You were convinced by the literate programming propaganda, and you wanted to be able to write an article about a program, and to derive the article and the text of the program from the same manuscript. So you went out there on the Web and read all you could about the literate programming systems that were around and got that sinking feeling.... It may be time to consider demiliterate programming.

“Demiliterate programming is to literate programming as ping-pong is to chess.”

pronounced *demmy literate*

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1 Demiliterate programming

\textTeX{} has a shallower learning-curve than most literate programming systems we have seen; partly because there isn’t much to learn. A \textTeX{} manuscript is a \TeX{} manuscript in which some sections of program code are marked-up \textit{both} to be recognised by the \textTeX{} system \textit{and} to be typeset by a \TeX{} or \LaTeX{} processor.

\textTeX{}\textsuperscript{2} is used to extract program text files from a \TeX{} or \LaTeX{} manuscript; this step corresponds to the “tangling” phase described by Knuth and his followers. There is no “weaving” phase at all: the manuscript is typeset by the usual \TeX{} or \LaTeX{} processor. As it happens we use the enormously versatile \texttt{listings}\textsuperscript{3} package to define code section markup in \LaTeX{}, but you don’t need to if you have something better.

We call this demiliterate programming because the markup and code extraction details are less than half as hard to master as those of most extant literate-programming systems. On the other hand, it cannot compensate for weaknesses in the design of the declarative structures of a programming language: something that many literate-programming systems (try to) achieve.

In short, if you are already happy being a literate programmer then you probably don’t need \textTeX{}; and if you are a semi-literate programmer there’s probably not a lot it can do for you.

\textTeX{} code sections take one of the forms:

\begin{verbatim}
\begin{kind} body \end{kind}
\begin{kind}[path] body \end{kind}
\begin{kind} \cdot\cdot\cdot other parameters \cdot\cdot\cdot body \end{kind}
\begin{kind}[path] \cdot\cdot\cdot other parameters \cdot\cdot\cdot body \end{kind}
\end{verbatim}

The code section’s \texttt{kind} matches the regular expression: \texttt{[+-=*]\*code[+-=*]\*}.\textsuperscript{4} The optional \texttt{path} parameter (when it appears) is either a \texttt{code-snippet} label or a path in the filestore. A code snippet label is a sequence of non-\texttt{'} characters that starts with 3 dots or a sequence of non-\texttt{'} characters between double-\texttt{''} characters.\textsuperscript{5}

\textTeX{} pays no attention to any \textit{other parameters} that appear.\textsuperscript{5} It simply appends the \texttt{body} of each code section to the file or snippet specified by its \texttt{[path]} parameter. If the particular path is appearing for the first time in a manuscript then the file or snippet it specifies is created first. If the parameter is not present (or blank), then the most recent \texttt{path} is used instead.

Lines that consist entirely of snippet labels, \textit{viz} lines of the form \ldots text or “text”, are expanded when code bodies are being copied to files.

That’s all!
2 Getting Started

Here’s a \TeX{T} \LaTeX{T} \TeX{T} manuscript:

\documentclass{article}
\usepackage{textract}
\begin{document}
\codestyle{java}
Here’s the \TeXTract ‘‘Hello World’’ in Java.
\begin{code}[HelloWorld.java]
public class HelloWorld
{ public static void main(String[] args)
{ System.out.println("Hello World") }
}
\end{code}
\end{document}

and here (to the right of the verticals) is what it looks like when it is \LaTeX{XEd}.

Here’s the \TeX{T} \LaTeX{T} “Hello World” in Java.

\begin{center}
\begin{verbatim}
public class HelloWorld
{ public static void main(String [] args)
{ System.out.println("Hello World") }
}
\end{verbatim}
\end{center}

When it’s \TeX{T} \LaTeX{T} the code is copied to HelloWorld.java.

\begin{verbatim}
// 248
public class HelloWorld
{ public static void main(String[] args)
{ System.out.println("Hello World") }
}
\end{verbatim}

The comment on the line before the class declaration indicates the line number – in the latex source file of this documentation – of the \begin{code} declaration that gave rise to the code. Such comments needn’t necessarily be present (see the FAQ for details), but we have enabled them for the purposes of generating this documentation.

