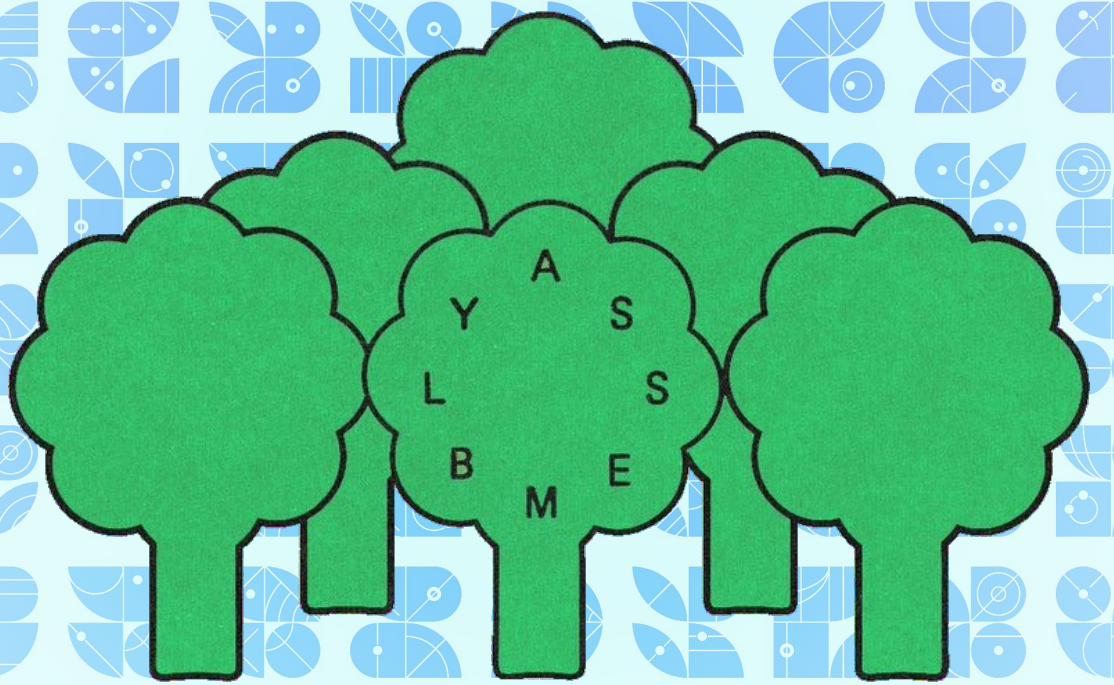


Urbit for Developers

Assembly 2021

~lagrev-nocfep · @sigilante · Neal Davis

“If you find your life tangled up
with somebody else’s life
for no very logical reasons,”
writes Bokonon,
“that person may be
a member of your *karass*.”

—Kurt Vonnegut, *Cat’s Cradle*

OKAY!

you are:
- done
- ready to move on
- bored

NOPE!

you are:
- stuck
- in need of help
- lost

PollEv.com/nealdavis717

```python
# Python
def fibonacci(n):
    i = 0
    p = 0
    q = 1
    r = []
    while (i < n):
        i = i + 1
        po = p
        p = q
        q = po + q
        r.append(q)
    r.reverse()
    return r
```

```python
# Python
def fibonacci(n):
  i = 0
  p = 0
  q = 1
  r = []
  while (i < n):
    i = i + 1
    po = p
    p = q
    q = po + q
    r.append(q)
  r.reverse()
  return r
```

```
:: "Aural" Hoon Pseudocode
gate  n=uint  {
  let  [i=0 p=0 q=1 \
        r=[list uint]]
  do {
    if (i == n) return r
  } loop {
    i ← i+1
    p ← q     q ← (p + q)
    r ← [q] + r
  }
  match-type  r
  apply  flop
}
```

```
# Actual Hoon
|=   n=@ud
%-   flop
=+   [i=0 p=0 q=1 \
       r=*[list @ud]]
|-   ^+   r
?:   =[i n]  r
%=   $
   i  +[i]
   p  q
   q  [add p q]
   r  [q r]
==
```

```
:: "Aural" Hoon Pseudocode
gate  n=uint  {
  let  [i=0 p=0 q=1 \
        r=[list uint]]
  do {
    if [i == n] return r
  } loop {
    i ← i+1
    p ← q     q ← [p + q]
    r ← [q] + r
  }
  match-type  r
  apply  flop
}
```

Fakezod Setup

1 Navigate to a new directory `/home/username/urbit`

2 Download the pill, or pre-packaged Urbit OS configuration:
`wget https://bootstrap.urbit.org/urbit-v1.6.pill`

3 Start a new fakezod in this directory with
`urbit -F zod -B urbit-v1.6.pill`

4 Mount the filesystem: `|mount %home`

5 Press Ctrl+D to exit the Urbit session.

6 Copy the fakezod to a local backup: `cp -r zod zod-ist-tot`

Fakezod Development

1 Save the file as `urbit/gen/fib.hoon`

2 Tell the fakezod to update from Unix:

```
|commit %home
```

3 Run the generator in the Dojo:

```
+fib 15
```

```
:: Original
|=  n=@ud
%-  flop
=+  [i=0 p=0 q=1 r=*[list @ud]]
|-  ^+  r
?:  =(i n)  r
%=  $
  i  +(i)
  p  q
  q  (add p q)
  r  [q r]
==
```

```
:: Expanded runes & children →
```

```
|=
  n=@ud
  %-
    flop
    =+
      [i=0 p=0 q=1 r=*[list @ud]]
      |-
        ^+
          r
          ?:
            =(i n)
            r
            %=
              $
              i
              +(i)
              p
              q
              q
              (add p q)
              r
              [q r]
            ==
```

Exercise

If we list all the natural numbers below 10 that are multiples of 3 or 5, we get 3, 5, 6 and 9. The sum of these multiples is 23.

