Assignment 2

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

Quantum Information and Computing
AA 2022–23

James Chryssanthacopoulos

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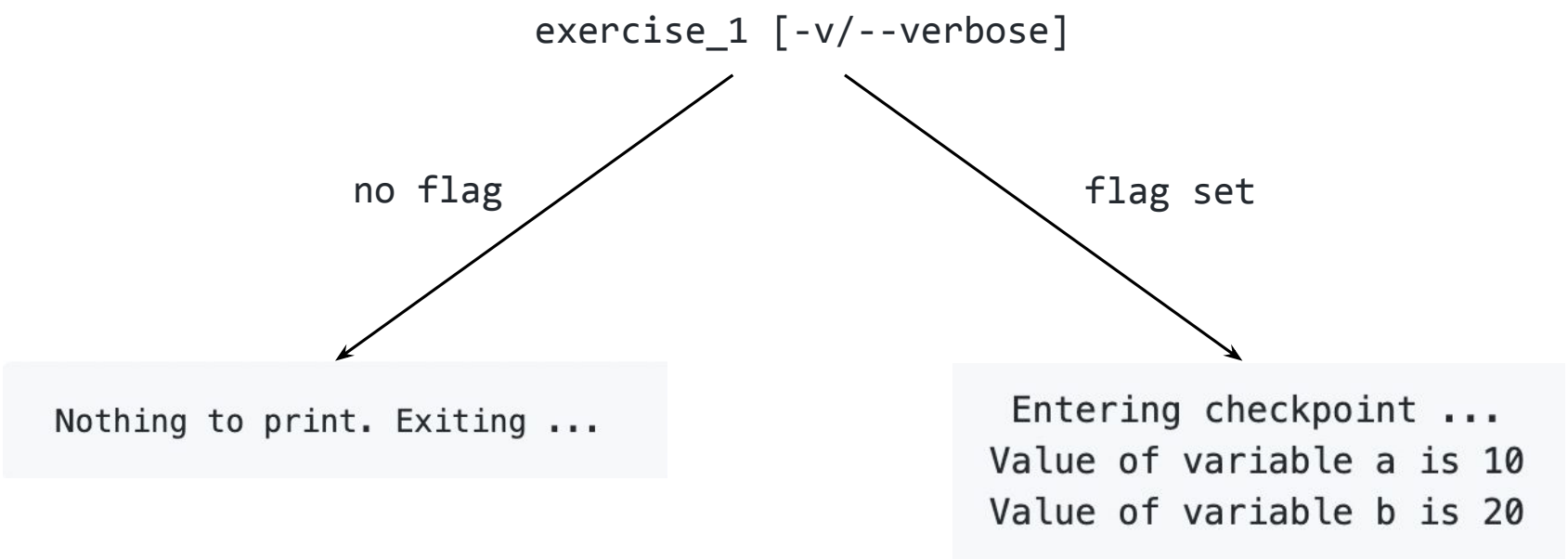
DI PADOVA

