depop

MAKING YOUR LIFE EASIER WITH MACROS

https://github.com/depop/json-macros

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Problem - writing out a class using snake case JSON field names

I want to write this:

```
SprayJsonMacros.jsonWriter[Car](toSnakeCase).write(Car(2, 2.4))
SprayJsonMacros.jsonWriter[Airplane](toSnakeCase).write(Airplane(4))
```

So that I can get this output:

```
JsObject("number_of_doors" -> JsNumber(2), "engine_capacity" -> JsNumber(2.4))
JsObject("number_of_engines" -> JsNumber(4))
```

Using some function:

```
def toSnakeCase: String => String
```

But I end up having to write:

```
new JsonWriter[Car] {
  override def write(car: Car): JsValue = {
    JsObject(
      "number_of_doors" -> car.numberOfDoors.toJson,
      "engine_capacity" -> car.engineCapacity.toJson
    )
  }
}
```

Problem - writing JSON for a parent type

Given I have this:

```
sealed trait Vehicle
case class Car(numberOfDoors: Int, engineCapacity: Double) extends Vehicle
case class Airplane(numberOfEngines: Int) extends Vehicle
```

And I have an implicit `JsonWriter[Car]` and `JsonWriter[Airplane]` in scope

When I want to create a `JsonWriter[Vehicle]`

Then I have to write this sort of crap:

```
new JsonWriter[Vehicle] {
  override def write(vehicle: Vehicle): JsValue = {
    vehicle match {
      case car: Car => car.toJson
      case airplane: Airplane => airplane.toJson
    }
  }
}
```

But I really want to just write:

```
val vehicleJsonWriter = SprayJsonMacros.jsonWriterFromSubTypes[Vehicle]
```

Benefits of Macros

- Allows a simple way of generating code
- If we can generate code, then it's simple for us to convert a domain model to a representation in a persistence layer or in json
- DRY principle - duplicating logic is annoying and error-prone
- Duplicated logic blocks across different types can be extracted into a macro, just as duplicated code blocks can be refactored to extract new methods

Tips and Tricks

- Auto-complete and `println` are your friends. Just keep typing until something good happens
- Your macro code needs to be in a separate code base from your domain model

