# Dickinson User Guide

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# Introduction

Dickinson is a text-generation language for generative literature. Each time you run your code, you get back randomly generated text.

It provides a language to define random texts like the Magical Realism Bot or fortune program.

# Installing Dickinson

## Distributions

Distributions for some platforms are available on the releases page.

Un-tar the package, then:

```
make install
```

## Source

First, install cabal and GHC. Then:

```
cabal install language-dickinson
```

This provides `emd`, the command-line interface to the Dickinson language.

You may also wish to install manpages for reference information about `emd`. Manpages are installed at

```
emd man
```

## Editor Integration

A vim plugin is available.

To install with vim-plug:

```
Plug 'vmchale/dickinson' , { 'rtp' : 'vim' }
```

To automatically enable spellchecking where appropriate put

```
autocmd BufNewFile,BufRead *.dck setlocal spell spelllang=en_us
```

in your `~/.vimrc`.

#### Tags

To configure Dickinson with exuberant ctags or universal ctags, put the following in a file named `.ctags`:

```
--langdef=DICKINSON
--langmap=DICKINSON:.dck
--regex-DICKINSON=/:def *([[:lower:]][[:alnum:]]+)/\1/f,function/
--regex-DICKINSON=/tydecl *([[:lower:]][[:alnum:]]+) *=/\1/t,type/
```

I have the following in my `~/.vimrc` to keep tags updated:

```
augroup ctags
    autocmd BufWritePost *.dck :silent !ctags -R .
augroup END
```

## Program Structure

Dickinson files begin with `%-`, followed by definitions.

### Example

Here is a simple Dickinson program:

```
%-

(:def main
  (:oneof
    (| "heads")
    (| "tails")))
```

Save this as `gambling.dck`. Then:

```
emd run gambling.dck
```

which will display either `heads` or `tails`.

The `:oneof` construct selects one of its branches with equal probability.

In general, when you `emd run` code, you'll see the result of evaluating `main`.

#### Comments

Comments are indicated with a `;` at the beginning of the line. Anything to the right of the `;` is ignored. So

```
%-

; This returns one of 'heads' or 'tails'
(:def main
  (:oneof
    (| "heads")
    (| "tails")))
```

is perfectly valid code and is functionally the same as the above.

## Definitions & Names

We can define names and reference them later:

```
%-

(:def gambling
  (:oneof
    (| "heads")
    (| "tails")))

(:def main
  gambling)
```

We can `emd run` this and it will give the same results as above.

## Branching

When you use `:oneof`, Dickinson picks one of the branches with equal probability. If this is not what you want, you can use `:branch`:

```
%-

(:def unfairCoin
  (:branch
    (| 1.0 "heads")
    (| 1.1 "tails")))

(:def main
  unfairCoin)
```

This will scale things so that picking `"tails"` is a little more likely.

## Interpolation

We can recombine past definitions via string interpolation:

```
%-

(:def adjective
  (:oneof
    (| "beautiful")
    (| "auspicious")
    (| "cold")))

(:def main
  "What a ${adjective}, ${adjective} day!")
```

### Multi-Line Strings

For large blocks of text, we can use multi-line strings.

```
(:def twain
  '''
  Truth is the most valuable thing we have - so let us economize it.
    - Mark Twain
  ''')
```

Multiline strings begin and end with `'''`.

## Expressions

Branches, strings, and interpolations are expressions. A `:def` can attach an expression to a name.

```
%-

(:def color
  (:oneof
    (| "yellow")
    (| "blue")))

(:def adjective
  (:oneof
    (| "beautiful")
    (| "auspicious")
    (| color)))

(:def main
```

```
  "What a ${adjective}, ${adjective} day!")
```

Branches can contain any expression, including names that have been defined previously (such as `color` in the example above).

### Lambdas

Lambdas are how we introduce functions in Dickinson.

```
(:def sayHello
  (:lambda name text
    "Hello, ${name}."))
```

Note that we have to specify the type of `name` - here, it stands in for some string, so it is of type `text`.

We can use `sayHello` with `$` (pronounced "apply").

```
(:def name
  (:oneof
    (| "Alice")
    (| "Bob")))

(:def main
  ($ sayHello name))
```

We can `emd run` this:

```
Hello, Bob.
```

`$ f x` corresponds to `f x` in ML.

### Matches & Tuples

Suppose we want to randomly pick quotes. First we define a function to return a quote by Fiona Apple:

```
(:def fionaAppleQuote
  (:oneof
    (|
      '''
      "You're more likely to get cut with a dull tool than a sharp one."
      ''')
    (|
      '''
      "You forgot the difference between equanimity and passivity."
      ''')))
```

Then we can define `quote`, which returns a quote as well as the person who said it.

```
(:def quote
  (:oneof
    (| ("« Le beau est ce qu'on désire sans vouloir le manger. »", "Simone Weil"))
    (| (fionaAppleQuote, "Fiona Apple"))))
```

Each branch returns a tuple.