We expect you already know what this code does after it is compiled and run.
So far so good? But maybe you want to typeset your code in a slightly different form – perhaps as a framed floating listing. The code markup environments we are using for this article are based on the listings package. This package offers a good deal of stylistic flexibility to the literate programmer, and does so without the slightest pain save that involved in making good æsthetic choices. You don’t have to use it if you don’t want to, but it’s very well documented and seems very reliable.

We generated Listing 1 by using the following markup.

```latex
\begin{code+}[Hi.java]{frame=tBlr, float=b, label=HWJ, caption={Hello Chum}}
public class Hi
{
    public static void main(String[] args)
    { try
        { System.out.print("Hello"); }
        finally
        { System.out.println("Chum"); }
    }
}
\end{code+}
```

The code+ environment takes an additional parameter that specifies further arguments for the listings macros. Here we specify a frame, then a floating constraint, a label and a caption: the latter work in the same way as in the figure environment.

The resulting code in Hi.java is

```java
// 318
public class Hi
{
    public static void main(String[] args)
    { try
        { System.out.print("Hello"); }
        finally
        { System.out.println("Chum"); }
    }
}
```

Listing 1: Hello Chum
The \texttt{listings} package lets us declare that material delimited by certain kinds of comment delimiter be suppressed from the listing. This is convenient if we don’t want to disfigure our pretty article about a Java program by including javadoc comments in it.

The \texttt{|code|} environment and indented style are defined, at the top of this article, by

\begin{verbatim}
\lstnewenvironment{|code|}[2][]
{\lstset{ captionpos=b,
  morecomment=[is]{/**}{*/},
  style=indented,frame={tBLR},#2,}}
{}
\lstdefinestyle{indented}{xleftmargin=1em,xrightmargin=1em,}
\end{verbatim}

So we can achieve a framed and titled effect, and suppress the javadoc comment from the typeset article by using the markup:

\begin{|code|}[Hello/Again.java]{title={Hello Again}}
package Hello;
/**
 * \tt\langle Hello.Again\rangle is a particularly useless program.
 */
... Code of HelloAgain
\end{|code|}

This gets typeset as:

\begin{verbatim}
package Hello;
... Code of HelloAgain
\end{verbatim}

Hello Again

Notice that no listing number is generated: this is what happens when a code section is titled rather than captioned.

Among the host of useful features offered by \texttt{listings} is the power to typeset code using more mathematical-looking symbols. One way of doing this systematically is to make a supplementary language or style declaration.

For example, the following defines a “mathematical” style:

\begin{verbatim}
\lstdefinestyle{mathematical}{literate={<-}{$\in$}1{+=}{$:\cup$}2}
\end{verbatim}

This can be used as a local style modifier, for example in

\begin{verbatim}
\begin{code+}[litexample]{style=mathematical}
for (arg<-args) set += arg
\end{code+}
\end{verbatim}

which typesets as:

\begin{verbatim}
for (arg\in\textit{args}) set :\cup arg
\end{verbatim}

To use it systematically we would incorporate it into a standard code section declaration, for example

\begin{verbatim}
\lstnewenvironment{+code}[1]{\lstset{style=mathematical,}}{}
\end{verbatim}
3 Code Snippets

We imagine that if you got this far you may want to write about more complicated programs than we have so far shown. For example, suppose you want to present a Scala program that imports some library material, then defines a simple class and a main program.

If you want to present it “top-down”, you could define its Scala text as follows in the manuscript file:

```scala
package TexTract

object program
{
  def main(args: Array[String]) =
  {
    val set = new PowerSet
    ... The main loop
  }
}
```

This would be shown in your article as:

```
package TexTract

object program
{
  def main(args: Array[String]) =
  {
    val set = new PowerSet
    ... The main loop
  }
}
```

You might want to present the body of the program first. It doesn’t take much explanation, so you can present it all at once:

```scala
for (arg<-args) set add arg
println(set.getSubsets)
```

The listing above was generated by

```
for (arg<-args) set add arg
println(set.getSubsets)
```

Notice that the name of the code section starts with three dots. The effect of this is to define a chunk of program text (a so-called code-snippet) with the symbolic label: “themainloop”.

When the body of a code section is finally output to its file, each...
line that consists only of a reference to a snippet, i.e. each line of the form \ldots .text or "text", is replaced by the body of the snippet (if it has been defined), and replaced by the text (marked as a comment) otherwise.

To define the imports snippet we might write

\begin{|code|} ... The imports\} \{title={The imports}}
import scala.collection.mutable._
import java.io._
import java.util.regex._
\end{|code|}

and it would be typeset as:

\begin{code}
import scala.collection.mutable._
import java.io._
import java.util.regex._

The imports
\end{code}

If we forget to include a code section describing “The definition of Powerset”, then the code eventually written to program.scala will be:

\begin{code}
// 440
package TexTract
// 441
// 503
import scala.collection.mutable._
import java.io._
import java.util.regex._
// 442
// The definition of PowerSet
object program
{ def main(args: Array[String]) =
  { val set = new PowerSet
  // 447
  // 481
  for (arg<-args) set add arg
  println(set.getSubsets)
  // 448
  }
}
\end{code}

Notice that: “... The definition of Powerset” has been transformed into a one-line comment.
4 Special Code Sections

4.1 Anonymous Sections

When a code section without a name appears, the enclosed code is typeset in the usual way, but it is appended to the previously-named code section or file.

This makes it convenient to intercalate sections of code intended for the same file or section between LaTeX comments.

4.2 Hidden Sections

The standard \texttt{T\LaTeX} style file defines the \texttt{code*} section to treat its content as a \LaTeX\ comment. Material within such sections is still extracted in the usual way.

\begin{quote}
A simple example of a passage that uses hidden and anonymous sections is:

\begin{verbatim}
\begin{code*}[What/Ho.java]
package What;
\end{code*}
This is the code of the ‘‘What.Ho’’ program.
As you can see, it is not very complicated:
\begin{code}
public static void main(String[] args)
{
  System.err.println("What ");
}\end{code}
and we don’t need to do a sophisticated proof of correctness.
\begin{code}
  System.err.println("Ho?");
}\end{code}
\end{verbatim}
\end{quote}

In the java code style this gets typeset as:

\begin{verbatim}
public static void main(String[] args)
{
  System.err.println("What ");
and we don’t need to do a sophisticated proof of correctness.
  System.err.println("Ho?");
}\end{verbatim}

The resulting code is
package What;
public static void main(String[] args)
{
    System.err.println("What ");
    System.err.println("Ho?");
}
Appendix

A FAQ

Q: Can I use more than one programming language in a single $\text{T}_{\text{e}}\text{X}$ $\text{T}_{\text{e}}\text{X}_\text{RAC}$ manuscript?

A: Yes; and you can also generate more than one program file from a single $\text{T}_{\text{e}}\text{X}$ $\text{T}_{\text{e}}\text{X}_\text{RAC}$ manuscript.

Q: Must the whole of a code section macro call appear on a single line in the manuscript?

A: It must; and we certainly won’t be writing a $\LaTeX$ or $\text{T}_{\text{e}}\text{X}$ parser to change that.

Q: How hard is tracking error message locations?

A: Unless you use snippets or output compression it’s trivial: output files are written so that manuscript and output file line numbers are identical. If you set \texttt{number-on} in the \texttt{<textract>} ant task, then compression is enabled and output files are annotated with source manuscript line numbers. Each annotation is in the form of a line-number pragma for the language being output if $\text{T}_{\text{e}}\text{X}$ $\text{T}_{\text{e}}\text{X}_\text{RAC}$ knows that form; otherwise it’s in the form of a comment for that language. For example, these code blocks – embedded in the latex source file of \textit{this documentation}:

\begin{code}[	exttt{propositions.hs}]
module Propositions where

... Imports
data Prop = Atom Atomic -- a, b ...
  | Not Prop -- not p
  | Prop 'And' Prop -- p q
  | Prop 'Or' Prop -- p q
  | Prop 'Imp' Prop -- p q
  | Prop 'Iff' Prop -- p q
deriving (Eq)

instance (Show Prop) where showsPrec = showProp
\end{code}

\%
% The main story about propositions
%

\begin{code}[	exttt{... Imports}]
import Prelude(Eq, String, Show, ShowS, Int,
map, (.), (++), foldr, take,
unlines, (>=), (+), (*), ($),
showParen, showString, showsPrec, show)
\end{code}

Give rise to the Haskell source file \texttt{propositions.hs})

{-# LINE 678 "/Users/sufrin/Develop/Textract/doc/textract.tex" #-}
module Propositions where

{-# LINE 679 "/Users/sufrin/Develop/Textract/doc/textract.tex" #-}
The answer to the next question may also be helpful.

