CoffeeScript: Pencilcode.net

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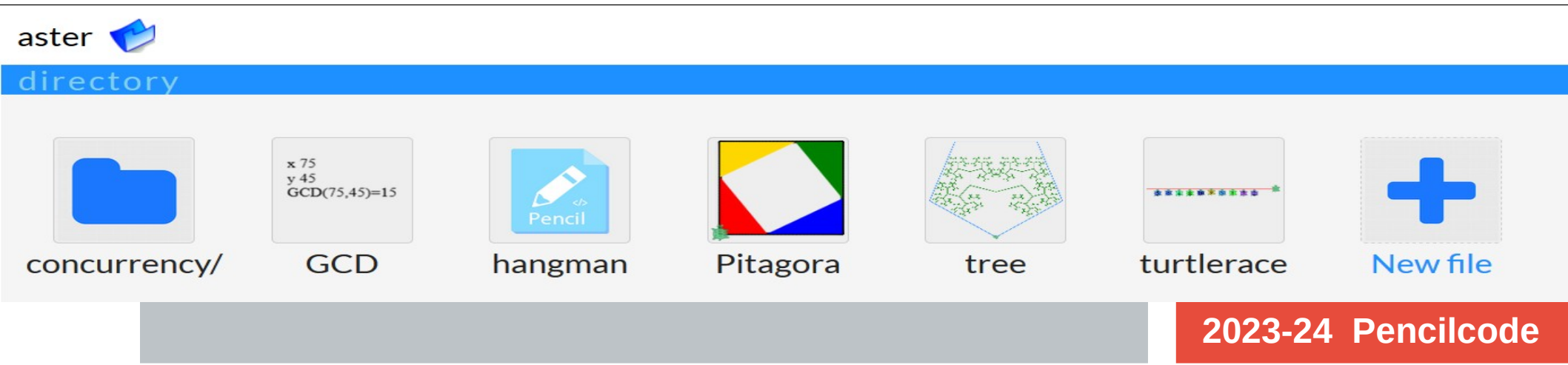
Pencilcode: CoffeeScript language (aka Javascript)

Editor with both textual and block-based editing

Turtle graphics, music, speech (and also the Processing.js lib!)

Input, print, picture display

Your personal web site (e.g. http://aster.pencilcode.net) showing/running your programs



CoffeeScript = Readable Javascript

CoffeeScript translates to Javascript

Adds some features from Perl / Python / Ruby:

- indentation instead than curlies {} and semicolons ;	**Python**
- list comprehension	**Python**
- pattern matching (multiple assignment)	**Python**
- argument packing / unpacking	**Python**
- postfix syntax available for if / for / switch	**Perl**
- interval comparison	**Python**
- literate programming using Markdown	

Iced CoffeeScript adds async interactions with ‘await’ / ‘defer’

Easy-enough interaction with other JS libs (Jquery, Processing, D3 ...)

Function definition with '->'

All functions are primitive objects (like Python) and return their last value

Iterative version of GCD

```
GCD = (x, y) ->
   # multiple assignment + postfix conditional loop
   [x, y] = [y, x%y] until y is 0
   # the last value computed is returned
   x
```

Recursive version

```
GCD = (x, y) ->
   # inline if + recursion + return last value
   if y!=0 then GCD(y, x%y) else x
```

All function calls have at least 1 argument (use 'do' for 0-args functions)

Data structures:
Lists, arrays and dictionaries (and generators)

```
# List
notes = ["do", "re", "mi", "fa", "sol"]

# Dictionary
singers = {Jagger: "Rock",
           Elvis: "Roll"}

Bitlist = [
  1, 0, 1
  0, 0, 1
  1, 1, 0
]
```

```
# dictionary/object in YAML syntax
Kids =
  brother:
    name: "Max"
    age:  11
  sister:
    name: "Ida"
    age:  9

# ranges using double dot
[start .. end]
```

Generators using the
Pythonic yield syntax

Loops and list comprehensions

Loops with automatic enumeration of index and value and guard clause

```
for element, index in list when index % 2        # print only odd index values
    print element, index
```

Select odd index elements with a list comprehension

```
odd_pos = [ element for element, index in list if index%2 ]
```

More

Lexical scoping (var scope = same block/indent level) ~~**Python**~~

Splats (…) allows to define / use:

