

编程之思想

抽象

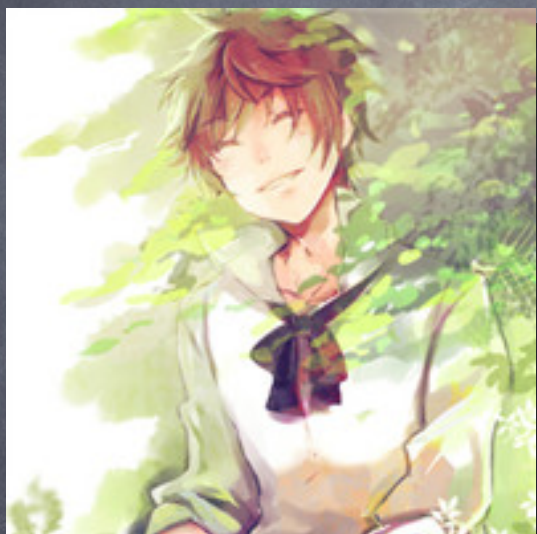
邓雄飞
DEATHKING



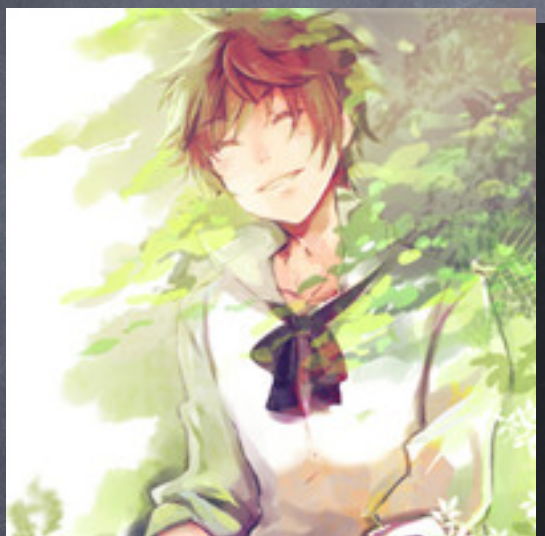
“ 如果艺术解释了我们
的梦想，那计算机就是以
程序的名义执行着它们。

ALAN JAY PERLIS

”



