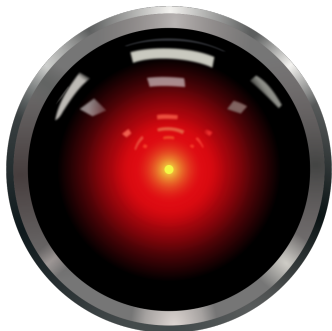


HAL

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Objective

Create a programming language:

- That results useful in the future
- Easy to write and read
- Very dynamic
- Inspired in good ideas of other languages (Python, Ruby,...)

```
5.times: print "Hello world!"
```

```
Hello world!  
Hello world!  
Hello world!  
Hello world!  
Hello world!
```

Main features

- **Clean** syntax, perfect for creating **Domain-Specific Languages**
- **Object-oriented** with **inheritance**
- **Dynamic typing** and **duck typing**
- **Builtin** methods that can be **overridden** in HAL itself
- Module **imports**
- **First-class** functions
- Interactive and easy-to-extend interpreter

Clean syntax

```
class Array:
    def sort!:
        return self if size < 2
        p = first
        q = pop!
        lesser = q.filter with x: x < p
        greater = q.filter with x: x >= p
        lesser.sort! ++ [p] ++ greater.sort!

a = [1, 2, 3, -1, -2, -3, 20, 40, 1, 2, 200, -5]
print a.sort!
```

```
[-5, -3, -2, -1, 1, 1, 2, 2, 3, 20, 40, 200]
```

List comprehension

```
class Array:
    def map:
        [ yield x for x in self ]

a = range(10).map with x: x * 2
print a
```

```
[0, 2, 4, 6, 8, 10, 12, 14, 16, 18]
```

First-class functions

```
def lambda: &yield  
  
add = lambda with x, y: x + y  
  
print add 5, add 3, add 1, 2  
print &add.arity
```

```
11  
2
```

Lambda blocks

```
class Integer:
  def times:
    i = 0
    while i < self:
      yield if &yield.arity == 0 else yield i
      i = i + 1
```

```
5.times: print "Something"
3.times with t: print "%s" % t
```

```
Something
Something
Something
Something
Something
0
1
2
```

```
File.open "test.txt" with f:  
  f.write "Writing a file has never been so easy!"  
  
print `cat test.txt`
```

```
Writing a file has never been so easy!
```


Spaces are significant

```
def f x: x * 20  
a = 10
```

```
print \  
    a - 1,  
    a-1,  
    f -1
```

```
9  
9  
-20
```

Four levels of scopes

Local Without *accessor*

Instance Using @

Static Using @@

Module Instance variables in the current module

When a name is referenced without any *accessor*, HAL looks in the scopes in that order.

Builtin classes

- Boolean
- Class
- Enumerable
 - Array
 - Dictionary
 - String
- File
- Kernel
 - Module
- None
- Number
 - Float
 - Integer
 - Long
 - Rational
- Object
- Package
- Process

Basic data types

```
public abstract class HalNumber<T extends Number>
    extends HalObject<T> {
    public abstract HalNumber add(HalNumber n);

    public abstract boolean canCoerce(HalObject n);
    public abstract HalNumber coerce(HalObject n);
}
```

Basic data types (I)

```
private static final Reference __add__ =
    new Reference(new Builtin("add", new Params.Param("x")) {
        @Override
        public HalObject mcall(HalObject instance,
            HalMethod lambda, Arguments args) {
            HalNumber i = ((HalNumber) instance);
            HalObject x = args.get("x");

            if (!i.canCoerce(x))
                return x.methodcall("__radd__", i);

            return i.add(i.coerce(x));
        }
    });
```

Basic data types (II)

```
public static final HalClass klass =
    new HalClass("Number", HalObject.klass,
        // ...
        __add__,
        // ...
    );

class HalInteger extends HalNumber<Integer> {
    // ...
    @Override
    public HalNumber add(HalNumber n) {
        if (addOverflows(toInteger(), n.toInteger()))
            return new HalLong(toInteger())
                .add(new HalLong(n.toInteger()));
        return new HalInteger(toInteger() + n.toInteger());
    }
    // ...
}
```

Basic data types (III)

Other Number methods:

- `bool`
- `pos`
- `neg`
- `sub`
- `mul`
- `pow`
- `div`
- `mod`
- `ddiv`
- `eq`
- `lt`

```
import haltex

section 'Use example'
enumerate:
    item; p '*First item*'
    item; p '|second|'
    item; p '**third**'
```

```
\section{Use example}
\begin{enumerate}
\item
\emph{First item}
\item
\texttt{second}
\item
\textbf{third}
\end{enumerate}
```