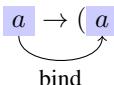


Monads reference card

Jean-Philippe Bernardy

January 27, 2013

| | monad component | DSL application | | | | | | | | | | | | |
|----------------|---|---|-----|--------------|---------------|---|---------------------------------|----------------|---|--|---------------|---|------------------------------|--|
| Syntax | $m :: \star \rightarrow \star$ $return :: a \rightarrow m a$ $(\gg=) :: m [a] \rightarrow ([a] \rightarrow m b) \rightarrow m b$  bind | Expressions parameterized on return type constant expression bind an a returned by the lhs into the rhs | | | | | | | | | | | | |
| Laws | <table border="1"> <thead> <tr> <th>name</th> <th>law</th> <th>a DSL aspect</th> </tr> </thead> <tbody> <tr> <td>left identity</td> <td>$return a \gg= (\lambda x. m x) \equiv m a$</td> <td>inlining/factorizing a constant</td> </tr> <tr> <td>right identity</td> <td>$m \gg= (\lambda x. return x) \equiv m$</td> <td>removal/introduction of useless return</td> </tr> <tr> <td>associativity</td> <td>$(m \gg= f) \gg= g \equiv m \gg= (\lambda x. f x \gg= g)$</td> <td>extension/shrinking of scope</td> </tr> </tbody> </table> | name | law | a DSL aspect | left identity | $return a \gg= (\lambda x. m x) \equiv m a$ | inlining/factorizing a constant | right identity | $m \gg= (\lambda x. return x) \equiv m$ | removal/introduction of useless return | associativity | $(m \gg= f) \gg= g \equiv m \gg= (\lambda x. f x \gg= g)$ | extension/shrinking of scope | |
| name | law | a DSL aspect | | | | | | | | | | | | |
| left identity | $return a \gg= (\lambda x. m x) \equiv m a$ | inlining/factorizing a constant | | | | | | | | | | | | |
| right identity | $m \gg= (\lambda x. return x) \equiv m$ | removal/introduction of useless return | | | | | | | | | | | | |
| associativity | $(m \gg= f) \gg= g \equiv m \gg= (\lambda x. f x \gg= g)$ | extension/shrinking of scope | | | | | | | | | | | | |
| “do” | $\begin{array}{l} \text{do } x \leftarrow \alpha \\ \quad y \leftarrow \beta \\ \quad \gamma \end{array}$ | $\begin{array}{l} \alpha \gg= \lambda x. \\ \beta \gg= \lambda y. \\ \gamma \end{array}$ | | | | | | | | | | | | |
| | <ul style="list-style-type: none"> • parentheses are not needed • x may appear in γ | | | | | | | | | | | | | |
| Comprehensions | $\left[\begin{array}{l} \gamma \\ \quad x \leftarrow \alpha \\ , \quad y \leftarrow \beta \\] \end{array} \right]$ | $\begin{array}{l} \alpha \gg= \lambda x. \\ \beta \gg= \lambda y. \\ \text{return } \gamma \end{array}$ | | | | | | | | | | | | |
| | <ul style="list-style-type: none"> • $\gg=$ can be used to “flatten” levels of the monad. • $join :: m(m a) \rightarrow m a$ • $join xs = xs \gg= id$ | | | | | | | | | | | | | |