Informatics for Astronomers - WS2021

Roland Ottensamer, Marina Dütsch, Miguel Verdugo, Andreas Schanz

Exercise sheet 6 - Bash and Fortran

The following will be also part of the assessment:

(1) Try to present exercises in a way that everyone can understand (even those who didn't do the exercises), so please explain the vital parts of your solution in a clear way.

(2) Try to also include some background information where applicable, and/or explain the possible context/motivation for the given exercise.

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1. Implement a simple calculator in `bash`. After you start the script, it should prompt the user to select from a list of mathematical operators and store the selection in a variable (use the `read` command).

2. Using a `bash` script, find the `N` largest files in your `$HOME` and copy them to another location. `N` is an argument (integer) provided by the user when running the script.

3. Take the file `Photomety_V_Band.txt`. This file contains photometric and positional data of over 6000 stars. The first column contains the ID of the stars, the second and third contain the `X` and `Y` position and the fourth column contains the flux in ADU (Analog-Digital Units). Use `awk` to select all stars in a $500 \times 500\mathrm{px}^2$ around the center (1000, 1000) and write the result to a new file. Then sort the file based on the flux.

4. Write a `bash` script that takes the `Photomety_V_Band.txt` and counts the number of stars inside of a 300px radius around the center (1000, 1000). The script shall then print the resulting number and the ID and signal of the brightest star inside of that region.

5. Write a `Fortran` program that uses the Babylonian Method to calculate the approximate square root of 42 (or any number).

6. Write a `Fortran` program that find all prime numbers up to the input value.

   - Compare the execution time to your `python` version