Find the sum of all the multiples of 3 or 5 below 1000.

Exercise

Try the following auras:

`@ud`0x1001.1111

`@ub`0x1001.1111

`@ux`0x1001.1111

`@p`0x1001.1111

`@p`0b1111.0000.1111.0000

`@ud`.1

`@ux`.1

`@ub`.1

`@sb`.1

`@ta`'hello'

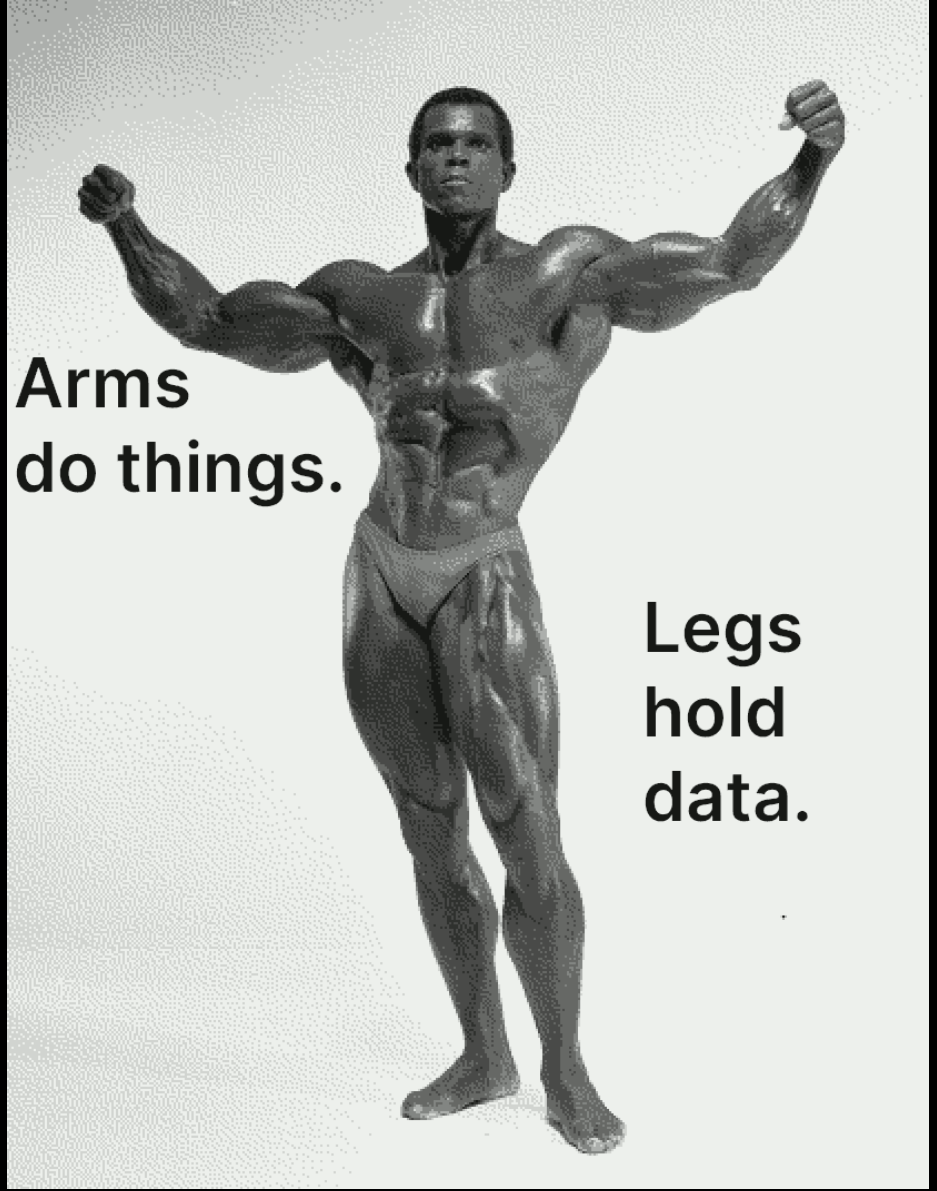
`@ud`'hello'