Code - writing out a class using snake case JSON field names

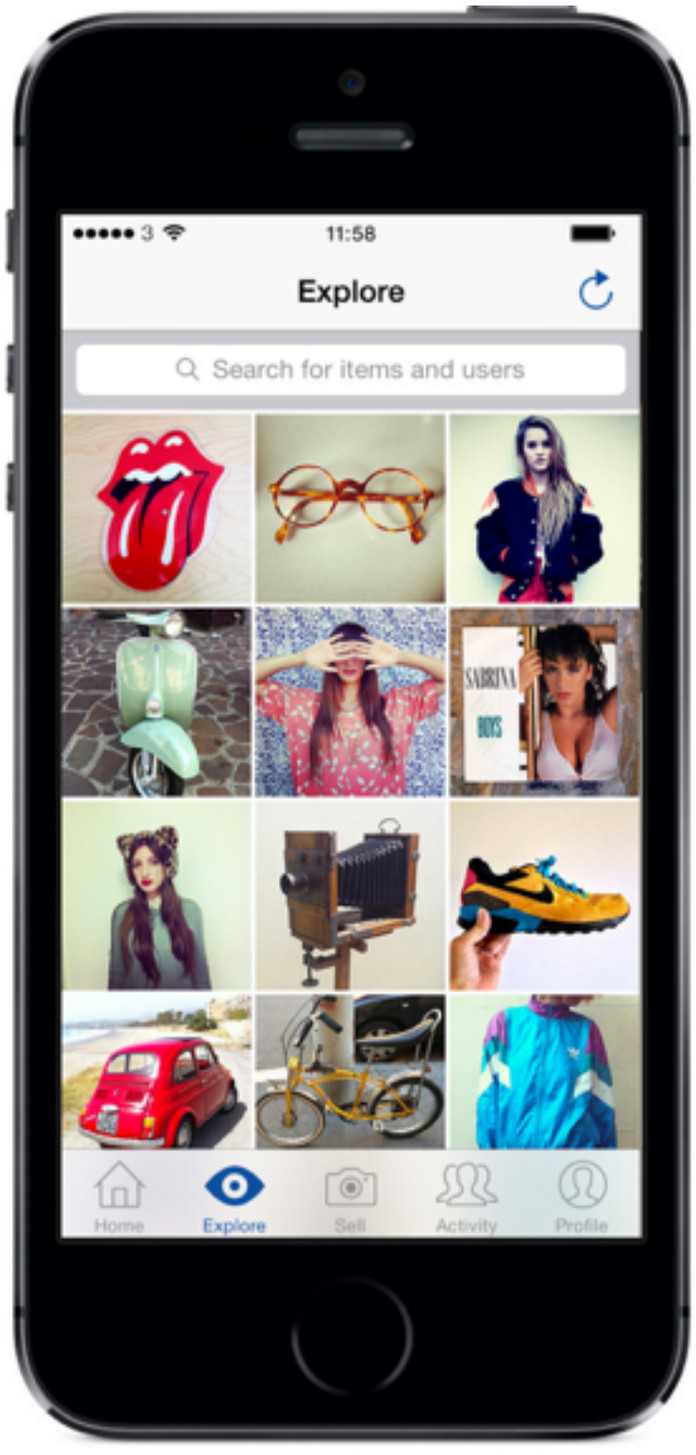
```scala
import spray.json.JsonWriter
import scala.reflect.macros.blackbox.Context

trait SprayJsonFieldNamingMacros {
  def jsonWriterMacro[T : c.WeakTypeTag](c: Context)(nameWriter: c.Expr[String => String]): c.Expr[JsonWriter[T]] = {
    import c.universe._

    // the type representation of T
    val baseType: c.universe.Type = weakTypeOf[T]

    // fields within the type T
    val fields: Iterable[c.universe.MethodSymbol] = baseType.decls.collect {
      case methodSymbol: MethodSymbol if methodSymbol.isCaseAccessor =>
        methodSymbol
    }

    // ensure all JsonWriters exist for field return types
    fields.map(_.returnType).toSet.foreach { fieldType: Type =>
      q"""implicitly[spray.json.JsonWriter[$fieldType]]"""
    }

    // pairs of String -> JsValue which represent json field name -> json field value
    val pairs: List[c.universe.Tree] = fields.toList.map { field =>
      val classFieldName = field.name.decodedName.toTermName
      val jsonFieldName = q"$nameWriter(${classFieldName.toString})"
      q"($jsonFieldName, item.$classFieldName.toJson)"
    }

    // create the JsonWriter
    val jsonWriterType: c.universe.Type = weakTypeOf[JsonWriter[T]]
    val jsonWriter: c.universe.Tree =
      q"""
        new $jsonWriterType {
          def write(item: $baseType): spray.json.JsValue = {
            JsObject($pairs)
          }
        }
      """

    c.Expr[JsonWriter[T]](jsonWriter)
  }
}
```

Code - writing JSON for a parent type

```
import spray.json.JsonWriter
import scala.language.experimental.macros
import scala.reflect.macros.blackbox._

trait ADTJsonMacros {
  def jsonWriterFromSubTypesMacro[T: c.WeakTypeTag](c: Context): c.Expr[JsonWriter[T]] = {
    import c.universe._

    // the type representation of T
    val baseType: c.universe.Type = weakTypeOf[T]

    // all subclasses for the type T which are "known", ie: extending a sealed trait
    val subclasses: Set[c.universe.Symbol] = baseType.typeSymbol.asClass.knownDirectSubclasses

    // the writers for all of the subclasses
    val writers: Set[Any] = subclasses.map { subclass =>
      // function taking an instance of the subclass and returning that instance as json
      val q"{ case $writer }" =
        q""" {
          case item: $subclass =>
            val jsonWriter = implicitly[spray.json.JsonWriter[$subclass]]
            jsonWriter.write(item)
        }
      """
      writer
    }

    val jsonWriterType: c.universe.Type = weakTypeOf[JsonWriter[T]]

    // the JsonWriter for the parent type which matches against each of the subclass writers
    val jsonWriterFound: c.Tree =
      q"""
      new $jsonWriterType {
        def write(item: $baseType): spray.json.JsValue = {
          item match { case ..$writers }
        }
      }
      """

    c.Expr[JsonWriter[T]](jsonWriterFound)
  }
}
```

Links/Resources

- http://docs.scala-lang.org/overviews/quasiquotes/syntax-summary.html is a great summary of quasiquotes syntax and has links on how to use, but doesn't necessarily have a high level overview of how everything might fit together



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