- Functions with variable # of args **(like '*' packing in Python)**

```
# "others" gets the remaining args in the call
LOSERS = (gold, silver, bronze, others...) →
others
```

- List unpacking **(like '*' unpacking in Python)**

all_elements = [group_1…, group_2…]

- Object/Dictionary unpacking **(like "update" or '**' in Python)**

currentUser = { user…, status='logged' }

Iced Coffescript
Asynchronous code with await / defer

‘await’ wraps a call and waits for completion ‘defer’ring assignment

Example:
search for 'keywords' then callback 'cb' with an array of the results

SERIAL SEARCH

```
serialSearch = (keywords, cb) ->
  out = []
  for k,i in keywords
    await search k, defer out[i]
    # each waits for prev. completion
  cb out
```

PARALLEL SEARCH

```
parallelSearch = (keywords, cb) ->
  out = []
  await
    for k,i in keywords
      search k, defer out[i]
  # cp wait for completion of all
  # BUT they are executed in parallel
  cb out
```

Programming styles

Programming style:

- procedural? Yes

- functional? YES!

- all procedures return something (their last value)

- functions can be passed as values and used in map / filter ...

- object oriented? YES (with prototypes like in JavaScript)

- concurrent

- “await” execution / “defer” control to assignment of the result

- e.g. sync between animation “plans”

(DEMO)

Activities: Pencilcode Gym

DRAW: draw turtle graphics

JAM: play music with keyboard/piano interaction

generate music or new sounds

IMAGINE: write interactive fiction (multiple-ended stories)

Using other Javascript libraries ...

GlowScript - 3D shapes

aster 3D

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{} code

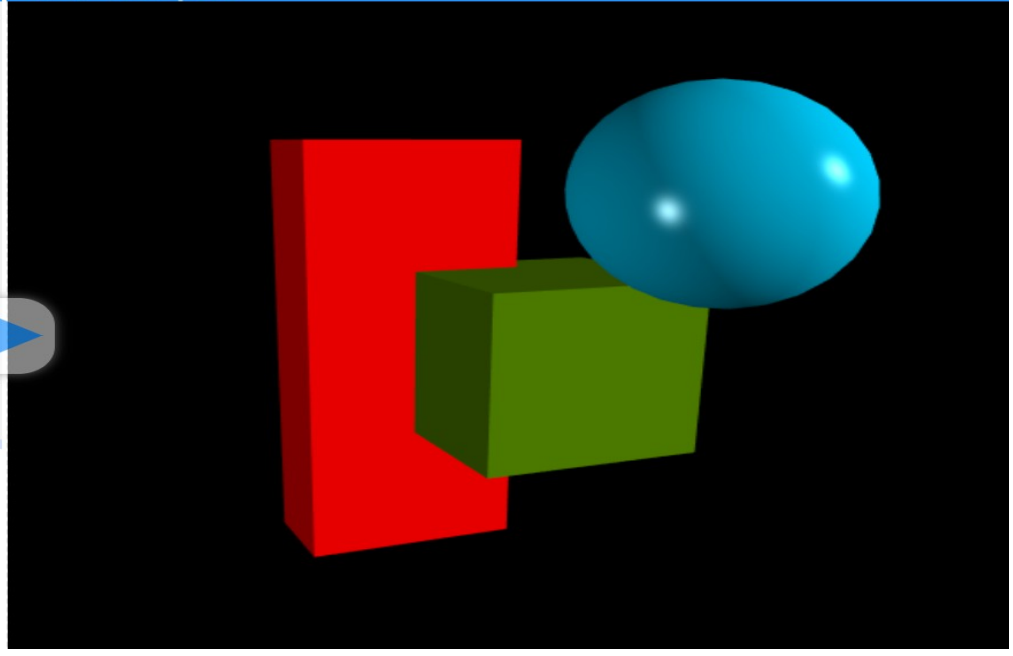
```
# to write 3D code you need also the javascript libs
# jQuery, jQueryUI, glow (GlowScript)
red = vec(1, 0, 0)              # RGB red = 1, 0, 0
b = box                         # build a box
  pos: vec(0, 0, 0)             # at the origin
  size: vec(2, 5, 1)            # with sides 2, 5, 1
  color: red                    # and red color

aqua = vec(0, 0.8, 1)           # RGB aqua = 0, 0.8, 1
s = sphere                      # make an hellipsoid
  pos: vec(1, 2, 3)             # here
  size: vec(1, 2, 3)            # with radii 1, 1, 1
  color: aqua
green = vec(0.3, 0.5, 0)        # RGB green = 0.3, 0.5, 0
c = box                         # build a box
  pos: vec(1, 0, 1)             # in this position
  size: vec(2, 2, 2)            # cube with side 2
  color: green                  # green
```

