Maintainable type classes for Haskell

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March 25, 2015

State of affairs ...

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  - Prelude 7.10 - Plan FTP [2]

Motivation

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class             Ord' a where
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import Library

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```
[1 of 1] Compiling Client ...
No instance for (Eq' Foo)
   arising from the superclasses of an instance declaration
In the instance declaration for ‘Ord' ClientData‘
```

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On the other hand there is no way to add a superclass into the class context – existing code does not provide instances.

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3. Add a superclass constraint

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There are two hard things in computer science: cache invalidation, naming things, and off-by-one errors

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- The Strathclyde Haskell Enhancement[8]

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  ticket opened 20 and closed 17 months ago
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The Strathclyde Haskell Enhancement

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- limited version of Default Superclass Instances proposal
  eg. instance visible only within one module

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We provide the formal syntax and the semantics.

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```
class Applicative m => Monad m where
    (>>=)  :: m a -> (a -> m b) -> m b
    return :: a -> m a

    default instance Applicative m where
        pure x = return x
        pf (<*>) px = px >>= \ x -> pf
            >>= \ f -> return (f x)

    default instance Functor m where
        fmap f x = pure f >>= \ g -> return (g x)
```

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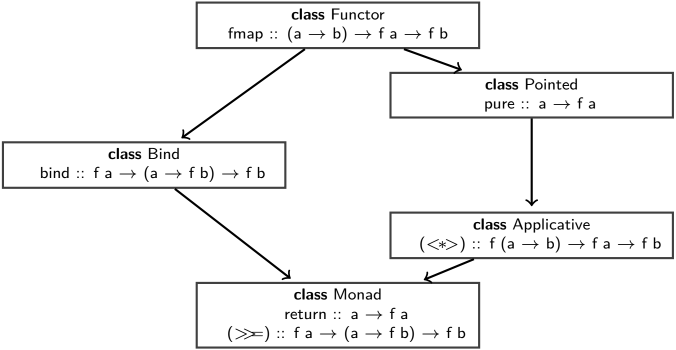


class Functor
fmap :: (a → b) → f a → f b

class Pointed
pure :: a → f a

class Bind
bind :: f a → (a → f b) → f b

class Applicative
(<*>) :: f (a → b) → f a → f b

class Monad
return :: a → f a
(>>=) :: f a → (a → f b) → f b

Figure: Refactored class structure

Applications (cont.)

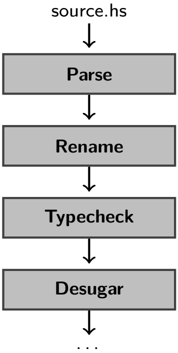
```
{-# LANGUAGE SuperclassDefaultInstance #-}
newtype Id a = Id { getId :: a }
newtype Const a = Const { getConst :: a }

instance Functor Identity where
  fmap f (Id x) = Id (f x)

instance Traversable (Const m) where
  traverse _ (Const m) = pure (Const m)

class (Functor t, Foldable t) => Traversable t where
  ...
  default instance Functor t where
    fmap f = getId .  traverse (Id . f)
  default instance Foldable t where
    foldMap f = getConst .  traverse (Const .  f)
```

GHC implementation



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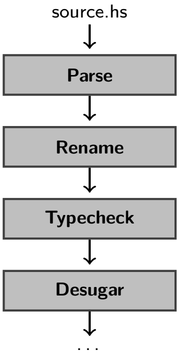
Proof-of-concept implementation of our proposal.



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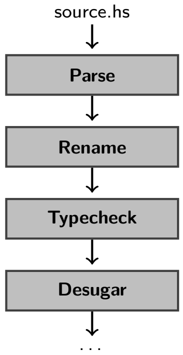
Enables a new language extension *SuperclassDefaultInstances*



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- Can we provide a solution?
  - Yes, Superclass Default Instances
- Is it a good solution?
  - It is up to the community
  - We have an implementation to test it

Applicative/Monad proposal related warnings (AMP phase 1). Online. July 2014. URL: https://ghc.haskell.org/trac/ghc/ticket/8004.

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