Two ways to run a program: avoids code duplication.

Monads have expressiveness and readability: they might make bidirectional programming easier.

Two ways to run a program: avoids code duplication.

An invertible parser can be turned around into a printer.

A lens lifts functions \( a \to x \) into updates on \( s \).

A generable set consists of a random generator and a membership function.

A pair of \( \text{reader} \) and \( \text{writer} \) transformations.

A more realistic example of invertible parser:

In the definition of a MBX like tree, every action is annotated with its “location” in the final result. Erasing these annotations in gray below reveals the code of a parser.

Monadic profunctors (MP)

MBXs are monadic profunctors.

A monadic profunctor is a monad,

\[
\text{return} :: a \to p \times a
\]

also a contravariant functor (cofunctor),

\[
(\_. :: (y \to x) \to p \times a \to y a
\]

such that \( f = \_ \) is a monad morphism for all \( f \).

Example: Parsing and printing trees

Motivation

Three types of bidirectional transformations (BX)

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Common interpretation

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