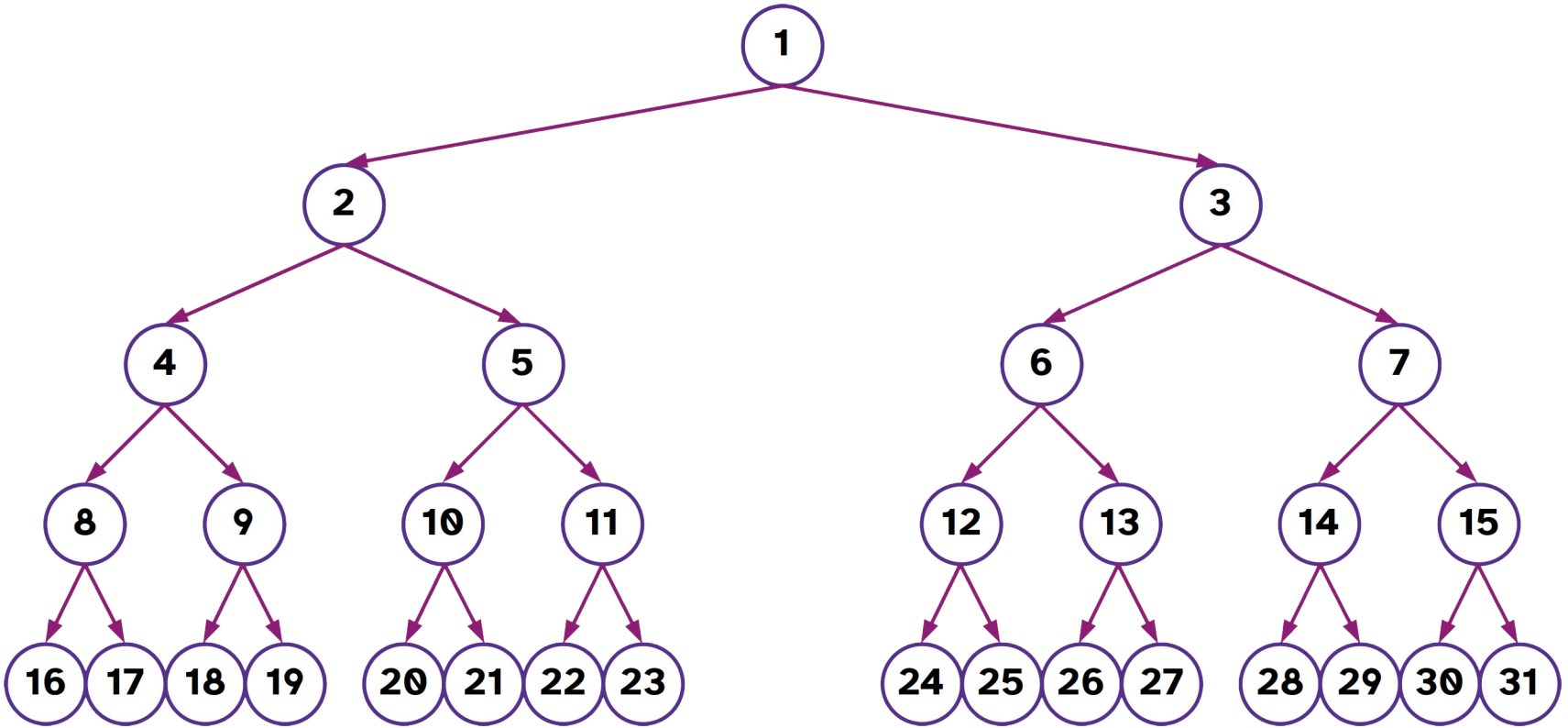
`@ux`'hello'

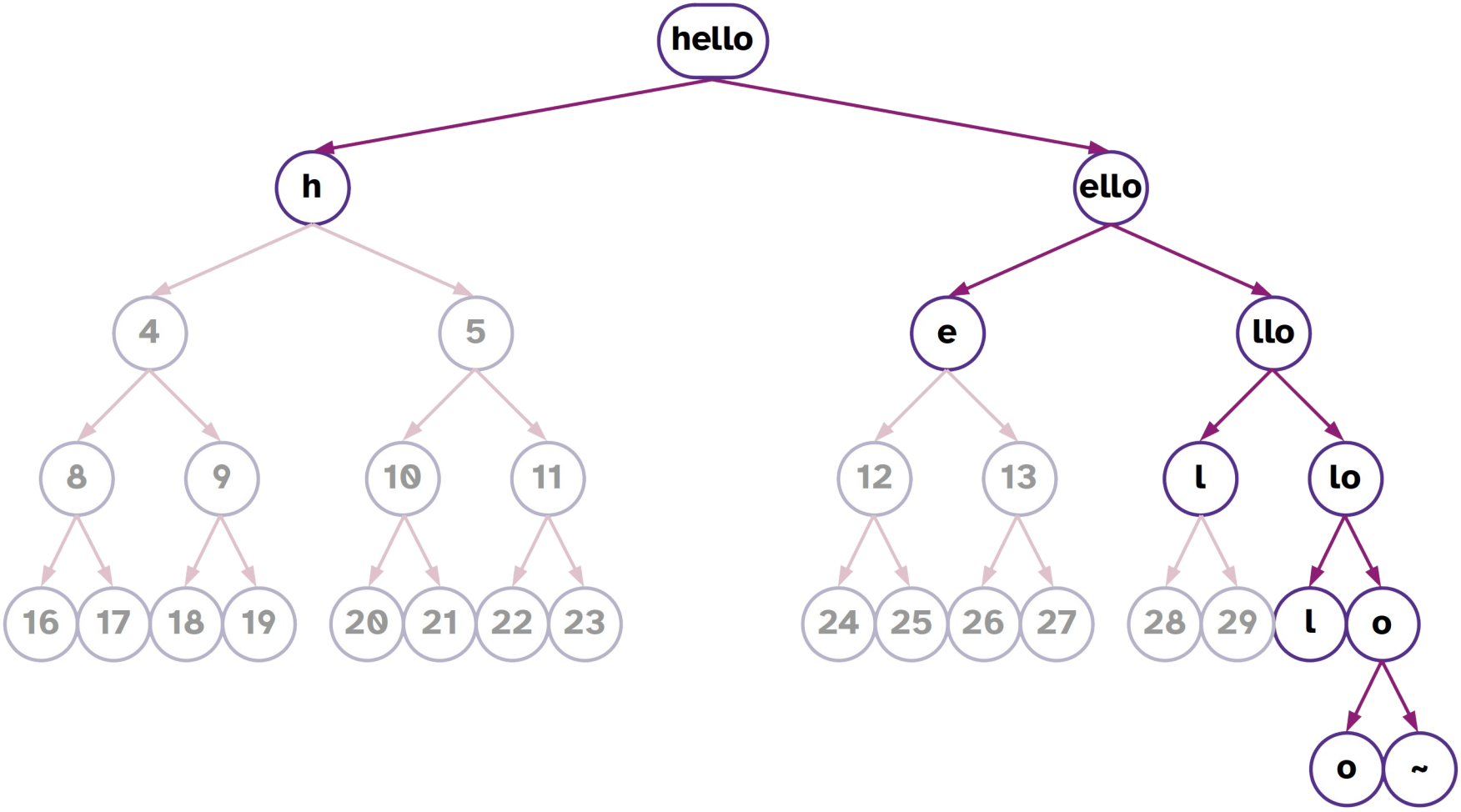
`@uc`'hello'