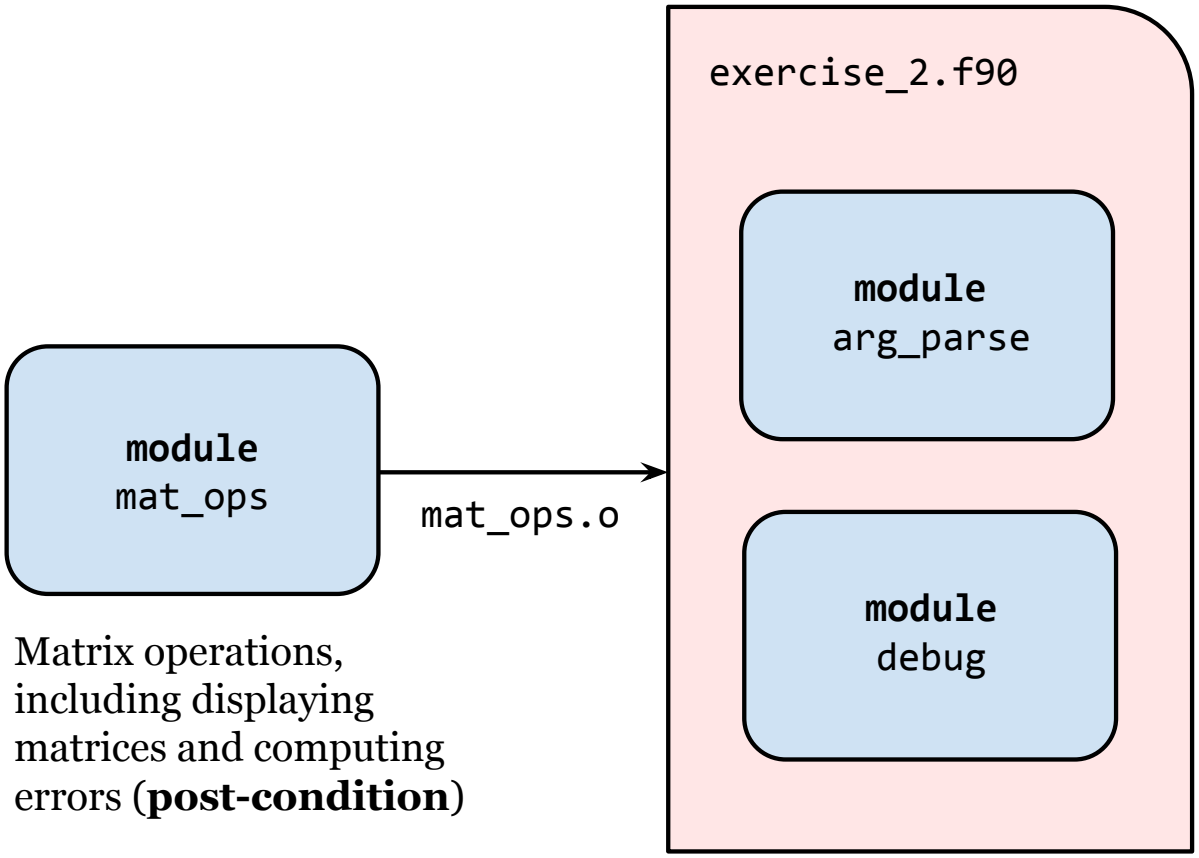
Exercise 1: Checkpoints

Debug subroutine entered depending on flag



Exercise 2: Documentation (1)

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



Validates user-provided matrix dimensions are positive integers (**pre-condition**)

Debug checkpoints to display input, output matrices based on command-line flag

Matrix operations, including displaying matrices and computing errors (**post-condition**)

