems of my program are: system A, B, E, H, I, J and K. The output of the plots function was the following:

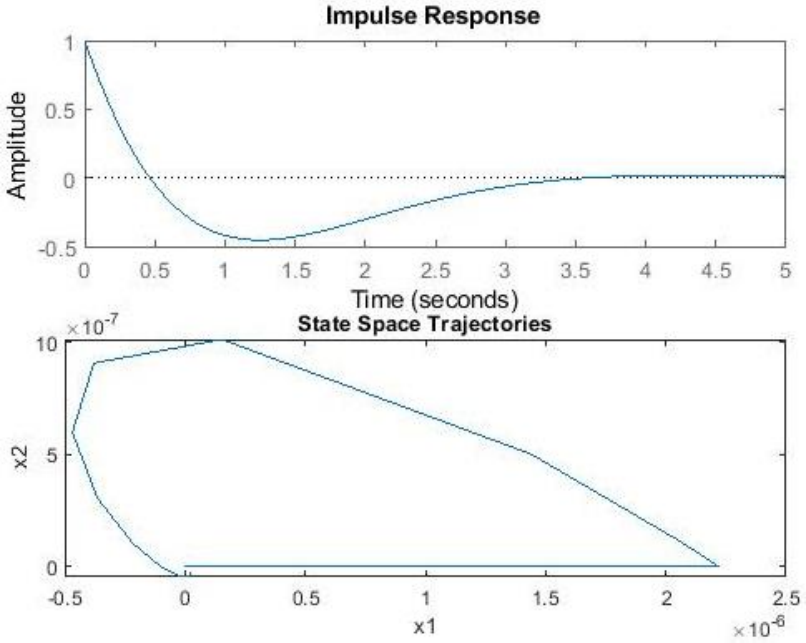
a) System A



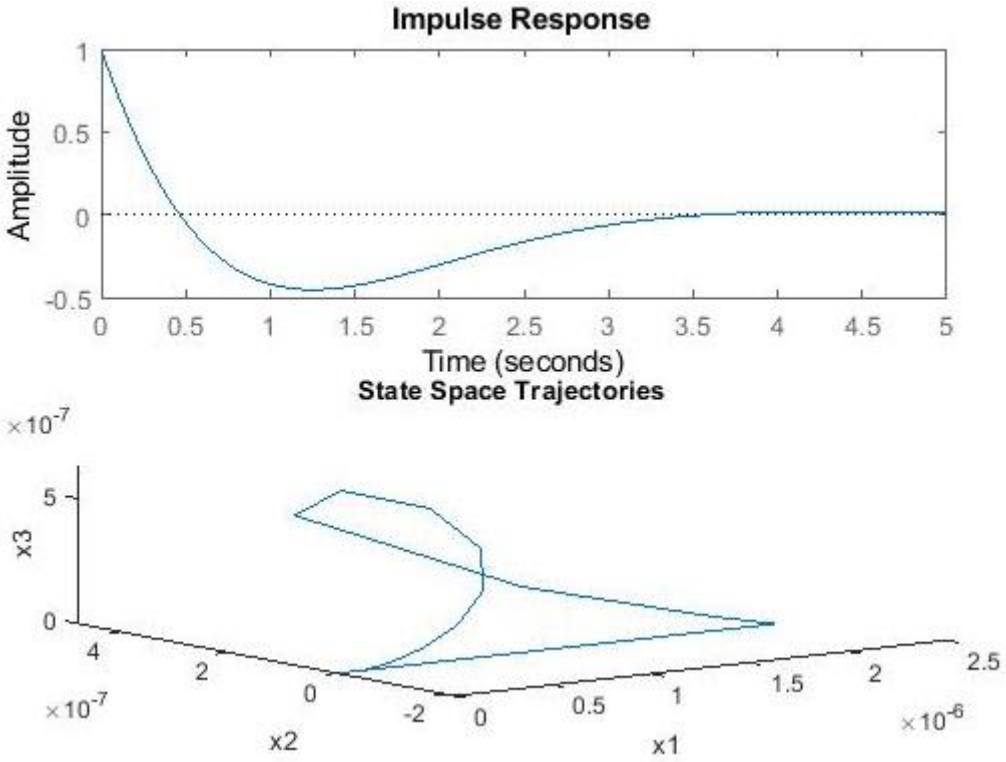
b) System B



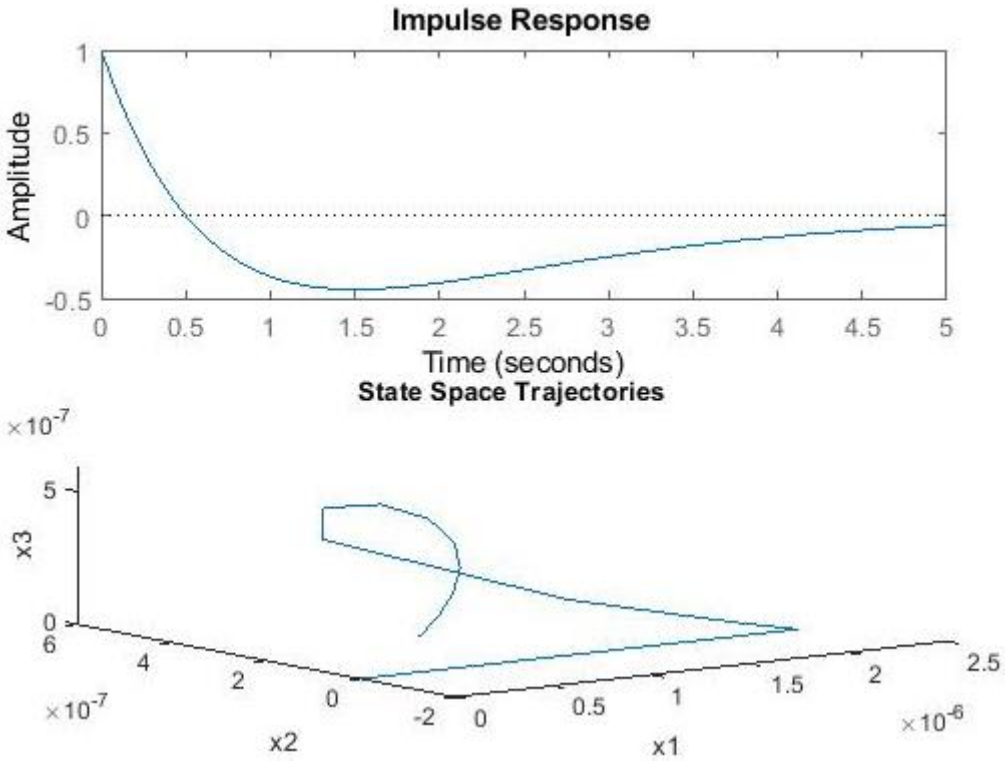
c) System E



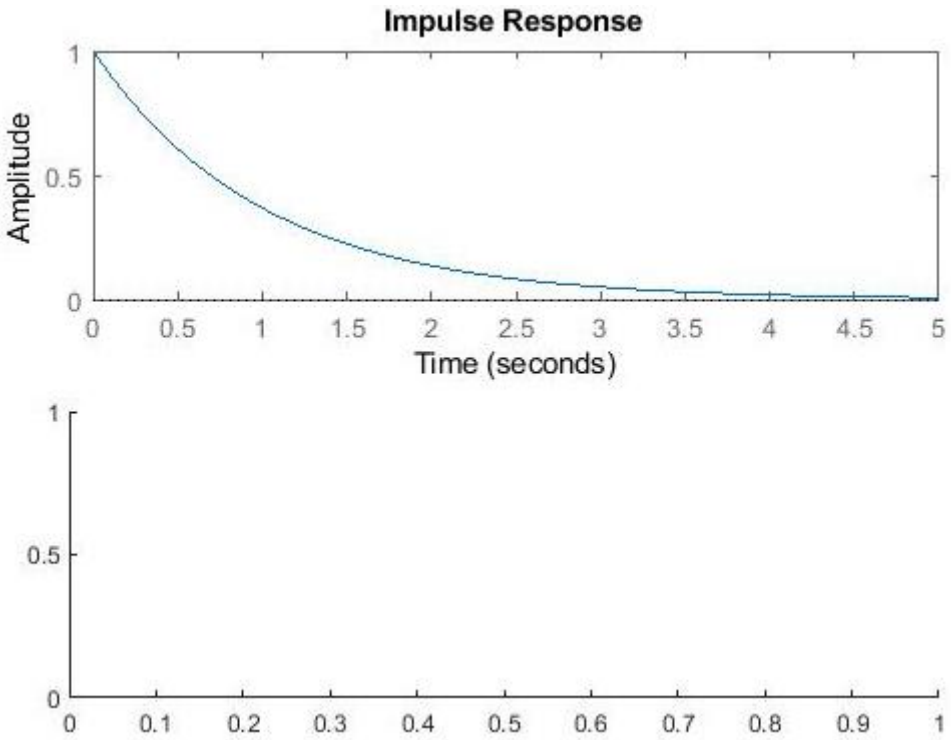
d) System H



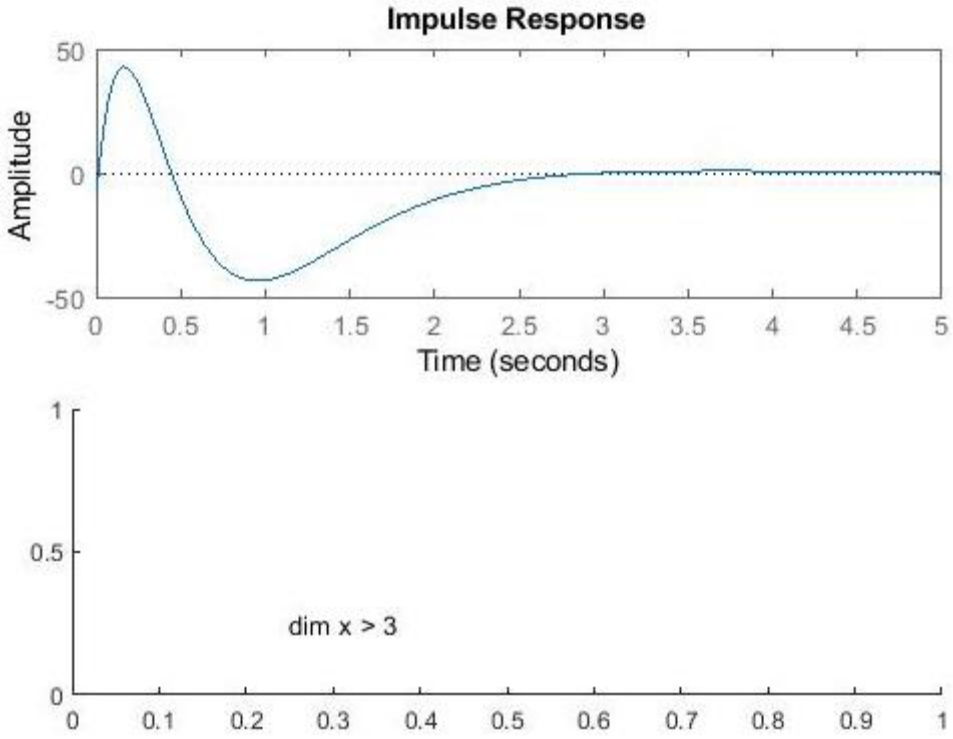
e) System I



f) System J



g) System K



3. Diary

The results I had using the diary function were the following:

>>init_db

>>read_f('database_z.txt')

>>read_k

System Name: B2

Enter Matrix A : [-2,-1;1,0]

Enter Matrix B : [1;0]

Enter Matrix C : [1,1]

Enter Matrix D : [0]

>>contents_db

system A

system B

system C

system D

system E

system F

system G

system H

system I

system J

system K

B2

>>stable_s

Stable systems:

system A

system B

system E

system H

system I

system J

system K

B2

>>sort_N('A')

system C

system D

system G

system J

system F

system A

system B

B2

system I

system E

system H

system K

>>search_db('B')

system B

B2

>>save_db('copy.txt')

>>plots('system A', 5)

>>plots('system B', 5)

>>plots('system C', 5)

>>plots('system D', 5)

>>plots('system E', 5)

>>plots('system F', 5)

>>plots('system G', 5)

>>plots('system H', 5)

>>plots('system I', 5)

>>plots('system J', 5)

>>plots('system K', 5)