`@sb`'hello'

`@rs`'hello'

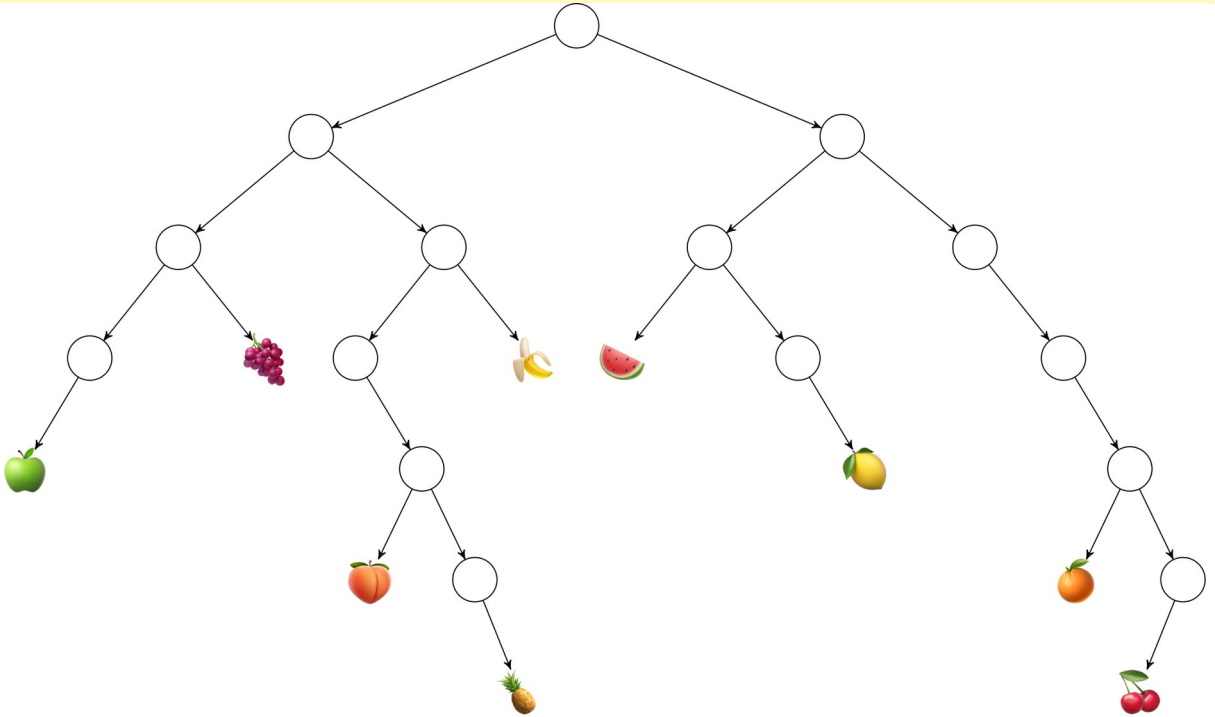

Arms
do things.
Legs
hold
data.


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31


hello
h
ello
4
5
e
llo
8
9
10
11
12
13
l
lo
16
17
18
19
20
21
22
23
24
25
26
27
28
29
l
o
o
~

Exercise

Produce a cell representation of the fruit tree.
Use `~` as a placeholder for an empty node.



