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Big Data System Engineering with Scala
Spring 2022
Assignment No. 6

Task

1. **Implement 3 TODOs in WebCrawler.scala**
2. **Implement 2 TODOs in MonadOps.scala**
3. **Suggest how to improve the web crawler**

Solution

1. Implement 3 TODOs in WebCrawler.scala

```
// 16 points.
def getURLs(ns: Node): Seq[Try[URL]] = for(anchor <- ns \\ "a") yield createURL(Option(u), anchor \@ "href")
```

```
// 9 points.
for(st <- getURLContent(u); r <- MonadOps.asFuture(getLinks(st))) yield r
```

```
// 15 points. Implement the rest of this, based on us2 instead of us.
Future.sequence( for (u <- us2) yield MonadOps.sequence(wget(u)) )
// Future.sequence( us2.map(wget).map(MonadOps.sequence(_)) )
```

2. Implement 2 TODOs in MonadOps.scala

```
// 6 points.
def mapFuture[X](xfs: Seq[Future[X]])(implicit executor: ExecutionContext): Seq[Future[Either[Throwable, X]]] =
  for(xf <- xfs) yield sequence(xf)
```

```
// 7 points.
def sequence[X](xe: Either[Throwable, X]): Option[X] = xe match {
  case Left(_) => None
  case Right(x) => Some(x)
}
```

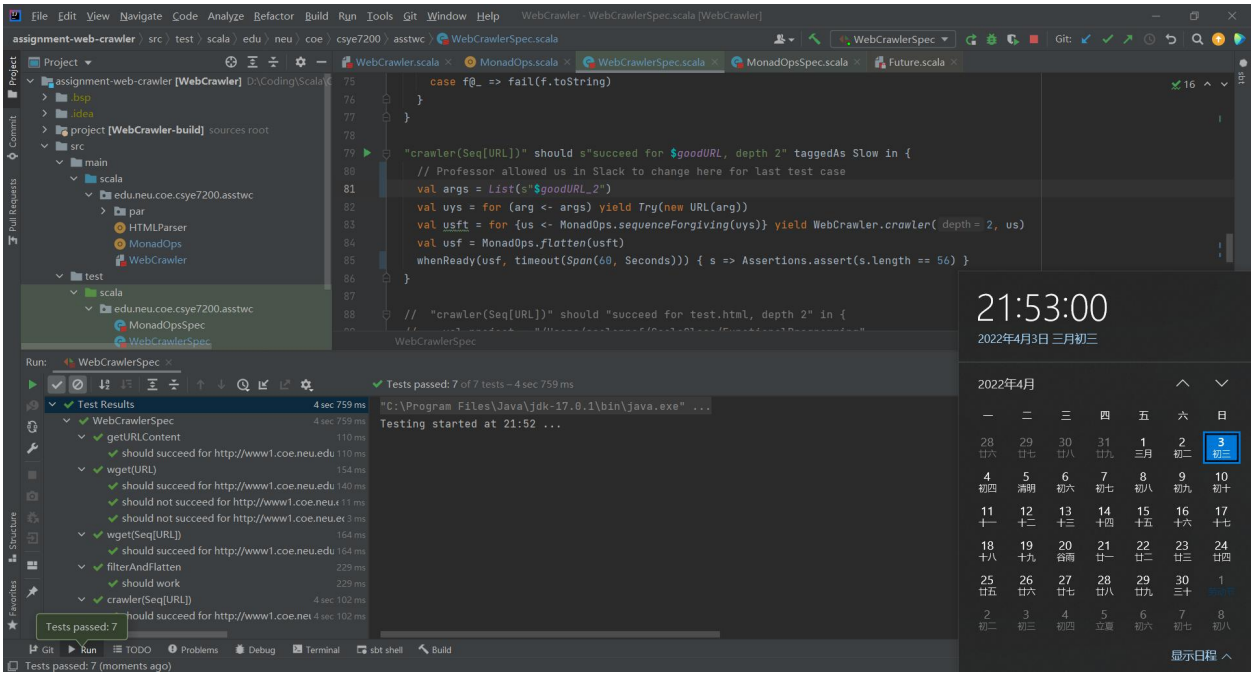
3. Suggest how to improve the web crawler

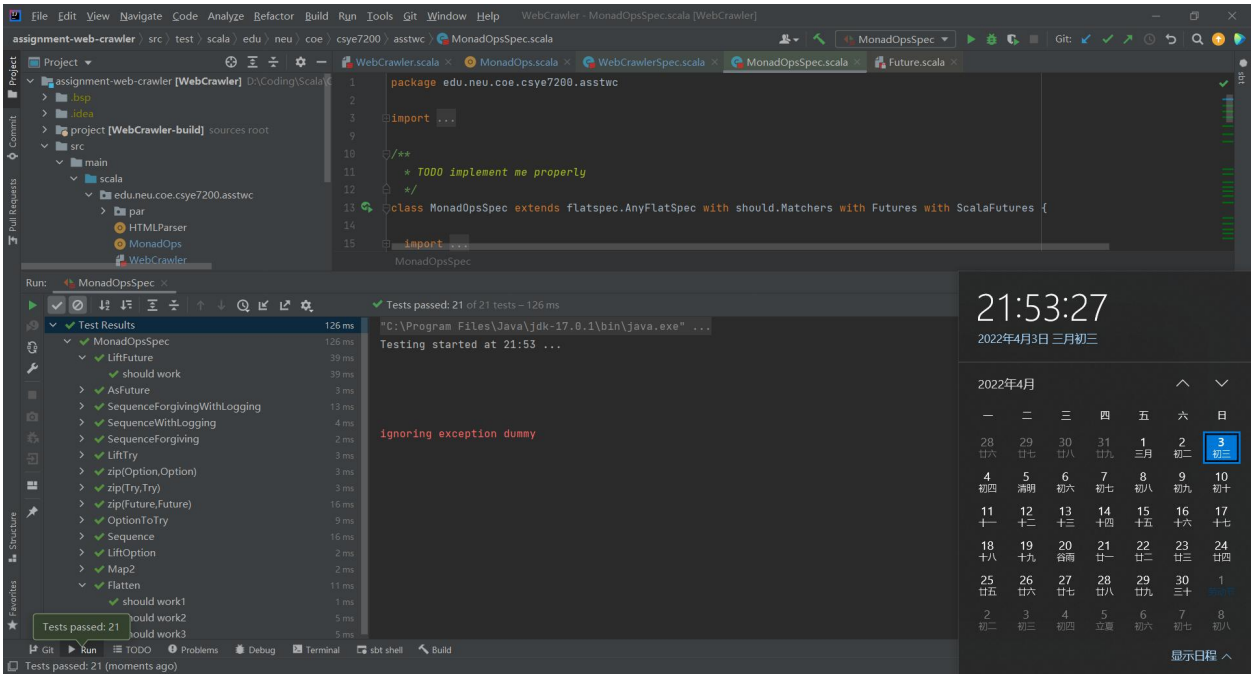
(1) In this assignment, we process the URLs one by one. Actually we can transform it to parallel processing.

In the wget(us), we perform wget(u) and MonadOps.sequence() to each url. I think we can make it parallel here: split the URLs to N parts(N is number of threads), for each thread, only process one of the parts.

(2) The result of wget(us) is Future[Seq[...]], which means if any URLs of the sequence don't response correctly, we can't get other results, too. Maybe we don't have to use Future.sequence to transform the former result of it, just keep it Seq[Future[...]].

Unit Test Screenshot





Project Source

https://github.com/MrNiro/CSYE7200/tree/Spring2022/assignment-web-crawler