We can use the `:match` construct to format the result of `quote`, viz.

```
(:def formatQuote
  (:lambda q (text, text)
    (:match q
      [(quote, name)
        '''
        ${quote}
            - ${name}
        ''']))))

(:def main
  $ formatQuote quote)
```

We can `emd run` this:

```
"You forgot the difference between equanimity and passivity."
    - Fiona Apple
```

Note the use of the `:lambda` in `formatQuote`; we specify the type `(text, text)`.

### Tags

Tags can be used to split things based on cases.

```
tydecl number = Singular | Plural

(:def indefiniteArticle
  (:lambda n number
    (:match n
      [Singular "a"]
      [Plural "some"])))
```

Note that we specify the type `number` in `(:lambda n number ...)`.

Tags themselves must begin with a capital letter while types begin with a lowercase letter.

Tags are a restricted form of sum types.

### Types

## REPL

To enter a REPL:

```
emd repl
```

This will show a prompt

```
emd>
```

If we have

```
%-

(:def gambling
  (:oneof
    (| "heads")
    (| "tails")))
```

in a file `gambling.dck` as above, we can load it with

```
emd> :l gambling.dck
```

We can then evaluate `gambling` if we like

```
emd> gambling
```

or manipulate names that are in scope like so:

```
emd> "The result of the coin toss is: ${gambling}"
```

We can also create new definitions:

```
emd> (:def announcer "RESULT: ${gambling}")
emd> announcer
```

Inspect the type of an expression with `:type`:

```
emd> :type announcer
text
```

We can define types in the REPL:

```
emd> tydecl case = Nominative | Oblique | Possessive
emd> :type Nominative
case
```

### Saving & Restoring States

We can save the REPL state, including any definitions we've declared during the session.

```
emd> :save replSt.emdi
```

If we exit the session we can restore the save definitions with

```
emd> :r replSt.emdi
emd> announcer
```

For reference information about the Dickinson REPL:

```
:help
```

### Builtins

Dickinson has several builtin functions. You can see all names in scope (including builtins) with `:list`, viz.

```
emd> :list
oulipo
allCaps
capitalize
titleCase
```

We can inspect the type like defined names:

```
emd> :type allCaps
(-> text text)
```

Try it out:

```
emd> $ allCaps "Guilt and self-laceration are indulgences"
GUILT AND SELF-LACERATION ARE INDULGENCES
```

## Lints

`emd` has a linter which can make suggestions based on probable mistakes. We can invoke it with `emd lint`:

```
emd lint silly.dck
```

## Libraries

Dickinson allows pulling in definitions from other files with `:include`.

## Using Libraries

### Example

The `color` module is bundled by default:

```
(:include color)

%-

(:def main
  "Today's mood is ${color}")
```

Which gives:

```
Today's mood is citron
```

The `:include` must come before the `%-`; definitions come after the `%-`.

`color.dck` contains:

```
%-

(:def color
  (:oneof
    (| "aubergine")
    (| "cerulean")
    (| "azure")
    ...
```

### Third-Party Libraries

Upon encountering `:include animals.mammal`, Dickinson looks for a file `animals/mammal.dck`.

When invoking `emd`, we can use the `--include` flag to add directories to search.

## Writing Libraries

Libraries can contain definitions and type declarations.

You can run `emd check` on a library file to validate it.

# Scripting

`emd` ignores any lines staring with `#!`; put

```
#!/usr/bin/env emd
```

and the top of a file to use `emd` as an interpreter. As an example, here is an implementation of the Unix fortune program as a script:

```
#!/usr/bin/env emd

%-

(:def adjective
  (:oneof
    (| "good")
    (| "bad")))

(:def main
  "You will have a ${adjective} day")
```

# Examples

## Cowsay

Here is a variation on cowsay:

```
(:def cowsay
  (:lambda txt text
    '''

    ${txt}
    ------
          \   ^__^
           \  (oo)\_______
              (__)\       )\/\
                  ||----w |
                  ||     ||
    '''))
```

## Noun Declension

We can use tuples and tags to model nouns and noun declension.

```
tydecl case = Nominative | Accusative | Dative | Genitive | Instrumental

tydecl gender = Masculine | Feminine | Neuter

tydecl number = Singular | Plural
```

```
; demonstrative pronouns
; "this" or "these"
(:def decline
  (:lambda x (case, gender, number)
    (:match x
      [(Nominative, Masculine, Singular) "þes"]
      [(Accusative, Masculine, Singular) "þisne"]
      [(Genitive, (Masculine|Neuter), Singular) "þisses"]
      [(Dative, (Masculine|Neuter), Singular) "þissum"]
      [(Instrumental, (Masculine|Neuter), Singular) "þys"]
      [((Nominative|Accusative), Neuter, Singular) "þis"]
      [(Nominative, Feminine, Singular) "þeos"]
      [(Accusative, Feminine, Singular) "þas"]
      [((Genitive|Dative|Instrumental), Feminine, Singular) "þisse"]
      [((Nominative|Accusative), _, Plural) "þas"]
      [(Genitive, _, Plural) "þissa"]
      [(Dative, _, Plural) "þissum"]
      )))
```

In the REPL:

```
emd> $ decline (Nominative, Feminine, Singular)
þeos
```

This actually has no element of randomness but such capabilities are important for agreement in longer generative texts.