Exercise

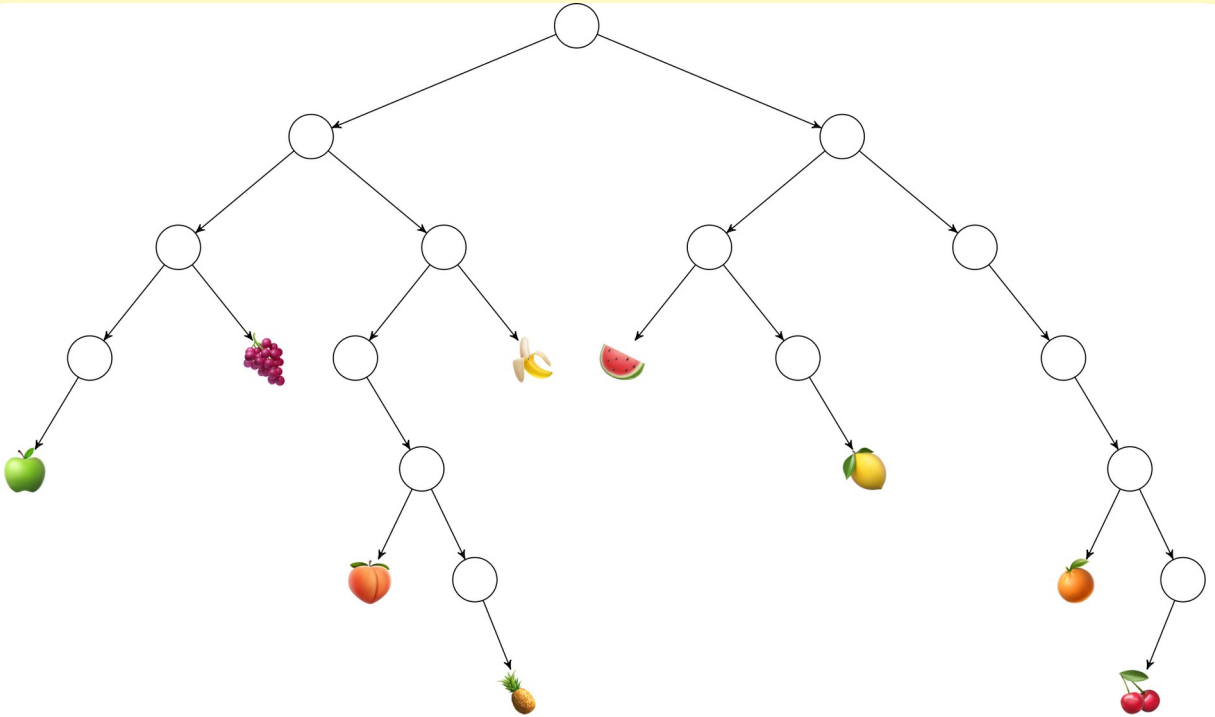
Implement the Sudan function in Hoon.

$$
\begin{aligned}
F_0(x, y) &= x + y \\
F_{n+1}(x, 0) &= x && \text{if } n \geq 0 \\
F_{n+1}(x, y+1) &= F_n(F_{n+1}(x, y), F_{n+1}(x, y) + y + 1) && \text{if } n \geq 0
\end{aligned}
$$

(Check Wikipedia “Sudan Function” for trial cases.)

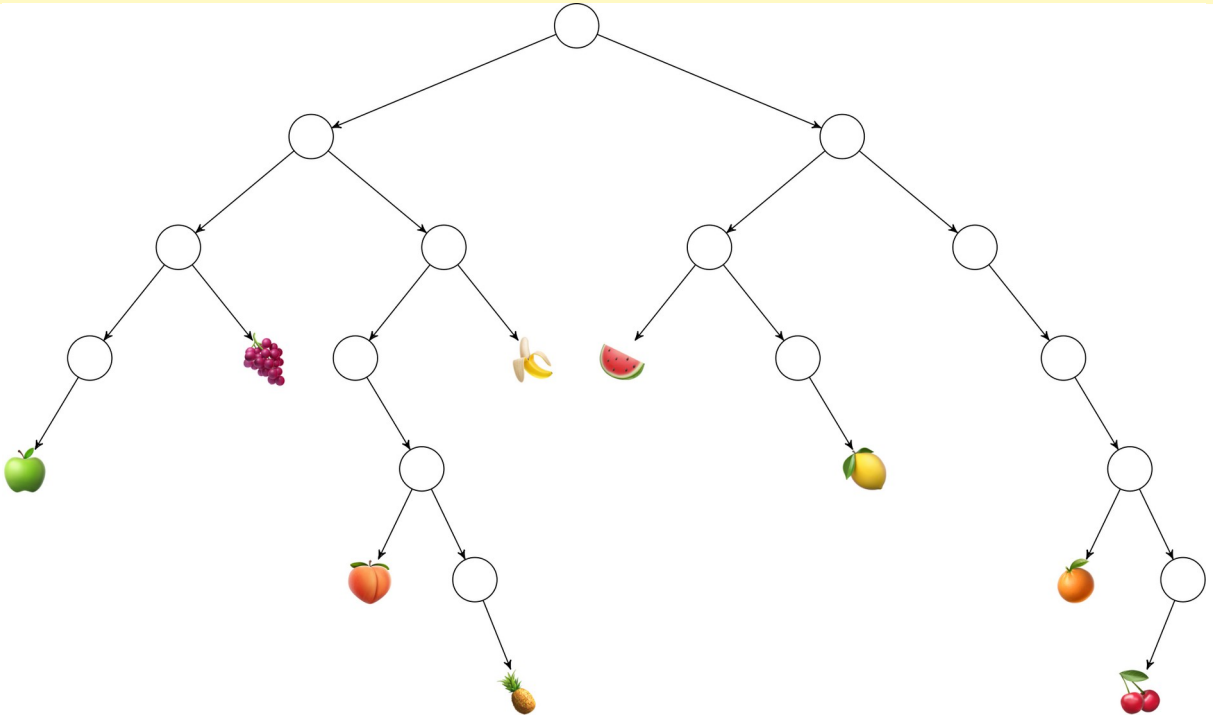
Exercise

Produce the numeric and lark-notated equivalent addresses for each of the fruit nodes in the binary fruit tree.



Solution

Produce the numeric and lark-notated equivalent addresses for each of the fruit nodes in the binary fruit tree.



