Dirk Praetorius
Michele Ruggeri

Sommersemester 2015
17.03.2015

Übungen zur Vorlesung
Einführung in das Programmieren für TM

Serie 2

Aufgabe 2.1. Write a function `dabs` that computes the modulus $|x|$ of a given number $x \in \mathbb{R}$. Moreover, write a main program that computes x and prints out $|x|$. The mathematical library `libm.so` must not be used. Save your source code as `dabs.c` into the directory `serie02`.

Aufgabe 2.2. Write a `void`-function `vectorproduct`, which, given two vectors $\mathbf{u} = (a, b, c)^T$ and $\mathbf{v} = (x, y, z)^T$, computes the vector product $\mathbf{w} = \mathbf{u} \times \mathbf{v}$ defined by

$$w_1 = bz - cy$$
$$w_2 = cx - az$$
$$w_3 = ay - bx.$$

Then, write a main program which reads the vectors $\mathbf{u}, \mathbf{v}$ from the keyboard, calls the function and displays the vector product. Save your source code as `vectorproduct.c` into the directory `serie02`.

Aufgabe 2.3. Write a function `member` that computes for given $n \in \mathbb{N}$ the member $a_n := (-1)^n/n$ of the series $(a_n)_{n\in\mathbb{N}}$. Moreover, write a main program that reads in n and prints out a_n. Save your source code as `member.c` into the directory `serie02`.

Aufgabe 2.4. Write a function `rounding`, which, given $x \in \mathbb{R}^+$, computes the number $n \in \mathbb{N}$ which is closest to x. If x is exactly in the middle between two integers n and $n + 1$, the function chooses the biggest one, i.e., $n + 1$. Then, write a main program which reads the number x from the keyboard, calls the function and displays the rounded value. Save your source code as `rounding.c` into the directory `serie02`.

Aufgabe 2.5. Write a `void`-function `date` computes for a given number $z \in \mathbb{N}$ the corresponding date. The date can be obtained from z under consideration of the formatting `DDMMYYYY`. Hence, $z = 10102014$ is the 10th October 2014. Note that leading zeros will not be stored, e.g., the first of October 2014 is represented by $z = 1102014$ (5 digits). Moreover, write a main program that reads in z and calls the function. Save your source code as `date.c` into the directory `serie02`.

Aufgabe 2.6. A circle C is given by its center (x, y) and its radius $r > 0$. Write a function `locate` which should return `-1` if a given point (u, v) is in the circle, `0` if (u, v) is on its boundary and `1` otherwise. Additionally write a main program which reads in the parameters u, v, x, y, r and prints out the position of (u, v) compared to C. Save your source code as `locate.c` into the directory `serie02`.

Aufgabe 2.7. Let the three points (x, y), (u, v), and (a, b) in $\mathbb{R}^2$ be given. Write a function `points` which checks if the three points lie on the same line. Additionally, write a main program which reads in the six values and prints out the result on the monitor.

Aufgabe 2.8. What is *Type-Casting*? Which types do exist? What is the output of the following code lines? Explain why!

```
#include <stdio.h>

main() {
  int x = 1;
  int y = 5;

  double erg1 = x / y;
```

```
  double erg2 = (double) x / y;
  double erg3 = 1. / 5;
  int erg4 = (double) x / y;

  printf("erg1 = %f\n",erg1);
  printf("erg2 = %f\n",erg2);
  printf("erg3 = %f\n",erg3);
  printf("erg4 = %d\n",erg4);
}
```