CS-257L Nonimperative Programming: Scheme!

Instructor:

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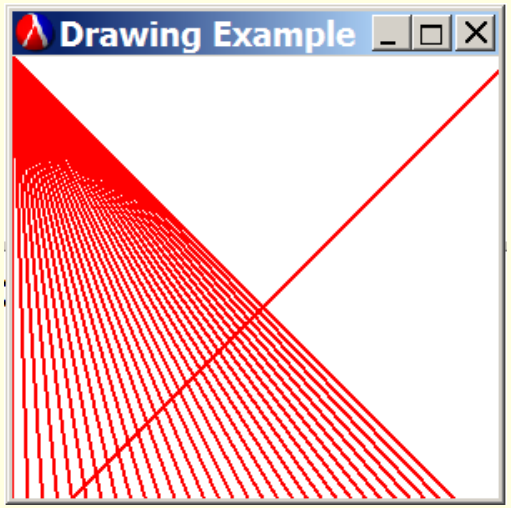


4/1/2008

Homework – Due Monday

- Write a Scheme program using MrEd that accepts a list of atoms consisting of f, +, and -.
- Create an 800 x 500 pixel frame.
- Start drawing directly up from the middle of the frame .
- Draw each f as a 20 pixel line.
- Each + and – changes the direction of drawing by +90 degrees or -90 degrees.
  - Note: since these are all right angles, you do not need to use sin() and cos().

MrEd

MrEd is a Scheme implementation based on MzScheme

MrEd embeds MzScheme and extends it with a graphical user interface (GUI) toolbox.

GUI applications written with MrEd run without modification under Windows, Mac OS X, and Unix/X.

Frame

```
;Make a 300 × 300 frame
(define frame
  (instantiate frame%
     ("Drawing Example")
     (width 300)
     (height 300)
  )
)

;Show the frame
;"send" calls methods from outside a class.
(send frame show #t)
```

Canvas with Paint-callback

```
;Drawing in MrEd requires a device context (dc).
(define canvas
  (instantiate canvas% (frame)
    (paint-callback
      (lambda (canvas dc) (draw-lines dc))
    )
  )
)
```

Create a Pen

A pen is a drawing tool with a color, width, and style.

```
(define red-pen
  (instantiate pen%
      ("RED"          ;color
        2             ;line thickness
        'solid        ;line style
      )
  )
)
```

A Pen's Style

A pen's style is one of the following:

- 'transparent -- Draws with no effect.
- 'solid -- Draws using the pen's color.
- 'xor -- The pen's color is xor-ed with existing destination pixel values. The 'xor mapping is unspecified for arbitrary color combinations, but performing the same drawing operation twice in a row with 'xor is guaranteed to be equivalent to a no-op.
- 'dot
- 'long-dash
- 'short-dash
- 'dot-dash
- 'xor-dot
- 'xor-long-dash
- 'xor-short-dash
- 'xor-dot-dash