- 9 or -<+
- 11 or ->+
- 12 or +<-
- 16 or -<-<
- 27 or +<+>
- 42 or ->->-
- 62 or +>+>-
- 87 or ->->+>
- 126 or +>+>+<

Exercise

Write a `%say` generator which simulates scoring a simple dice throw of *n* six-sided dice. That is, it should return the sum of *n* dice. If no number is specified, then only one die roll should be returned.

Exercise

Here is a `%say` generator that returns a list of *n* probabilities between 0–100%.

```
:-  %say
|=  [[* eny=@uv *] [n=@ud ~] ~]
  :-  %noun
  =/  values  `(list @ud)`~
  =/  count  0
  =/  rng  ~(. og eny)
  |-  ^-  (list @ud)
    ?:  =(count n)  values
    =^  r  rng  (rads:rng 100)          :: preserve state change
  $(count +(count), values [(weld values ~[(add r 1)])])
```

Exercise

The Sieve of Eratosthenes is a classic (if relatively inefficient) way to produce a list of prime numbers. Save this as a file `/gen/primes.hoon`, sync it, and run it as

```
+primes 100
```

(Be careful not to use too large a number—use Ctrl+C to interrupt evaluation!)

Exercise

Scan through the generators in `/gen` and see which libraries are used and how they are imported.

Exercise

Examine several source code files. Enumerate some principles of good Hoon style that you infer from these.

```
{
   "name":  "John",
   "age":  30,
   "car":  null
}
```

```
[~
   [%o p={
         [p='car'
          q=~
         ]
         [p='name'
          q=[%s p='John']
         ]
         [p='age'
          q=[%n p=~.30]
         ]
      }
   ]
]
```

~the.6-week.hooner

Literally
learned to code

Acquired Hoon
in 6 weeks.

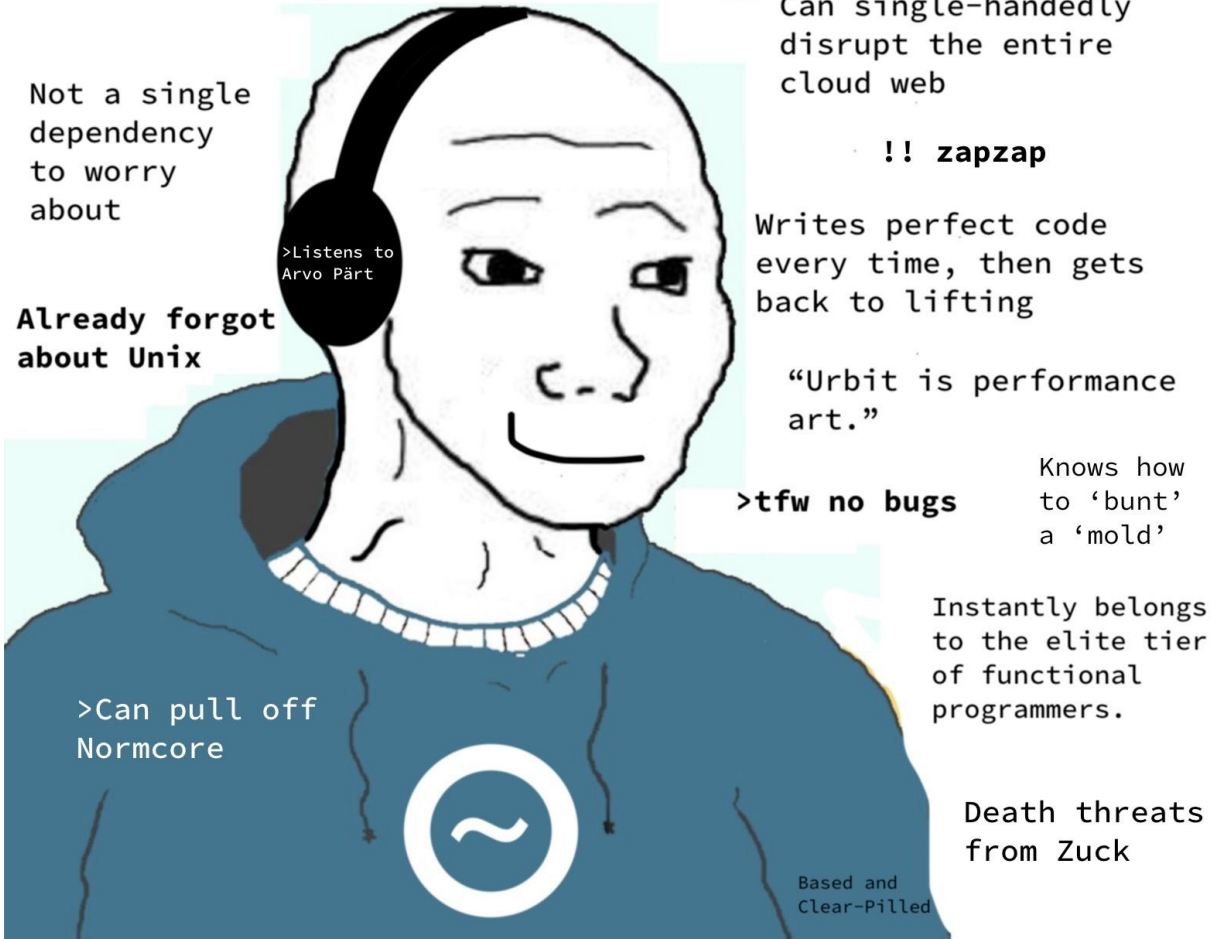
|hi~zod

Can single-handedly
disrupt the entire
cloud web

Not a single
dependency
to worry
about

!! zapzap

Writes perfect code
every time, then gets
back to lifting



**Already forgot
about Unix**

“Urbit is performance
art.”

