Week 10 - Day 2 (Streams)

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# Week 10 - Day 2 (Streams)

Mar 24, 2016

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Announcement (We might go outside for class on Tuesday)

Audio 0:01:29

(define (ints-from n)  
 (cons-stream n (ints-from (+ n 1)))  
)  
  
(define (sdisplay s n)  
 (cond  
 ((= n 8) (print "..."))  
 (else  
 (print (stream-car s) " ")  
 (sdisplay (stream-cdr s) (- n 1))  
 )  
 )  
)  
  
(sdisplay (ints-from 2) 100)  
;@ Audio 0:06:39 VM woes  
(sdisplay s 100)  
  
(define (add-streams s t)  
 (cons-stream   
 (+ (stream-car s) (stream-car t))  
 (add-streams (stream-cdr s) (stream-cdr t))  
 )  
)  
  
(sdisplay (add-streams s s) 10)  
  
;@ Audio 0:09:07  
(define (make-ones)  
 (s-cons 1 (make-ones))  
)  
  
;@ Audio 0:11:40  
;@ How did he do it?  
(define ones (scons 1 ones))  
  
(sdisplay (ones) 10)

Wowza we can make recursive calls.

Audio 0:13:00 How do we make a stream of integers starting at one and incrementing?

Ex:

|  |  |
| --- | --- |
| 1 | 1 1 1 1 1 1 … |

|  |  |
| --- | --- |
| + | 1 2 3 |

-——————-

|  |  |
| --- | --- |
| 1 | 2 3 4 5 … |

Audio 0:15:50

(define ints (scons 1 (add-streams ones ints)))  
(sdisplay ints 100)

Audio 0:17:00

## Fibinocci



(define fibs (scons 0 (scons 1 (add-streams fibs (scdr fibs)))))

Audio 0:21:00 ## Sieve of Eratostheones

;@ Audio 0:23:00  
;@ stream remove  
(define (sremove p? s)  
 (if (p? (scar s))  
 (sremove p? (scdr s))  
 (scons (scar s) (sremove p? (scdr s)))  
 )  
)  
  
(define (divides? x y) (= (% x y) 0))  
  
;@ Audio 0:26:30  
;@ Prints integers which are not divisible by 3   
;@ Hint for project3 # 8 ;)  
(sdisplay (sremove (lambda (x) (divides? x 3)) ints) 20)

### Sieve Function

Audio 0:29:00

(define (sieve s)  
 (scons   
 (scar s)   
 (sieve (sremove (lambda (x) (divides? x (scar s))) (scdr s)))  
 )  
)  
;@ Audio 0:32:50  
(sdisplay (sieve (scdr ints)) 20)

## Book Problem pi/4

Audio 0:34:00

PI/4 = 1 - (1/3)+(1/5)-(1/7)+…

Audio 0:36:57

(define (div-streams s t)  
 (cons-stream  
 (/ (stream-car s) (\* 1.0 (stream-car t)))  
 (div-streams (stream-cdr s) (stream-cdr t))  
 )  
)  
(define alt-ones (scons 1 (scons -1 alt-ones)))  
(define odds (scons 1 (add-streams twos odds)))  
(define twos (scons 2 twos))  
;@ Audio 0:40:00  
  
(define pi-stream (div-streams alt-ones odds))  
(sdisplay pi-stream 10)

Audio 0:44:00

How do you sum an infinite amount of things?

(define (psum s)  
 ;@ Audio 0:49:00  
 (scons (scar s) (psum (scons (+ (scar s) (scar (scdr s))) (scdr (scdr s))))))  
;@ Audio 0:53:15  
(sdisplay (psum pi-stream) 10)  
(define (sscale s x)  
 (scons (\* x (scar s)) (sscale (scdr s) x))  
)  
  
(sdisplay (sscale (psum pi-stream) 4) 10)

## Euler’s Transform

Audio 0:56:00

This will speed up the convergence of the pi stream to being closer to accurate

(define (et s)  
 (define s0 (scar s))  
 (define s1 (scar (scdr s)))  
 (define s2 (scar (scdr (scdr s))))  
 ;@ Audio 0:59:30  
 (scons  
 (- s2 (/ (^ (- s2 s1) 2) (+ s0 (\* -2 s1) s2)))  
 (et (scdr s))  
 )  
)

Let’s do it again!!!

Audio 1:03:40

We need a stream of streams of Euler Transforms

(define (tableau s) (scons s (tableau (et s))))

Audio 1:05:00

Lusth is describing the streams

We can get an everbetter approximation

## CS 403 - 001 Spring 2016

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Website for notes and study material for CS 403 (Programming Languages) at The University of Alabama Spring 2016