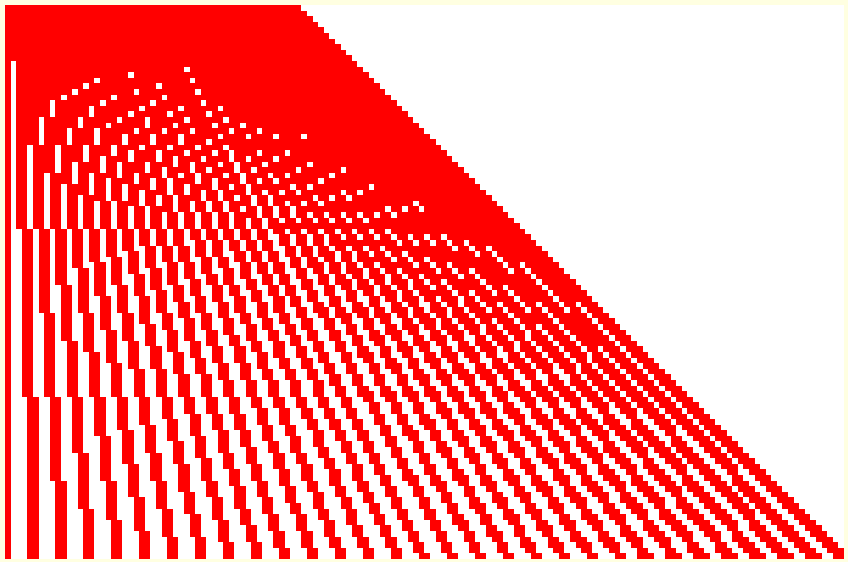
A Pen's Size

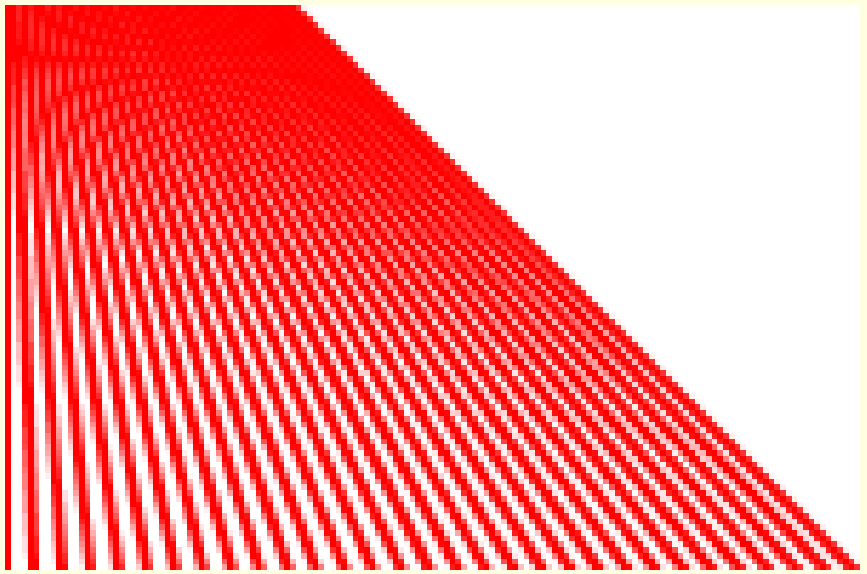
- A pen of size 0 uses the minimum line size for the destination drawing context.
- In (unscaled) canvases and bitmaps in unsmoothed mode, a zero-width pen behaves the nearly same as a pen of size 1.
- In a smoothing mode, a pen of size 0 draws a line thinner than a pen of size 1.

set-smoothing

Enables or disables anti-aliased smoothing of lines, curves, rectangles, rounded rectangles, ellipses, polygons, paths, and clear operations.

Text smoothing is not affected by this method, and is instead controlled through the font% object.





Drawing

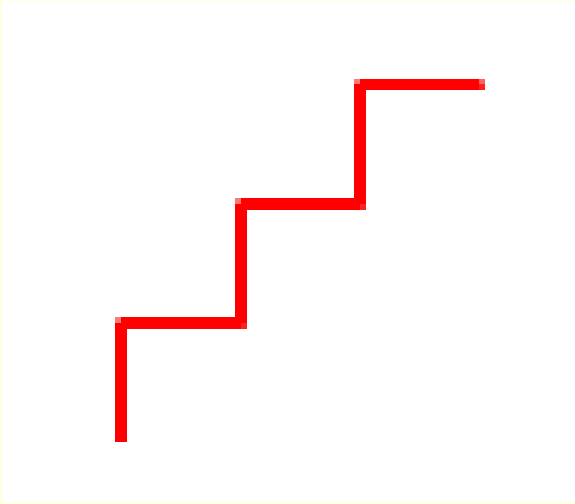
```
(define (draw-lines dc)
    (send dc set-smoothing 'smoothed)

    (send dc set-pen red-pen)
    (send dc draw-line 0 0 300 300)
    (send dc draw-line 0 300 300 0)

    (do ((i 0 (+ i 10))) ((>= i 300))
      (send dc draw-line 0 0 i 300)
    )
)
```

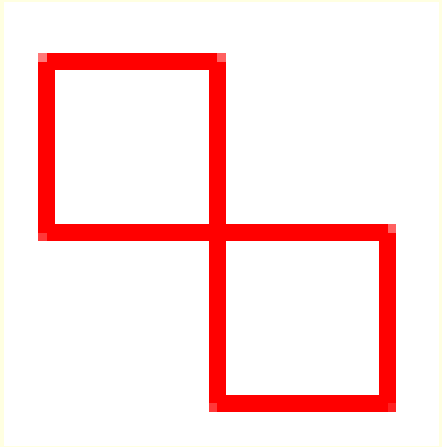
Test Cast 1

```
(drawSystem
  '(f + f - f + f - f + f))
```



