Haskell Unit 4: ZF-expressions

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Introduction

A ZF-expression has the following form:

[x * x | x <- [1, 2, 7, 12], even x]

This is a very convenient way of defining a list. The above ZF-expression is the list of all those things of the form x * x such that x is drawn from the list [1, 2, 7, 12] and x is even. The above ZF-expression evaluates to [4, 144].

The general format of a ZF-expression is:

[EXP | QUAL , ... , QUAL]

where QUAL is either a Boolean-valued expression or a generator. A generator is something of the form:

VARIABLE <- LIST PATTERN <- LIST

Reduction rules for ZF-expressions

- (ZF1) [e | v <- [], q] reduces to [], where q is zero or more qualifiers.
- (ZF2) [e | v <- f:fs, q] reduces to [e | q] [v := f] ++ [e | v <- fs, q], where h [v := f] represents h with all occurrences of v in it replaced by f.
- (ZF3) [e | False, q] reduces to [].
- (ZF4) [e | True, q] reduces to [e | q].
- (ZF5) [e |] reduces to [e].

Quicksort

ZF-expressions allow a very concise definition of Hoare's Quicksort algorithm: