

Tutorium Funktionale Programmierung 2019

Part 11 - foldr and Modules

VO - Part 4 and 5

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Exercise 11.1.: Rollback *foldr*

- ▶ A list consists of positive integer values e.g. [2,3,5,7,3,4]. Try to express a function which finds the maximum value of this list. Use *foldr*. The function should be called *findMax*.
- ▶ Illustrate the abstract syntax tree for *findMax [4, 3, 5, 5]*.
- ▶ Afterwards show *each step by hand* to find the max. value for the following expression *findMax [4, 3, 5, 5]*.

```
foldr :: (a -> b -> b) -> b -> [a] -> b
foldr _ z []      = z
foldr f z (x:xs) = f x (foldr f z xs)
-- foldr op x0 (x:xs) = x 'op' (foldr op x0 xs)
```

Modules

- ▶ to organize code
- ▶ it is a collection of functions, types and type classes
- ▶ still now included module: prelude
- ▶ create module containing functions, types etc. : `module MyModul(x,y,z) where ...`
- ▶ import everything from a module: `import MyModul`
- ▶ import something (functions, types...) of a module: `import MyModul(x, y, z)`
- ▶ A qualified import makes the imported entities available only in qualified form: `import qualified MyModul` → `MyModule.testFunction`
- ▶ *exclude something of a module*: `import MyModul hiding (x, y, z)`

Exercise 11.2.: Create modules

Create a new module which is called Coordinates. It contains

- ▶ type X = Double
- ▶ type Y = Double
- ▶ data Coordinate = CoordinateC X Y
- ▶ a function to **add two coordinate**
- ▶ a function for a **scalar product**
- ▶ a function for the **vector magnitude**
- ▶ pi :: Double
pi = 3.1415 ~> What does happen if you use *pi*?
- ▶ testFunction :: String
testFunction = "Test" ~> The test function shouldn't be part of the module.

Exercise 11.3.: Use modules

Create a new function to calculate the *centre of mass* of a given list of coordinates. For all $i \in \{1, \dots, n\}$ is $m_i = (x_i, y_i) \in \mathbb{R}$. The centre of mass is calculated in the following way

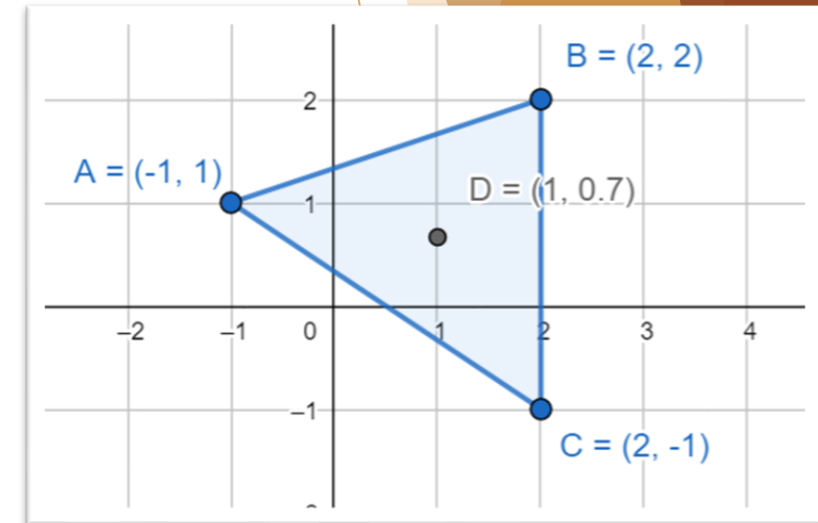
$$c = \frac{1}{n} * \sum_{i=1}^n m_i$$

Create a new file `10_3_centreOfMass` and use the *Coordinates module*.

Test it with

`[(CoordinateC (-1,1)), (CoordinateC (2,2)), (CoordinateC (2,-1))]`

and compare it with the given figure.



Questions? Need help? Feedback? etc.

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