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Theoretical exercises
Spring 2021

Practical Exercises 1

Introduction to C programming

Please submit solutions on Blackboard by Friday, 5.02.2021 14:00h

Notice: Please submit solutions on Blackboard in groups of two or three students.
The practical exercises will be graded and count as part of your final grade.

Update: We have added an indication of the number of points you can achieve!

1.1 Recursion in C (10 points total)

Write a simple C program (`rec_sum.c`) that calculates the sum of the numbers 1 to n using a *recursive* function `int sum_n(int n)`. For example, a call to `sum_n(5)` should return the value 15. After calling the function, print out its return value like this:
(6 points)

```
The sum of numbers from 1 to 5 is 15.
```

Use `printf(3)` to create the output. Please refer to the C crash course slides for details on printf.

In addition, create a number of different variables (different types, global, local, initialized, uninitialized) in your program and print their addresses in memory in the `main()` function. You can print addresses of variables using `printf(3)` like this:

```
printf("Address of foo is %p\n", &foo);
```

Deliver your implementation in a single C source code file `rec_sum.c`. In addition, answer the following questions:

a. Experiment with different (also large) values for the parameter n. Why does the program fail to run correctly until its end beginning with a certain value of n? What is this value on your computer? (1 point)

b. Which distance (in bytes) do the addresses of two variables have that are declared one after the other in `main()`? Explain, why the distance is the one you see. (1 point)

c. Why is a global `int` variable located at a completely different address? (1 point)

d. Why does the address of a local variable in the recursive function *decrease* the higher the level of recursion is? (1 point)