"SLOGO: A Vector Graphic Application Prototyping Language"

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Abstract: SLOGO is a script language and framework designed to aid in the development of rapid-prototypes of vector graphic applications. SLOGO is the intermediate language between graphic applications and SVG. SLOGO syntax is simple: an image is a collection of attributes and objects and these attributes may affect more than one object. SLOGO attributes embraces diverse SVG, CSS and SMIL attributes. SLOGO objects include rectangles, circles, lines, paths, images and groups of objects. Server-side SLOGO interpreter is simple, efficient and small. By reusing SLOGO framework, building a new graphic application interpreter is simple and fast. This paper describes SLOGO architecture: the font-end components and back-end virtual machine, SLOGO formal language definition, and exposes different graphic applications running atop of SLOGO server-side framework.

Keywords: Scripted server-side graphics, Charting and diagramming software, Scripting languages, Rapid-prototyping SVG-based applications, Graph drawing and animation, Domain-specific languages.
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**Introduction**

Fig. 1. Rube Goldberg Machine made by a student using SLOGO [1]

**SLOGO** as a shortcut for *SVG programming* 😊
SLOGO Design Goals:

1. **Scripting language:** simple, compact, non-XML.
2. **Scripted server-side graphics.**
3. **SVG images:** Small SLOGO scripts embedded in HTML pages.
4. **Rapid-prototyping of Graphic Applications.**
5. **Charting and Diagramming editors:** web-enabled, light-weight, easy-to-use.
6. **Academic projects:** programming languages, web programming, traducers, etc.
**SLOGO**: Aimed for rapid prototyping of graphic applications.

**Fig. 3.** SLOGO supports a wide-range of vector graphic applications.
**Fig. 4.** SLOGO Layers: Editors, Interpreters and SLOGO Virtual Machine.
One back-end, multiple front-ends: To add new application GA-n, develop Editor-n and Traducer-n.

**Fig. 5.** SLOGO-VM = Back-end, SLOGO-GA = Front-end = Editor + Traducer.
Fig. 6. SLOGO-GA and SLOGO-VM communication is through SLOGO scripts.
**SLOGO Language:** an image is a collection of attributes and objects.

![Diagram of SLOGO sentences](image)

**Fig. 7.** SLOGO sentences represent attributes or objects.
SLogoScript ::= Sentence+
Sentence ::= Attrib* Object
Attrib ::= Attr-Basic | Attr-Trx | Attr-Font | Attr-Adv
Attr-Basic ::= Color | Border | Opacity
Attr-Trx ::= Translate | Rotate | Scale | Animate
Attr-Font ::= "bold" | "italic" | Font-Size | Align | Font
Attr-Adv ::= ("save" | "@") | "@G" | "@L" | CSS-based | SVG-based
Object ::= [" SlogoScript "] | Text "!" | Figure "!"
Figure ::= Line | Rect | Circ | Path | Image
Text ::= Point "," Char+ ("http://" Char+)?
Line ::= ("L"|"A") Point "," Point ; Line or Arrow
Rect ::= "R"  "3D"? Point "," Dim ("," N99)?
Circ ::= "C"  "3D"? Point "," Dim ; Circle or Ellipse
Path ::= "P"  "3D"? Path-Val ; SLOGO Path = SVG Path
Image ::= "I" Point "," Dim "," ("http://"? Char+)

Color ::= ("c" | "c=none") | "c" "="? CVal
Border ::= "b" "="? CVal ("," Digit+)?
Opacity ::= "o" "="? N100
Translate ::= "t" "="? Point
Rotate ::= "r" "="? Angle
Scale ::= "z" "="? (Scale | Scale2) ; e.g. z=2|z=0.25:1.5!
Animate ::= "a" Anim-Attr "," Anim-Range ",," Anim-Time
CSS-based ::= "s" "="? Char+ ; e.g. s=font-family:Arial;
SVG-based ::= "S" "="? Char+ ; e.g. S=fill='none';
Font-Size ::= 8..99 ("pt" | "px")
Align ::= ("left" | "lf") | ("right" | "rg") | ("center" | "ct")
Font ::= "mono" | "sans" | "serif" | "script" | "fantasy" | "f" "="? Char+
SLOGO Syntax

Anim-Attr ::= \"x1\" | \"x2\" | \"y1\" | \"y2\" | \"w\" | \"width\" | \"h\" | \"height\" | \"x\" | \"y\" | \"r\" | \"rx\" | \"ry\" | \"c\" | \"color\" | \"o\" | \"opacity\" | \"rot\" | \"rotate\" | \"t\" | \"trans\" | \"s\" | \"scale\" | \"z\" | \"sx\" | \"zx\" | \"sy\" | \"sz\"

Anim-Range ::= Value \"@\" Value

Anim-Time ::= Init \"@\" Dur (\"@\" Repeat) ?

Init | Dur ::= Digit+ (\".\" Digit+) ?

Repeat ::= \"-1\" | Digit+

Anim-Attr ::= \"x1\" | \"x2\" | \"y1\" | \"y2\" | \"w\" | \"width\" | \"h\" | \"height\" | \"x\" | \"y\" | \"r\" | \"rx\" | \"ry\" | \"c\" | \"color\" | \"o\" | \"opacity\" | \"rot\" | \"rotate\" | \"t\" | \"trans\" | \"s\" | \"scale\" | \"z\" | \"sx\" | \"zx\" | \"sy\" | \"sz\"
SLOGO Syntax

Value ::= Dim | CVal | N100 | Point | Angle | Number | Scale | Scale2
CVal ::= Char+ | Hex-Dig | Hex-Dig{3} | Hex-Dig{6}
Point ::= Number | Number "::" Number
Dim ::= Digit+ | Digit+ "::" Digit+
N99 ::= 1..99 | 1..99 "::" 1..99 ; Compact or Expanded form
Scale2 ::= Scale "::" Scale
Scale ::= 0.01..1.0 | 1.0..99
Number ::= "-"? Digit+
N100 ::= 0.0..1.0 | 0..100
Angle ::= -359..359
Path-Val ::= Char+ (Char | Digit | "","")+ ; Same as SVG Path Grammar
Hex-Dig ::= Digit | A..F
Digit ::= 0..9
Char ::= a..z
SLOGO Script Example: Draw the Japanese flag.