Q: Is snippet-substitution nested?

A: Judge for yourself. This code block:

```latex
% 713
\begin{code}[foo.tex]
... Undefined snippet
... Answer
\end{code}
\begin{code}[... first clause]
Snippet-expansion takes place in the final output phase of \TeXTract,
\end{code}
\begin{code}[... Answer]
... first clause
and the bodies of nested snippets are themselves subject to snippet-expansion as they are output.
... another undefined snippet
\end{code}
```

leads to this output (in foo.tex)

```latex
% 713
\begin{quote}
% 714
\begin{quote}
% 717
% 722
Snippet-expansion takes place in the final output phase of \TeXTract,
and the bodies of nested snippets are themselves subject to snippet-expansion as they are output.
\end{quote}
\end{quote}
```

The first line-number annotation is the line number – in the latex source of this document – of the (snippet-call) text ... Undefined snippet. The next three annotations denote, respectively, the line number of the (snippet-call) text ... Answer, the line number of the (snippet-call) ... first clause, and the line number of the first line of the expansion of ... first clause.
B Tools

B.1 Ant Task

To define the ant task in your build task:

```xml
<taskdef name="textract"
    classpath="$\{TEXTRACTHOME\}/textract.jar" classname="ant.Textract"/>
```

The task has the following parameters:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>root</td>
<td>Output paths are prefixed with this path</td>
</tr>
<tr>
<td>compress</td>
<td>Output files are not compressed</td>
</tr>
<tr>
<td>code</td>
<td>Core of the block kind of a code section</td>
</tr>
<tr>
<td>ans</td>
<td>Name of the answer environment</td>
</tr>
<tr>
<td>answers</td>
<td>Code within answer environments is not excluded</td>
</tr>
<tr>
<td>number</td>
<td>No line-number comments are placed in output files</td>
</tr>
<tr>
<td>enc</td>
<td>Encoding of input and output files</td>
</tr>
<tr>
<td>force</td>
<td>If source is up-to-date output is not regenerated</td>
</tr>
<tr>
<td>errnone</td>
<td>Fail if no existing source files are specified</td>
</tr>
<tr>
<td>legacy</td>
<td>Legacy processing is disabled (see below)</td>
</tr>
<tr>
<td>code</td>
<td>Specify the {code} pattern</td>
</tr>
<tr>
<td>comments</td>
<td>Specify comment conventions for output files</td>
</tr>
<tr>
<td>pragmas</td>
<td>Specify line number pragma conventions for output files</td>
</tr>
</tbody>
</table>

It also takes a `file=path` to specify a single file to process, or one or more nested `<fileset>... </fileset>` elements to specify a collection of existing files. It is usually an error if such a specification results in no files to process.

When output files are compressed there is no attempt to correlate the location of an output line to its location in the source manuscript.

Comment conventions have to be specified all at once. The specification takes the form `@spec@spec@spec...`, where `@` is any character that is not going to be part of a comment specification, and all `spec` take the form `ext@left@right`, where `left` and `right` are `@`-free strings denoting the opening (respective closing) brackets of a comment, and `ext` is the filename extension.