>tfw no bugs

Knows how
to ‘bunt’
a ‘mold’

Instantly belongs
to the elite tier
of functional
programmers.

Death threats
from Zuck

LAWFUL SOCIAL NEUTRAL REBEL CHAOTIC

GOOD

MORAL

NEUTRAL

IMPURE

EVIL

CHOOSE YOUR FIGHTER

LAWFUL SOCIAL NEUTRAL REBEL CHAOTIC

LAWFUL SOCIAL NEUTRAL REBEL CHAOTIC

GOOD

MORAL

NEUTRAL

IMPURE

EVIL

CHOOSE YOUR FIGHTER


SQL


Excel


Assembly


Perl


MATLAB

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GOOD

MORAL

NEUTRAL

IMPURE

EVIL

CHOOSE YOUR FIGHTER


SQL


Excel


Assembly

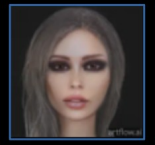

Perl

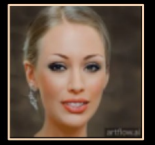

MATLAB


C


COBOL


Bash


Visual Basic


PHP

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LAWFUL SOCIAL NEUTRAL REBEL CHAOTIC

GOOD

MORAL

NEUTRAL

IMPURE

EVIL

CHOOSE YOUR FIGHTER


SQL


Excel


Assembly


Perl

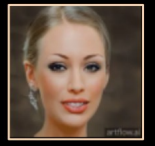

MATLAB


C


COBOL


Bash


Visual Basic


PHP


Java

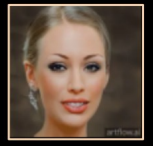

C++


Javascript


Brainfuck


HTML/CSS

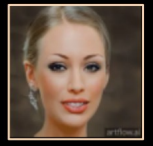
LAWFUL SOCIAL NEUTRAL REBEL CHAOTIC

	LAWFUL	SOCIAL	NEUTRAL	REBEL	CHAOTIC
GOOD					
MORAL	 Haskell	 Python	 Ruby	 Lua	 Fortran
NEUTRAL	 SQL	 Excel	 Assembly	 Perl	 MATLAB
IMPURE	 C	 COBOL	 Bash	 Visual Basic	 PHP
EVIL	 Java	 C++	 Javascript	 Brainfuck	 HTML/CSS
	LAWFUL	SOCIAL	NEUTRAL	REBEL	CHAOTIC

CHOOSE YOUR FIGHTER

	LAWFUL	SOCIAL	NEUTRAL	REBEL	CHAOTIC
GOOD					
MORAL	 Haskell	 Python	 Ruby	 Lua	 Fortran
NEUTRAL	 SQL	 Excel	 Assembly	 Perl	 MATLAB
IMPURE	 C	 COBOL	 Bash	 Visual Basic	 PHP
EVIL	 Java	 C++	 Javascript	 Brainfuck	 HTML/CSS
	LAWFUL	SOCIAL	NEUTRAL	REBEL	CHAOTIC

CHOOSE YOUR FIGHTER

	LAWFUL	SOCIAL	NEUTRAL	REBEL	CHAOTIC
GOOD					 Hoon
MORAL	 Haskell	 Python	 Ruby	 Lua	 Fortran
NEUTRAL	 SQL	 Excel	 Assembly	 Perl	 MATLAB
IMPURE	 C	 COBOL	 Bash	 Visual Basic	 PHP
EVIL	 Java	 C++	 Javascript	 Brainfuck	 HTML/CSS
	LAWFUL	SOCIAL	NEUTRAL	REBEL	CHAOTIC

