

Assignment 2

https://github.com/jchryssanthacopoulos/quantum_information/tree/main/assignment_2

Quantum Information and Computing AA 2022–23

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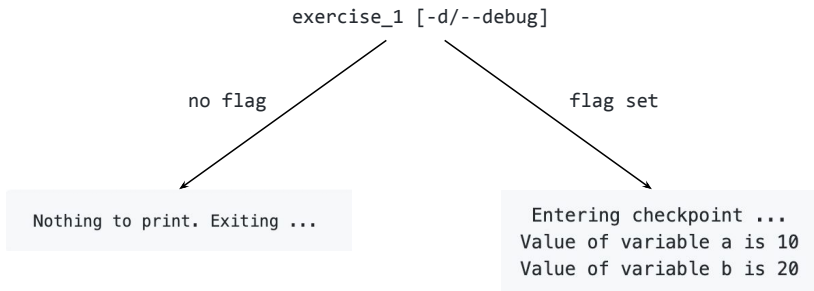


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Exercise 1: Checkpoints



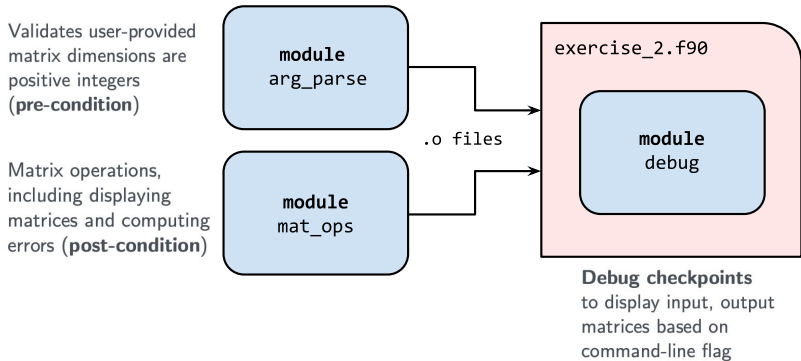
Debug subroutine entered depending on flag



Exercise 2: Documentation (1)



Matrix multiplication program enhanced
to be fault tolerant and easier to debug



Exercise 2: Documentation (2)



Less room for error and more visibility into results

```
# non-integers
$ compiled/exercise_2
Enter number of rows, columns, and inner dimension:
a b c
Dimensions need to be integers!

# non-positive integers
$ compiled/exercise_2
Enter number of rows, columns, and inner dimension:
1, 2, -1
Dimensions must be greater than zero!
```

Error checking

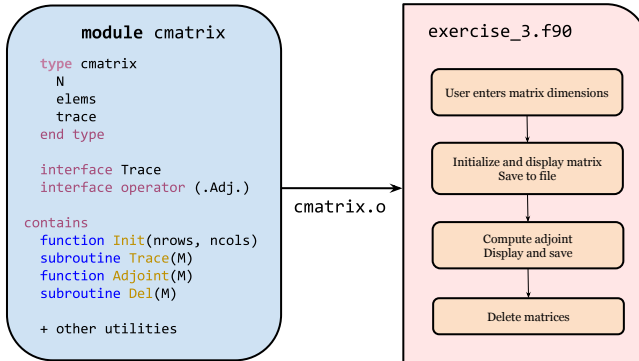
```
Running in debug mode ...
Matrix A =
  0.82  0.79
  0.80  0.99
Matrix B =
  0.25  0.71
  0.48  0.96
Product using matmul =
  0.58  1.35
  0.67  1.53
Elapsed time for matmul = 1.7000000000E-05
Product using row-col =
  0.58  1.35
  0.67  1.53
Max abs error for row-col = 0.0000000000E+00
Elapsed time for row-col = 3.0000000000E-06
Product using col-row =
  0.58  1.35
  0.67  1.53
Max abs error for col-row = 0.0000000000E+00
Elapsed time for col-row = 2.0000000000E-06
```

Debug mode

Exercise 3: Derived types (1)



Derived type implementing double complex matrix
with associated methods



Exercise 3: Derived types (2)



Program writes matrices to screen and files

```
The original matrix is:
+0.6862 +0.6708i   +0.4096 +0.0576i
+0.8869 +0.4427i   +0.1159 +0.7512i
The trace of M is +0.8021 +1.4219i
Saving to file mat.txt ...
The adjoint matrix is:
+0.6862 -0.6708i   +0.8869 -0.4427i
+0.4096 -0.0576i   +0.1159 -0.7512i
The trace of M is +0.8021 -1.4219i
Saving to file mat_adj.txt ...
Deleting matrices ...
```

Program execution

mat_adj.txt

Dimensions: 2 x 2

Matrix elements:
+0.6862 -0.6708i
+0.4096 -0.0576i
Trace:
+0.8021 -1.4219i

mat.txt

Dimensions: 2 x 2

Matrix elements:
+0.6862 +0.6708i +0.4096 +0.0576i
+0.8869 +0.4427i +0.1159 +0.7512i
Trace:
+0.8021 +1.4219i

Saved files