CSCI 334:
Principles of Programming Languages

Lecture 14: Project Ideas / Evaluation

Instructor: Dan Barowy

Williams

Announcements

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No class Thursday

Example: brace language

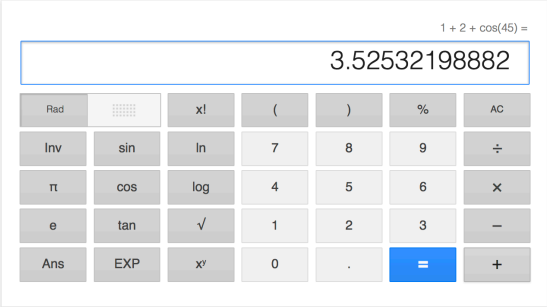
- An ***expression*** is a sequence of ***terms***, consisting of ***at least one term***.
- A ***term*** is either '`aaa`', '`bbb`', or a ***brace expression***.
- A ***brace expression*** is '`{`', followed by an ***expression***, followed by '`}`'.

Lexical vs Dynamic Scope

Inspiration for Projects

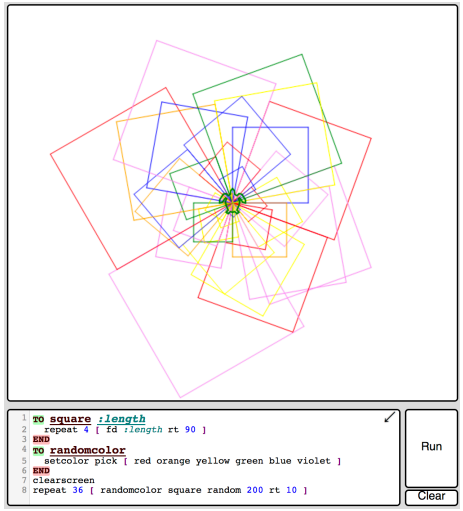
Scientific Calculator

(using infix expressions)



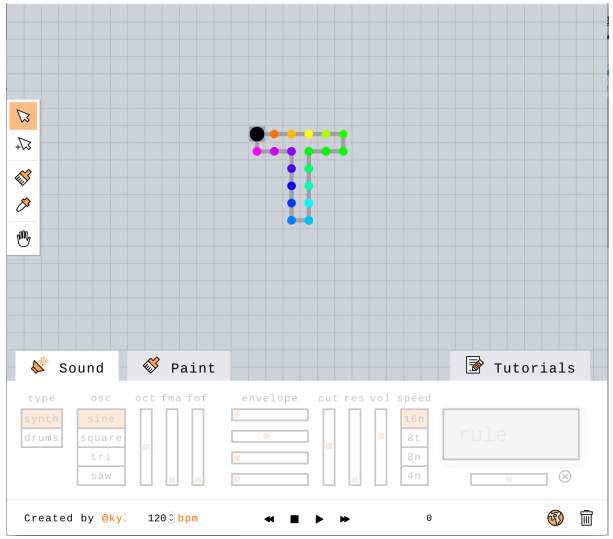
https://www.google.com/search?q=google+calculator