CHOOSE YOUR FIGHTER

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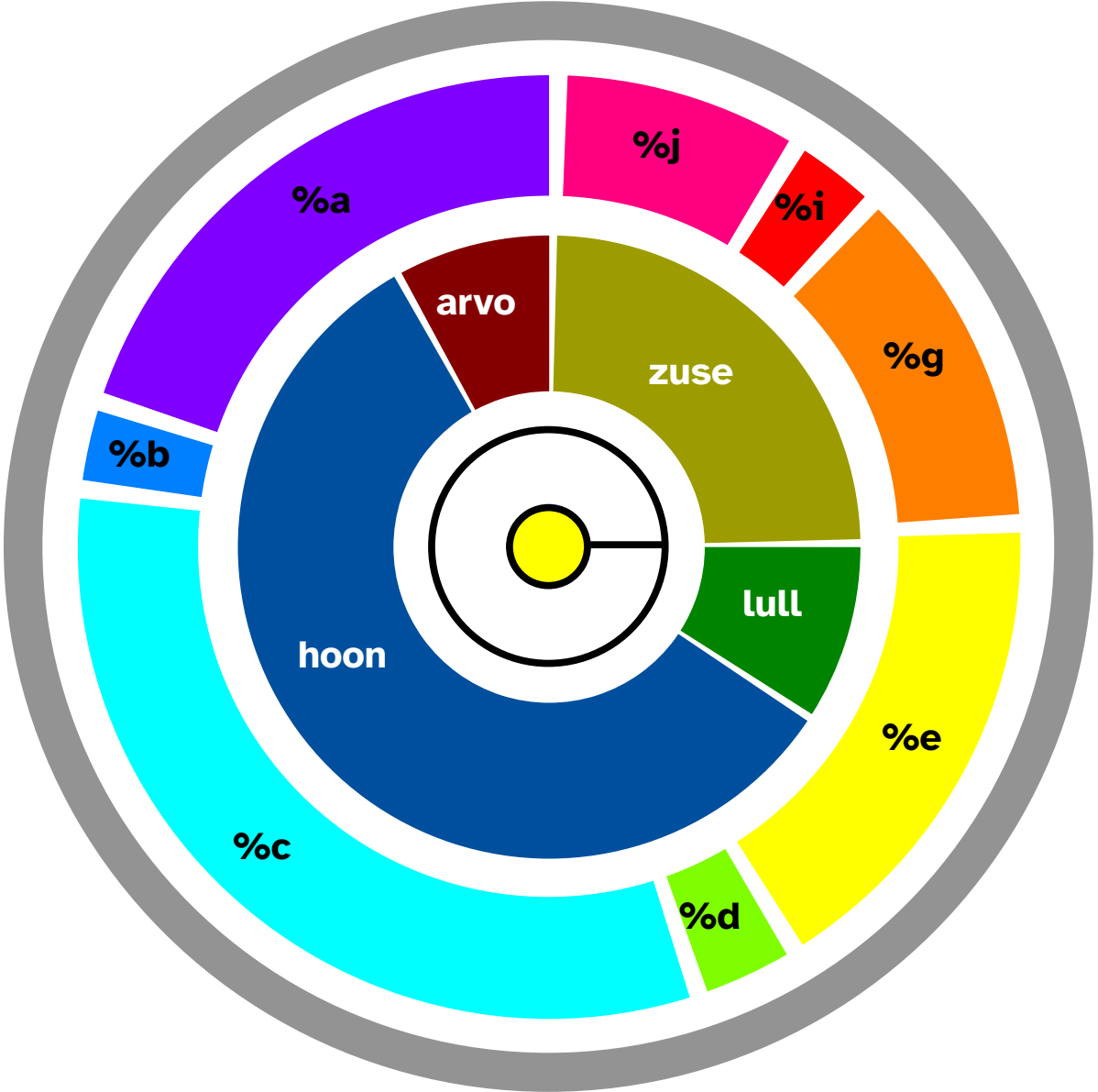
%a
%j
%i
%g
%e
%d
%c
%b
arvo
zuse
lull
hoon

```
+$  href                                    :: where a tile links
  $%  [%glob base=term =glob-location]      :: location of client-side data
      [%site =path]                         :: location of server-rendered frontend
  ==                                        ::
::                                          ::
+$  url   cord                              :: URL type
::                                          ::
+$  glob-location                           :: how to retrieve glob (client-side)
  $%  [%http =url]                          :: HTTP source, if applicable
      [%ames =ship]                         :: %ames source, if applicable
  ==                                        ::
::                                          ::
+$  version                                 :: version of app (not Kelvin version)
  [major=@ud minor=@ud patch=@ud]           ::
::                                          ::
+$  docket                                  ::
  $:  %1                                    :: Docket protocol tag
      title=@t                              :: text on home screen
      info=@t                               :: long-form description
      color=@ux                             :: app tile color
      =href                                 :: link to client bundle
      image=(unit url)                      :: app tile background
      =version                              :: version of app (not Kelvin version)
      website=url                           :: URL to open on click
      license=cord                          :: software release license
  ==                                        ::
```

- `%alfa` basic demo of Gall as MWE
- `%bravo` add local operations
- `%charlie` add peer-to-peer operations
- `%delta` write complete basic app

Exercise

- Examine /sur/dns.hoon (basic) or /sur/bitcoin.hoon (advanced).
- Examine /mar/json.hoon

  (and discuss with your *karass*)

```
|_  =bowl:gall
++  on-init
++  on-save
++  on-load
++  on-arvo
++  on-peek
++  on-poke
++  on-watch
++  on-leave
++  on-agent
++  on-fail
--
```

```
|_  =bowl:gall
++  on-init
++  on-save
++  on-load
++  on-arvo
++  on-peek
++  on-poke
++  on-watch
++  on-leave
++  on-agent
++  on-fail
--
```

```
|_  =bowl:gall
++  on-init
++  on-save
++  on-load
++  on-arvo
++  on-peek
++  on-poke
++  on-watch
++  on-leave
++  on-agent
++  on-fail
--
```

```
|_   =bowl:gall
++  on-init
++  on-save
++  on-load
++  on-arvo
++  on-peek
++  on-poke
++  on-watch
++  on-leave
++  on-agent
++  on-fail
--
```

Permissions Model

- A *store* is a local database.
- A *hook* is a permissions broker for the database.
- A *view* is a data aggregator which parses objects for external clients such as Landscape.

Code courageously.

If you avoid changing a section of code for fear of awakening the demons therein, you are living in fear. If you stay in the comfortable confines of the small section of the code you wrote or know well, you will never write legendary code. All code was written by humans and can be mastered by humans.

It's natural to feel fear of code; however, you must act as though you are able to master and change any part of it. To code courageously is to walk into any abyss, bring light, and make it right.

(Philip Monk, “Urbit Precepts”)


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Please Stand by!
We'll Be Back in a Jingleheimer Jiffy