The Thue Programming Language

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What is a Semi-Thue System

- Axel Thue
  - express theorems in formal language
- Abstract rewriting system
  - rewrite pieces of input string
- isomorphic to unrestricted grammar
  - Allows arbitrary combination of symbols to be replaced
    - e.g. asdf -> qwertyuiop
- effectively a grammar for Turing Machines

Classic Turing Machine problem

C={ $a^nb^nc^n$ | n >= 0 }

Rules:

S->abcS | ε

ba->ab

ca->ac

cb->bc

Trace:

1. **S**
2. abc**S**
3. abcabc**S**
4. ab**ca**bc
5. a**ba**cbc
6. aab**cb**c
7. aabbcc

What is Thue?

- esoteric programming language
- based on a Semi-Thue System
- basic structure:
  - while there is an applicable rule
    - pick an arbitrary rule
    - replace lhs with rhs

Examples of Thue Code

Hello World!

```
a::=~Hello World!
::=
a
```

::= defines a rule (an empty rule denotes end of rules)

A tilde ~ denotes characters or strings to be output

::: denotes input

Examples of Thue Code

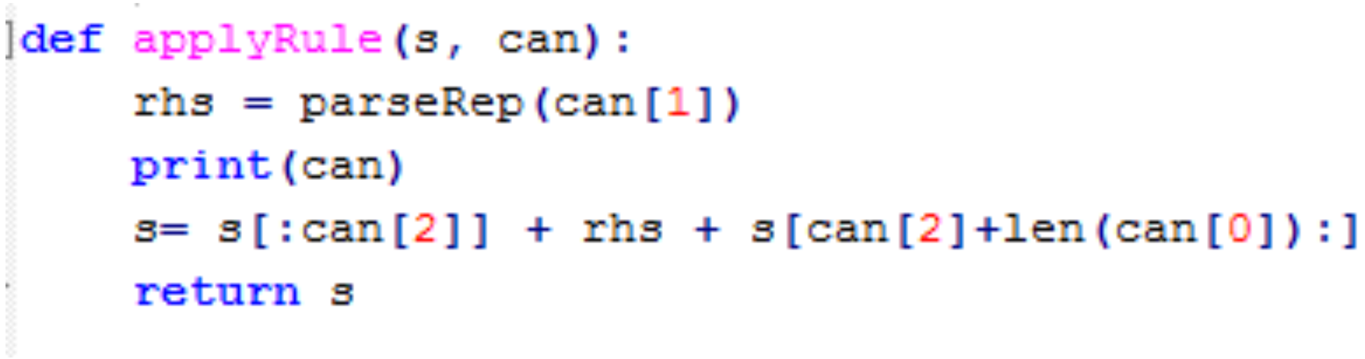
Random Numbers

```
b::=~0
b::=~1
ac::=abc
::=
abc
```

arbitrarily picks a rule to apply:

b->~0 or b->~1

A Thue Interpreter in Python



```
def applyRule(s, can):
    rhs = parseRep(can[1])
    print(can)
    s= s[:can[2]] + rhs + s[can[2]+len(can[0]):]
    return s
```

- only about ~75 lines of python
- slight change in input format
- see writeup for complete code

Thanks for Watching

Source: http://esolangs.org/wiki/Thue