

Mathematics 1266 (C Programming) Hilary 2019, fourth assignment

February 18, 2019

due by 5pm Friday 29/2/19, just before Reading Week.

This assignment has several features

- Command-line arguments *combined with* keyboard (or redirected) input through `scanf()`.
- Two-dimensional arrays. All work will be done within arrays of 10×10 doubles; but they are effectively reduced in size to $m \times n$ arrays.
- The program is to include two routines,

```
void extract_minor ( int m, int n, int rr, int cc, double a[10][10],
                    double b[10][10]);
```

and

```
void print_matrix ( int m, int n, double a[10][10] );
```

- The main program is to take two integers, `row` and `column`, *from the command line*, `scanf` two integers m and n *from keyboard or redirected input*, and `scanf` the $m \times n$ double-precision numbers into an array `a[10][10]`.

Then it calls `extract_minor` to get the `row`, `column` minor, and finally calls `print_matrix` to print the matrix.

```
#include <stdlib.h>
....
int main ( int argc, char * argv[] )
{
    int row = atoi ( argv[1] ), column = atoi ( argv[2] );
    ...
}
```

Assume the `row` is between 1 and `m`, and `column` between 1 and `n`.

```
void extract_minor ( int m, int n, int rr, int cc, double a[10][10],
                    double b[10][10]);
```

copies the `rr, cc` minor of `a` to the array `b`. This is the $(m - 1) \times (n - 1)$ matrix got by omitting row `rr` and column `cc` from `a`. In calling this routine, `row-1` should be passed as `rr` and `column-1` as `cc`, because of C's indexing conventions.

- Your `print_matrix` routine is straightforward. In the examples below, a special `"%8g"` format is used. This chooses the output format, and in particular numbers which are integers are printed without the 6 zeroes given in `%f` format.
- Comments are important and helpful, but please try to keep the lines in your program short — under 80 columns wide.
- Make sure your program works, *on the maths machines*, or at least that it 'compiles.' It is bad if a program is not working properly, but the *worst* thing you can do is to submit a program which does not compile on the maths machines.
- In programming, it is very important to follow a specification *exactly*, and for this reason you will always be expected to follow the specification *exactly*.

Examples. (The datasets are on the web.)

```
prompt% cat 6x6
```

```
6 6
  2  -4  -4   2  -8  -6
 -2   4   3   0   7   4
  3  -7  -8   6 -13 -12
 -3   7   7  -6  10  14
 -2   3   2  -2   2   9
  1   0   1   0  -1  -4
```

```
0
```

```
gcc -o mm minormatrix.c
```

```
prompt% mm 4 5 < 6x6
```

```
4,5 minor matrix is
```

```
    2      -4      -4      2      -6
   -2       4       3       0       4
    3      -7      -8       6     -12
   -2       3       2      -2       9
    1       0       1       0      -4
```

```
prompt% mm 1 6 < 6x6
```

```
1,6 minor matrix is
```

```
   -2       4       3       0       7
    3      -7      -8       6     -13
   -3       7       7      -6     10
   -2       3       2      -2       2
    1       0       1       0      -1
```

```

prompt% cat 2x2
2 2
1 2
3 4
0
prompt% mm 1 2 < 2x2
1,2 minor matrix is
      3
prompt% cat 3x3
3 3
1 2 3
4 5 6
7 8 8
0
prompt% mm 2 2 < 3x3
2,2 minor matrix is
      1      3
      7      8
prompt%

```