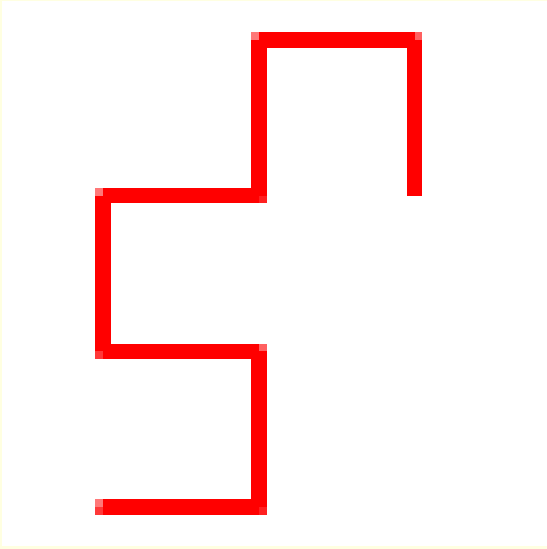
Test Cast 2

```
(drawSystem
  '(f - f - f - f f + f + f + f))
```



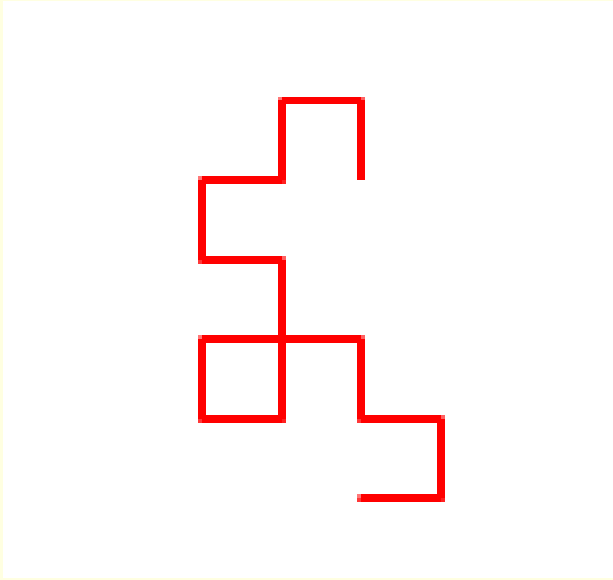
Test Cast 3

```
(drawSystem
  '(f - f - f + f –
    f - f + f + f)
    )
```



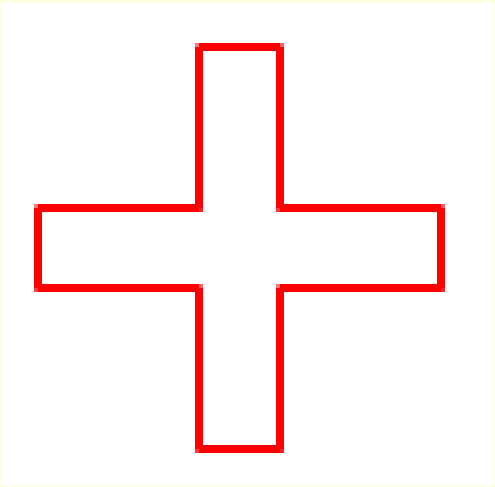
Test Cast 4

```
(drawSystem
  '(f - f - f + f - f - f + f +
    f - f - f - f + f + f - f +
    f + f)
  )
```



Test Cast 5

```
(drawSystem
  '(f f - f - f f +
    f f - f – f f +
    f f - f - f f +
    f f - f - f f)
   )
```



Grading Rubric for HW-9

15 Points Total

[5 points]:

- Assignment appears to have good effort,
- ALL source is included in the submission including very standard helpers like atom?

[2 points each]:

- Given the input in test cases 1 through 5 on the previous slides, the output should match the given image with the smallest unit length being 20 pixels.
- The foreground and background colors can be anything (except both the same).