Logo Interpreter



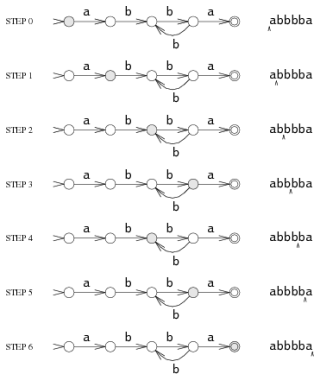
https://www.calormen.com/jslogo/

Turtle Audio



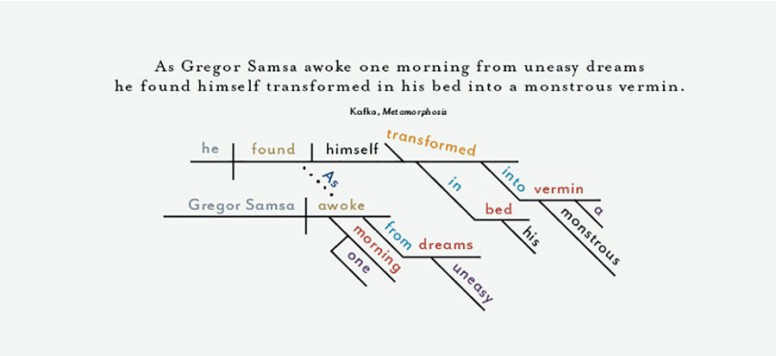
https://turtle.audio

Regular Expressions



https://swtch.com/~rsc/regexp/regexp1.html

Auto Sentence Diagramming

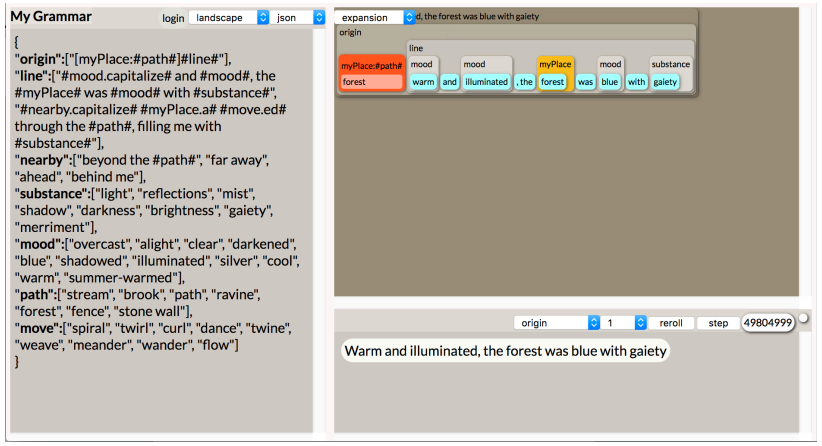


https://www.npr.org/sections/ed/2014/08/22/341898975/a-picture-of-language-the-fading-art-of-diagramming-sentences

BASIC

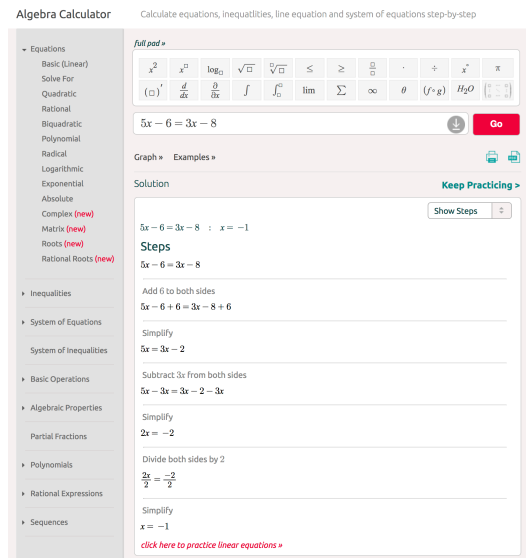
```
710 IF PR(IPS,3)=1 THEN PRINT "Your victim is badly wounded" :: RETURN
720 PRINT "You killed your victim"
730 PR(IPS,1)=0 :: IVW=8+IPS
740 VP(IVW)=IKM :: IPS=0
750 RETURN
760 PRINT "Possible commands:"
770 FOR I=1 TO 15
780 PRINT H$(I)
790 NEXT I
800 RETURN
810 IF IVW<>0 THEN 840
820 PRINT "There is nothing to take    here"
830 RETURN
840 IF BLL=0 AND IKM<25 THEN PRINT "You cannot take things that you do not see"
:: RETURN
850 PRINT "I take the ";V$(IVW);" for you"
860 B(IBMAX)=IVW
870 IBMAX=IBMAX+1
880 VP(IVW)=0
890 IVW=0
900 RETURN
910 INPUT "What would you like to drop? ":D$
920 LNG=LEN(D$)
930 IVWB=0
940 FOR I=1 TO 12
950 IF D$=SEG$(V$(I),1,LNG)THEN IVWB=I :: I=12
960 NEXT I
970 IF IVWB<>0 THEN 1000
980 PRINT "I do not understand you"
```

A BNF parser and generator



http://tracery.io/editor/

An algebra solver



https://www.symbolab.com/solver/algebra-calculator

ChucK

```
SinOsc ge => dac;

while( true )
{
  Math.random2f(30,1000) => ge.freq;
  .5::second => now;
}
```

https://www.ted.com/talks/ge_wang_the_diy_orchestra_of_the_future#t-237999

http://chuck.cs.princeton.edu/

Program Evaluation as Reduction

1 + 2 * 3 - 1

(λx.λx.x)(λx.y)

(λx.λx.x)(λx.y)

$\Downarrow \alpha$

$$(\lambda x.\lambda x.x)\,(\lambda x.y)$$

$$\Downarrow \alpha$$

$$(\lambda x.\lambda a.a)\,(\lambda b.y)$$

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In other words, all variable names are unique.

Parts

```
e: Expr            An expression
b: Set<char>       Variable bindings
r: Map<char,char>  Renamings
```

```
alphanorm(e: Expr)(b: Set<char>)(r: Map<char,char>)
                : Expr*Set<char>
```

What is passed in; returned

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Note that we want the set of bindings to persist, therefore it is both *passed in* and *out*.

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Note that we want the set of bindings to persist, therefore it is both *passed in* and *out*.

But the set of renamings is *scoped*: it is only passed in.

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