HTML

```
<!DOCTYPE html>
<script src="https://ajax.googleapis.com/ajax/libs/jquery/3.4.1/jquery.min.js" type="text/javascript"></script>
<script src="https://ajax.googleapis.com/ajax/libs/jqueryui/1.12.1/jquery-ui.min.js" type="text/javascript"></script>
<script src="https://rawgit.com/davidbau/glowjs/master/dist/glow.js" type="text/javascript"></script>
```

output



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… other JavaScript libraries

D3.js - data visualization

aster D3js

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{} code

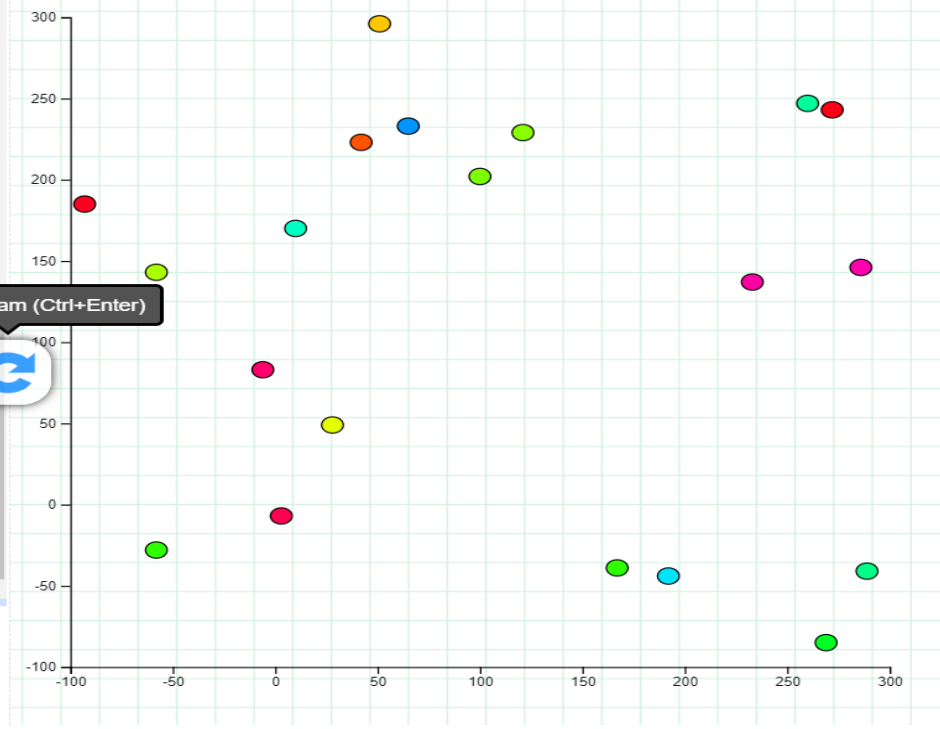
```
svG
   .append('g')
   .attr("transform", "translate(0," + height + ")")
   .call(d3.axisBottom(x));

# X scale and Axis
y = d3.scaleLinear()
     .domain([min, max])        # This is the min and the max of the data: 0
to 100 if percentages
     .range([height, 0]);       # This is the corresponding value I want in
Pixel
svG
   .append('g')
   .call(d3.axisLeft(y));

# Add 3 dots for 0, 50 and 100%
svG
   .selectAll("whatever")
   .data(data)
   .enter()
   .append("circle")
     .attr("cx", (d) -> x(d.x) )           # scale wrt X axis
     .attr("cy", (d) -> y(d.y) )           # scale wrt Y axis
     .attr("r", 7)                         # dot size
     .style("stroke", (d) -> "black")      # dot border
     .style("fill",   (d) -> d.color)      # dot color
```

HTML

```
<!DOCTYPE html>
<!-- Add a svg area, empty -->
<div id="scatter_area"></div>
<!-- Load d3.js -->
<script src="https://d3js.org/d3.v4.js"></script>
```

output

Restart program (Ctrl+Enter)



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Demo

DEMO