Line-number pragma conventions are specified similarly. Each `spec` takes the form `.ext@format`, where `format` is a `@`-free string. When outputting a line-number annotation, this text is written with `%f` replaced (everywhere) by the input filename, and `%n` replaced (everywhere) by the line number.
B.2 Command-Line Task

textract [switch]* [file]*

-\texttt{c} \quad \text{compress output (eliminate latex source lines)}
-\texttt{a} \quad \text{suppress classes contained within ans environments (implies -c)}
-\texttt{-d=<root>} \quad \text{specify root directory for output}
-\texttt{-c=<root>} \quad \text{implies -c -d=<root>}
-\texttt{-a=<root>} \quad \text{implies -a -c=<root>}
-\texttt{-f} \quad \text{force code generation, even if the generated files are up to date}
-\texttt{-l} \quad \text{force legacy code block processing}
-\texttt{-n} \quad \text{place line-number comments on output lines}
-\texttt{-enc=<enc>} \quad \text{Input and output file(s) are in the given encoding (default is UTF8)}
-\texttt{-code=<pat>} \quad \text{Specify the [code] pattern -- initially 'code'}
-\texttt{-comments=<specs>} \quad \text{Specify output language comment conventions (see Ant Task)}
-\texttt{-pragmas=<specs>} \quad \text{Specify output language line number pragma conventions (see Ant Task)}

This assumes that the \texttt{textract} command is the equivalent of

\texttt{scala -cp $TEXTRACTHOME/textract.jar textract}
C  textract.sty
%
% Designed to work with TexTract to weave code from latex sources
% $Id: textract.sty 61 2010-04-26 10:21:55Z sufrin$
% \ProvidesPackage{textract}
\RequirePackage{breakverbatim}
\RequirePackage{listings}
\RequirePackage{ifthen}
%
% Style-definition and style switching
%
\def\newcodestyle#1#2{\lstdefinestyle{#1}{language=#1,#2,}}
\def\codestyle#1{\lstset{style=#1}}
%
% A few styles
%
\newcodestyle{java}
{basicstyle=\classsize\sffamily,}
\newcodestyle{scala}
{basicstyle=\classsize\sffamily,xleftmargin=1em,xrightmargin=1em,}
%
\newcodestyle{xml}
{basicstyle=\classsize\ttfamily,xleftmargin=1em,xrightmargin=1em,}
%
% Default style is Java
% \codestyle{java}
%
% \newenvironment{code}{\lstset{xleftmargin=1em,xrightmargin=1em,}}{}%
% \newenvironment{code+}{\lstset{xleftmargin=1em,xrightmargin=1em,captionpos={b},#2,}}{}
% \expandafter\def\csname code*\endcsname#1{\comment}
% \expandafter\let\csname endcode*\endcsname=\endcomment
%
\def\unquote''#1''{\textrm{#1}}
\def\textcode#1{{\ttfamily\lstinline{#1}}}
\def\textcodett#1{{\sffamily\lstinline{#1}}}

15
% Doesn’t do anything, but doc blocks are transformed into java/scala block comments.

\newenvironment{doc}[2][]{"begin{smaller}{#1}{#2}\{\end{smaller}}
D Legacy Processing

In legacy processing mode many bets are off. Code blocks take one of the forms

\begin{class}{java filename without .java extension}
   body
\end{class}

\begin{hideclass}{java filename without .java extension}
   body
\end{hideclass}

\begin{obj}{scala filename without .scala extension}
   body
\end{obj}

\begin{hideobj}{scala filename without .scala extension}
   body
\end{hideobj}
Notes

1. Anne R. Surfbird: On seeing the first literate programming system of Spring, Onomatopeia Inc., March 2008. (Quoted without permission)

2. The $\TeX\LaTeX$ system can be invoked as a command-line program or an Ant task.


4. In other words a code section’s kind is a sequence of characters consisting of zero or more occurrences of one of the characters “+=*|”, followed by the word “code”, followed by zero or more occurrences of one of the characters “+=*|”. In both the Ant task and the command-line program even the word “code” can be changed to an arbitrary regular expression pattern by setting a parameter. For example, if you wanted your “code” environments to be named either CODE or LOGIC, you could set code=”CODE|LOGIC” (see appendix B).

5. The standard $\TeX\LaTeX$ style file specifies a few specific kinds, each with its own fixed number of (non-optional) parameters.

6. To avoid hard-so-spot mistakes in references to them, snippet labels are “normalized” by removing any spaces, and transforming their letters to lowercase.

Subversion Revision : 70


All Wrongs Reversed.