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!
```

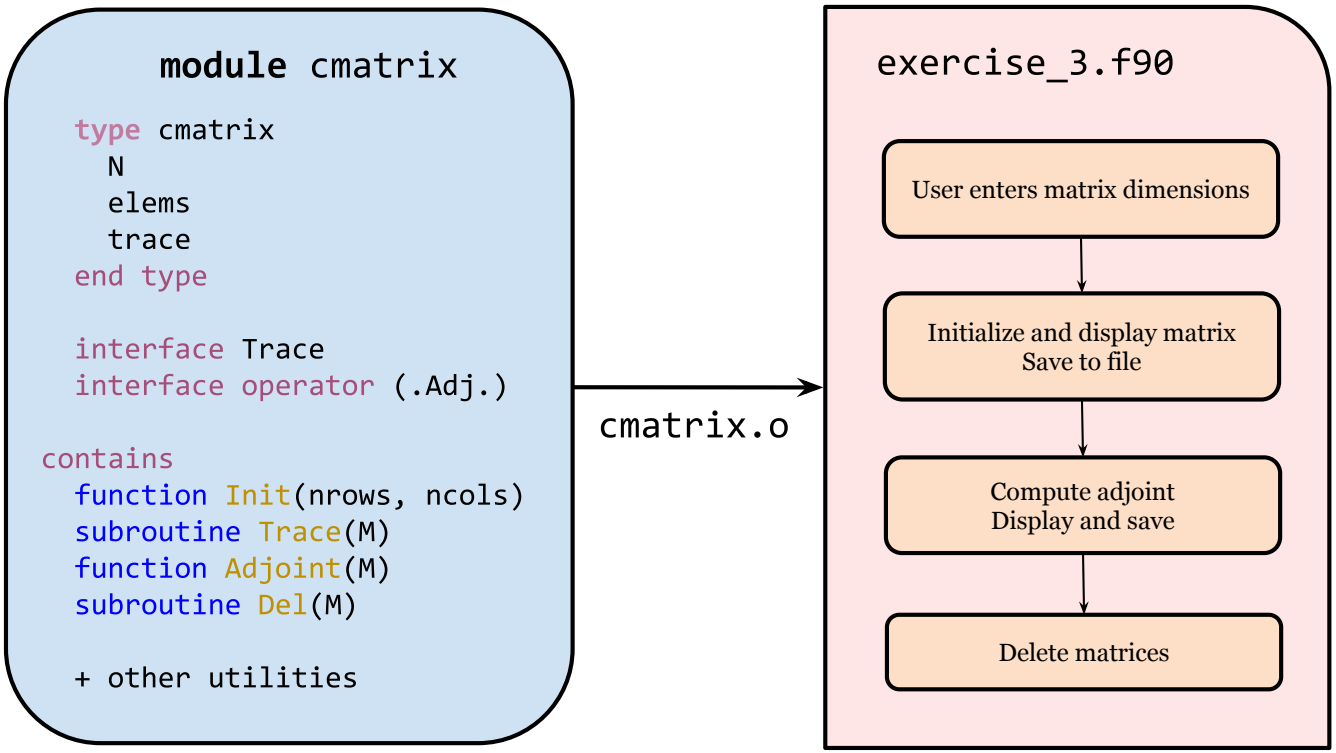
Error checking

```
 Running in verbose 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
```

Verbose mode

Exercise 3: Derived types (1)

Derived type implementing double complex matrix with associated methods

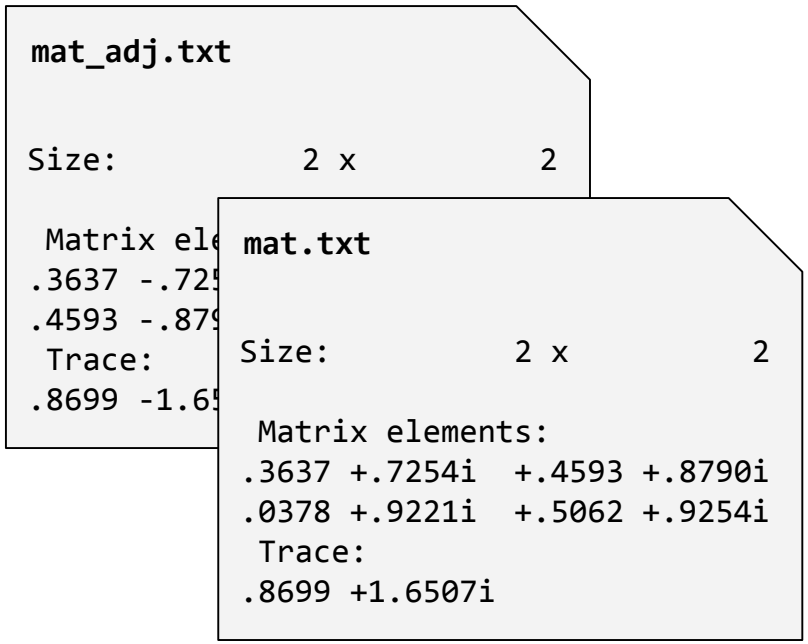


Exercise 3: Derived types (2)

Program writes matrices to screen and files

```
 The original matrix is:
.3637 +.7254i   +.4593 +.8790i
.0378 +.9221i   +.5062 +.9254i
The trace of M is .8699 +1.6507i
 Saving to file mat.txt ...
 The adjoint matrix is:
.3637 -.7254i   +.0378 -.9221i
.4593 -.8790i   +.5062 -.9254i
The trace of M is .8699 -1.6507i
 Saving to file mat_adj.txt ...
 Deleting matrices ...
```

Program execution



Saved files