**SLOGO:**

```plaintext
SLOGO: 
c=f! % Attribute: fill color = #ffffff (white)
R3D 5,200:150! % Object: Rectangle with a 3D effect
c=red! % Attribute: fill color = red
C3D 100:75,35! % Object: Circle
```

**SVG:**

```xml
<rect x='5' y='5' width='200' height='150' filter='url(#3D)' fill='#fff'>
</rect>
<circle cx='100' cy='75' r='35' filter='url(#3D)' fill='red'>
</circle>
```
Image generated with: cf! R3D 5,200:150! cred! C3D 100:75,35!

Fig. 8. Japanese flag generated by SLOGO server.
SMIL Example: an illustrative SLOGO animation.

SLOGO:

```
aopacity=.8@.4,0@6! ascale=.5@1,0@6! arotate=0@-15,0@6! [ 
c=silver! C3D 60,30!
   ac=silver@gold,0@1@-1! C3D 60,60@6!
]
```

Fig. 9. SLOGO animation using SMIL.
Fig. 10. SLOGO interactive editor web page
Steps: To develop a new SLOGO-GA font-end prototype is recommended the following methodology:

0. **Design GA:** Write an input script, its corresponding SLOGO script and SVG image.

1. **Define Script Language:** Example BNF formal language specification.

2. **Develop GA-interpreter:** Transform GA-scripts to SLOGO.

3. **Develop GA-editor:** Build an interactive user interface.
Examples of Graphic Application Prototypes:

1. **Synopsis**: Produce synoptic charts using SLOGO.
2. **SBlock**: Produce flow charts using SLOGO.
Step 0: Synopsis Data I/O Streams.

Input Stream:

Topic { Theme 1; Theme 2 }

Output Stream:

SLOGO (GA Output):

22px! 20:79,Topic!
101:37,* Theme 1!
101:112,* Theme 2!
z=1.0@4.0! 30pt!79:28,{}
Step 0: Synopsis Data I/O Streams.

Synoptic chart generated with: Topic \{ Theme 1; Theme 2 \}

Fig. 11. Synoptic Charts (first prototype aproximation).
**Step 1: Synoptic Script Language**

**Step 1:** Synopsis graphic application mini-language

\[
\text{SynopticScript} ::= \text{Settings} \text{DataSet} \\
\text{Settings} ::= ("%" \text{ConfigSet}+ ";")? ("#" \text{SLogoScript} ";")? \\
\text{ConfigSet} ::= (\text{Config} ";")? \text{Config} \\
\text{Config} ::= "\text{Symb}" | "\text{Num}" | "\text{Alpha}" | "n=" 1..12 \\
\text{DataSet} ::= \text{SynopticLabel} "{" \text{SubLevel}+ "}" \\
\text{SubLevel} ::= \text{SynopticLabel} "";" | \text{Block} \\
\text{Block} ::= "{" (\text{SynopticLabel} "";")+ "}" \\
\text{SynopticLabel} ::= (A-Za-z0-9)+
\]
Step 2: Implement **Synopsis interpreter** to translate synopsis scripts (input) to SLOGO (output).

**Input Script (Synopsis):**

```
%Num,n=3;
#c=purple! P m10,140 h50 l-25,15 z;
SCORM http://www.adlnet.gov/scorm { CAM Book; RTE Book; SN Book }
```

**Synopsis interpreter output (SLOGO):**

```
c=purple! P m10,140 h50 l-25,15 z!
z=1.0@4.0!serif!50pt!79:47,!
```
Step 2: Synopsis Interpreter

Synoptic chart generated.

Fig. 12. SVG Image generated by Synopsis server.
**Fig. 13.** Sinopsis: Synoptic editor web page
Script:

\[%\text{NUM,ROUND,BIG;} \text{EDITOR;} \text{INTERPRETER;} \text{SVG}\]

Output: Flowchart generated by SBlock server.

1) EDITOR

2) INTERPRETER

3) SVG

Fig. 14.
1. **Rube Goldberg Machines** [2] [3] [4]: An introductory programming course exercise.

2. **Web Programming and Compilers courses**: Students built final term SLOGO GA projects.

3. **Programming Languages Review courses**: Students made comparison of SLOGO implementations using diverse programming languages, *e.g.* Ruby.

4. **ExpoVision-SLOGO Integration**: All SVG images of this presentation
SLOGO Benefits:

- Rapid-prototyping of graphic applications.
- A learning artifact.
- A shortcut to SVG.
- Is Open Source! 😊
The SVG Open 2007 article could be found at

www.svgopen.com/papers/SLOGO_Abstract

This Web Presentation could be found at

| [SLOGO animation] | A. Pacheco, "SLOGO Animation: Saturn", 2007. | slogo.php?f=aopacity%3D.8%40.4%2C0%406!ascale%3D.5%401%2C0%406!arotate%3D0%40-15%2C0%406!%5Bcsilver!c3d0%2C30!ac%3Dsilver%40gold%2C0%401%40-1%2C200%2C60%406%5D |