

Scala solution

How to make your Scala controll effects a-la Haskell

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<https://github.com/folone/funcclub-words>

Note: I intentionally made it more "interesting" to show more neat scalaz stuff

I won't cover everything though. If something seems strange, please ask.

Main functions

```
wordCount :: String → Map (String, Int)
acceptedChars :: Char → Boolean
```

Helper functions

```
time :: (a → IO b) → IO b
close :: Closeable a ⇒ a → IO ()
```

```

def acceptedChars(c: Char) = {
  val sum: (((Boolean, Boolean), Boolean)) =>
    Boolean = _ match {
      case ((a, b), c) => a || b || c
    }
  val fun = ((_: Char).isLetterOrDigit) &&&
    ((_: Char).isWhitespace) &&&
    ((_: Char) == '-')
  (fun >>> sum)(c)
}

```

```
def wordCount(text: String): Map[String, Int] =  
  text.filter(acceptedChars)  
    // split words  
    .toLowerCase.split("\\W").toList  
    // Optionally parallelize  
    .par  
    // group  
    .groupBy(identity)  
    // calculate group sizes  
    .map { case(key, value) =>  
      key.trim → value.length  
    }  
    // Get results from parallel computation  
    .seq
```

Typeclass instances

```
val N = 10
implicit val mapInstances = new Show[List[(String,
  override def shows(l: List[(String, Int)]) =
    l.filterNot(_._1.isEmpty)
      .sortBy(_._2)
      .take(N)
      .foldLeft("") { case(acc, (key, value)) =>
        acc + "\n" + key + ": " + value
      }
}]
```

```
// function :: String → IO String
def main(args: Array[String]) = {
  val path    = args(0)
  val action = for {
    result ← time(function(path))
    _ ←      putStrLn(result)
  } yield ()
  // Yuck!
  action.unsafePerformIO()
}
```

Let's see how far we can push this solution.

First attempt

```
def wholeFile(path: String): IO[String] =  
  IO { Source.fromFile(path) }.bracket(close) {  
    source =>  
      IO {  
        val text    = source.mkString  
        val result = wordCount(text)  
        result.toList.shows  
      }  
  }
```

First attempt

Works fine, but eats all the heap on a large enough file.

Second attempt

```
def byLine(path: String): IO[String] =  
  IO { Source.fromFile(path) }.bracket(close) {  
    source =>  
      IO {  
        val stream = source.getLines.toStream  
        val result = stream.map(wordCount)  
          .foldLeft(Map.empty[String, Int]) {  
            case (acc, v) => acc |+| v  
          }  
        result.toList.shows  
      }  
    }  
}
```

Just what is this $|+|$?

```
instance Show [(String, Int)] where ...  
instance Show Monoid b ⇒ Map a b where ...
```

$$(S, \otimes, 1)$$

$$\forall a, b \in S : a \otimes b \in S$$

$$\forall a, b, c \in S : (a \otimes b) \otimes c = a \otimes (b \otimes c)$$

$$\forall a \in S : 1 \otimes a = a \otimes 1 = a$$

Pretty good, but can we do better?

Scala machines (<https://github.com/runarorama/scala-machines>)
Gave similar performance on a by-line basis. Thought, three times faster if we provide a Process to split it by words and then monoidally merge single-element Maps.

Iteratees – same as Stream

```
def wordFreq(path: String) =  
  getFileLines(new File(path),  
    id outmap wordCount) execute
```

Iteratees – 3x faster

```
def splitWords(text: String): List[String] =  
  text.filter(acceptedChars)  
    .toLowerCase.split("\\W").toList
```

```
val words: Process[String, String] = (for {  
  s ← await[String]  
  _ ← traversePlan_(splitWords(s))(emit)  
} yield ()) repeatedly
```

```
def wordCount(path: String) =  
  getFileLines(new File(path),  
    (id split words) outmap (  
      _ .fold(1 ⇒ (1, Map.empty[String, Int]),  
        w ⇒ (0, Map(w → -1)))) execute
```

Wordcounting software

Scoobi <http://nicta.github.com/scoobi/>

Spark <http://spark-project.org/>

Scalding <https://github.com/twitter/scalding/wiki/Type-safe-api-reference>

I did not have time to try to use those. But turns out, this code should work for these "as is".

That's it

Questions?