For guidance:

```
emd> :type decline
(-> (case, gender, number) text)
```

## Divination Bot

This is a more sophisticated version of Maja Bäckvall's divination bot. The novelty is that by using tags, we get agreement between the Greek root and the definition.

```
%-

tydecl means = Fish
             | Stars
             | Snakes
             | Sun
             | Animals
             | Lips
             | Dreams
```

```
              | Placenta
              | Poo
              | Fingers
              | Number
              ...

(:def prefix
  (:lambda x means
    (:match x
      [Fish "ichthyo"]
      [Stars "astro"]
      [Snakes "ophio"]
      [Sun "helio"]
      [Animals "zoo"]
      [Lips "labio"]
      [Dreams "oneiro"]
      [Placenta "amnio"]
      [Poo "scato"]
      [Fingers "dactylo"]
      [Number "numero"]
      ...
      )))

(:def english
  (:lambda x means
    (:match x
      [Fish "fish"]
      [Stars "stars"]
      [Birds "birds"]
      [Snakes "snakes"]
      [Sun "sun"]
      [Animals "animals"]
      [Lips "lips"]
      [Dreams "dreams"]
      [Placenta "placenta"]
      [Poo "excrement"]
      [Fingers "finger movements"]
      [Number "numbers"]
      ...
      )))

(:def means
  (:pick means))

(:def postfix
  (:branch
```

```
    (| 1.0 "mancy")
    (| 0.065 "scopy")
    (| 0.03 "spication")
    (| 0.015 "logy")))

(:def main
  (:bind
    [means means]
      "${$prefix means}${postfix} - divination by ${$english means}"))
```

`:pick` is a builtin construct which randomly selects a tag of type `means`.

So the Tracery bot might produce

```
uranospication

Divination using the appearance of proper names.
```

but ours produces results like

```
amniomancy - divination by placenta
```

We've also weighted `postfix` so that the more common suffixes (such as '-mancy') occur more often.

See the full example in `examples/divinationBot.dck`

## Shakespearean Insult Generator

Inspired by the Shakespeare Insult Kit's insult table, we can generate our own insults.

```
%-

(:def adjective
  (:oneof
    (| "artless")
    (| "base-court")
    (| "bawdy")
    (| "bat-fowling")
    ...

(:def noun
  (:oneof
    (| "apple-john")
    (| "baggage")
    (| "barnacle")
    (| "bladder")
    ...
```

```
(:def main
  ("Thou ${adjective} ${adjective} ${noun}!"))
```

Run it get something like:

```
Thou beslubbering clouted hedge-pig!
```

See the full example in `examples/shakespeare.dck`.

## Lyrics Bot

Lyrics bots sample lyrics from some particular artist; see the africa by toto bot for an example.

We can make our own Fiona Apple bot, viz.

```
%-

(:def fiona
  (:oneof
    (| "You forgot the difference between equanimity and passivity.")
    (| "You're more likely to get cut with a dull tool than a sharp one.")
    (| "The child is gone.")
    (|
      '''
      Oh darling, it's so sweet
      You think you know how crazy, how crazy I am.
      ''')
    ...

(:def main
  fiona)
```

See the full example in `examples/fionaBot.dck`

## Magical Realism Bot

We can write our own magical realism bot using builtin libraries:

```
(:include profession)
(:include geography)

%-

(:def main
  (:oneof
```

```
(|
  (:let
    [accomplishment
      (:oneof
        (|
          (:let
            [txt
              (:oneof
                (| "Excel spreadsheet")
                (| "palimpsest"))]
            [power
              (:oneof
                (| "comfort animals")
                (| "practice bilocation"))]
            (:oneof
              (| "discovers a ${txt} that allows her to ${power}"))))
        (|
          (:let
            [topic
              (:oneof
                (| "balneology")
                (| "teleology")
                (| "nephrology")
                (| "orgonomy"))]
            "writes a monograph on ${topic}"))
        (|
          (:let
            [secret
              (:oneof
                (| "immortality")
                (| "heliophagy")
                (| "levitation")
                (| "good skin"))]
            "discovers the secret to ${secret}")
        ))]
    "A ${profession} in ${bigCity} ${accomplishment}"))))
```

This reuses the `bigCity` definition from the `geography` library and `profession` from the `profesion` library.

This is not as sophisticated as the twitter bot but it is quite concise thanks to the libraries we used.