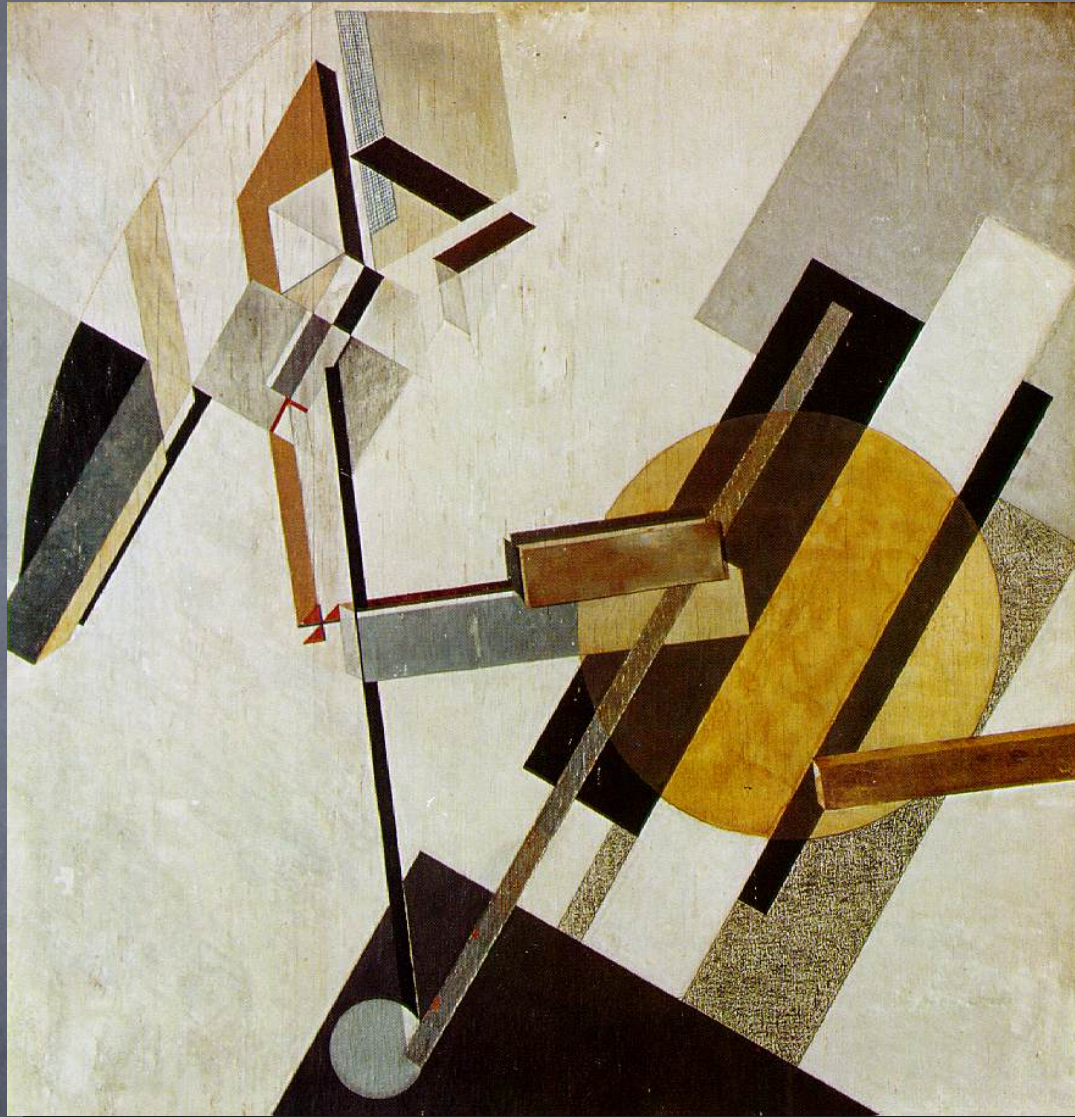
- 优秀的算法
- 高质量的编译器



- 语言形式之抽象
- 计算过程之抽象
- 数据封装之抽象

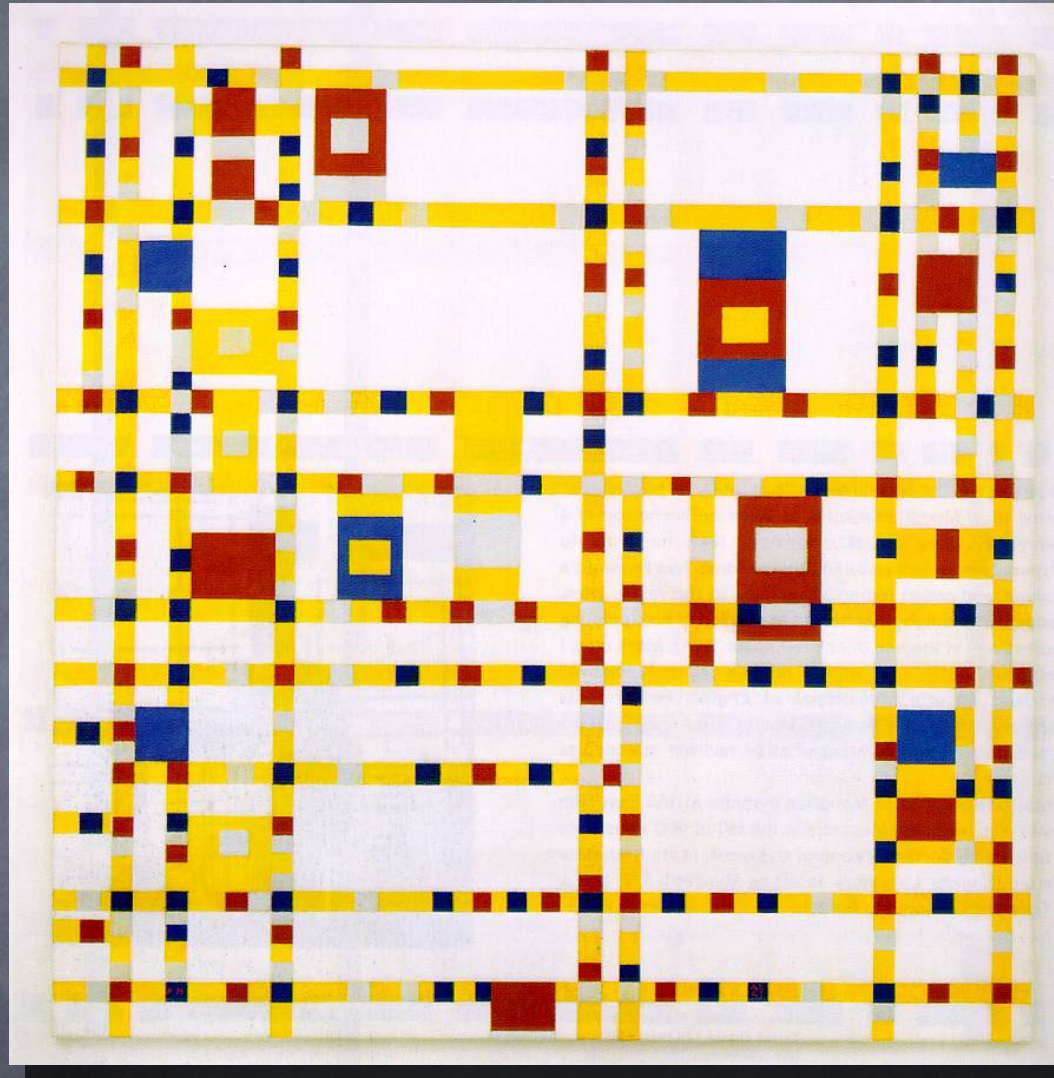
抽

豕



PROUN 19D (1922)

Эль Лисицкий



BROADWAY BOOGIE-WOOGIE (1942)

PIET MONDRIAN



THE GLEANER (1857)

JEAN FRANCOIS MILLET

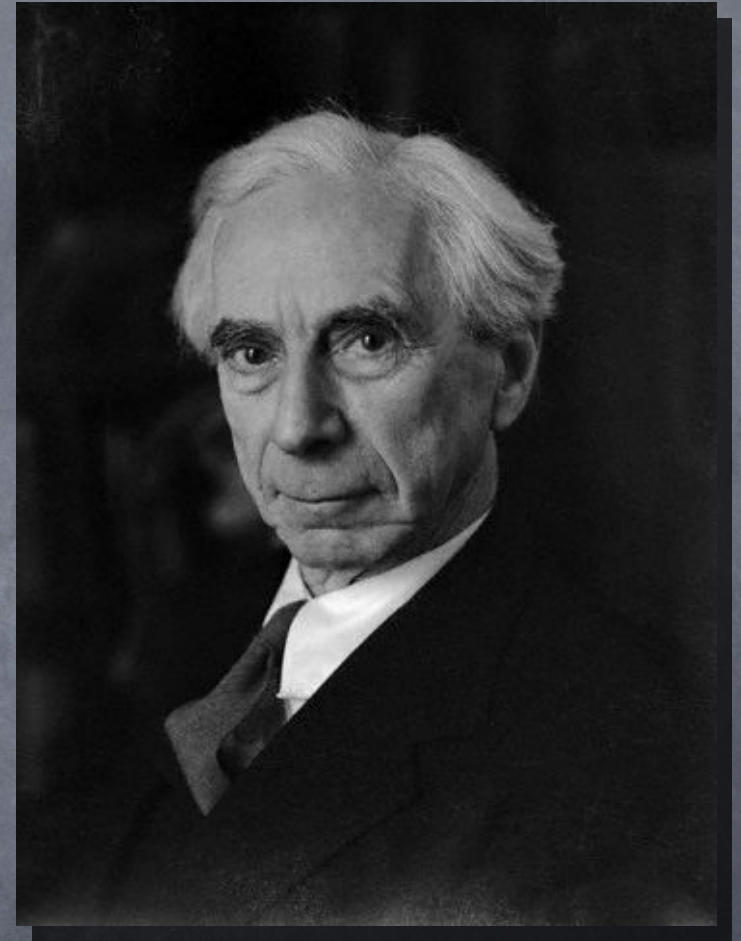
语言形式之抽象

- 抽离具象的抽象形式化
- S- 表达式与结构化表达式
- 线性顺序思想的形式

$$p \rightarrow q$$

$$\psi_1, \psi_1 \rightarrow \psi_2 \rightarrow \dots \rightarrow \psi_n \models \psi_n$$

$$f(x, y) \wedge f(y, z) \rightarrow f(x, z)$$



BERTRAND RUSSELL

- 你难道不喜欢看电影么？
- 不，我喜欢。

- DON'T YOU LOVE WATCHING MOVIE?
- YES, I DO.

$$n!$$

$$\begin{array}{|c|} \hline \\ \hline \end{array}$$

$$+$$

$$A_m^n$$

$$p\longrightarrow q$$

$$\lim A_n$$

$$\lambda x. x^2$$

$$C_n^k$$

$$n\rightarrow\infty$$

$$\neg q$$

$$\sqrt{}$$

$$f:X\mapsto Y$$

$$\begin{bmatrix} 2 & 3 \\ 1 & 4 \end{bmatrix}$$

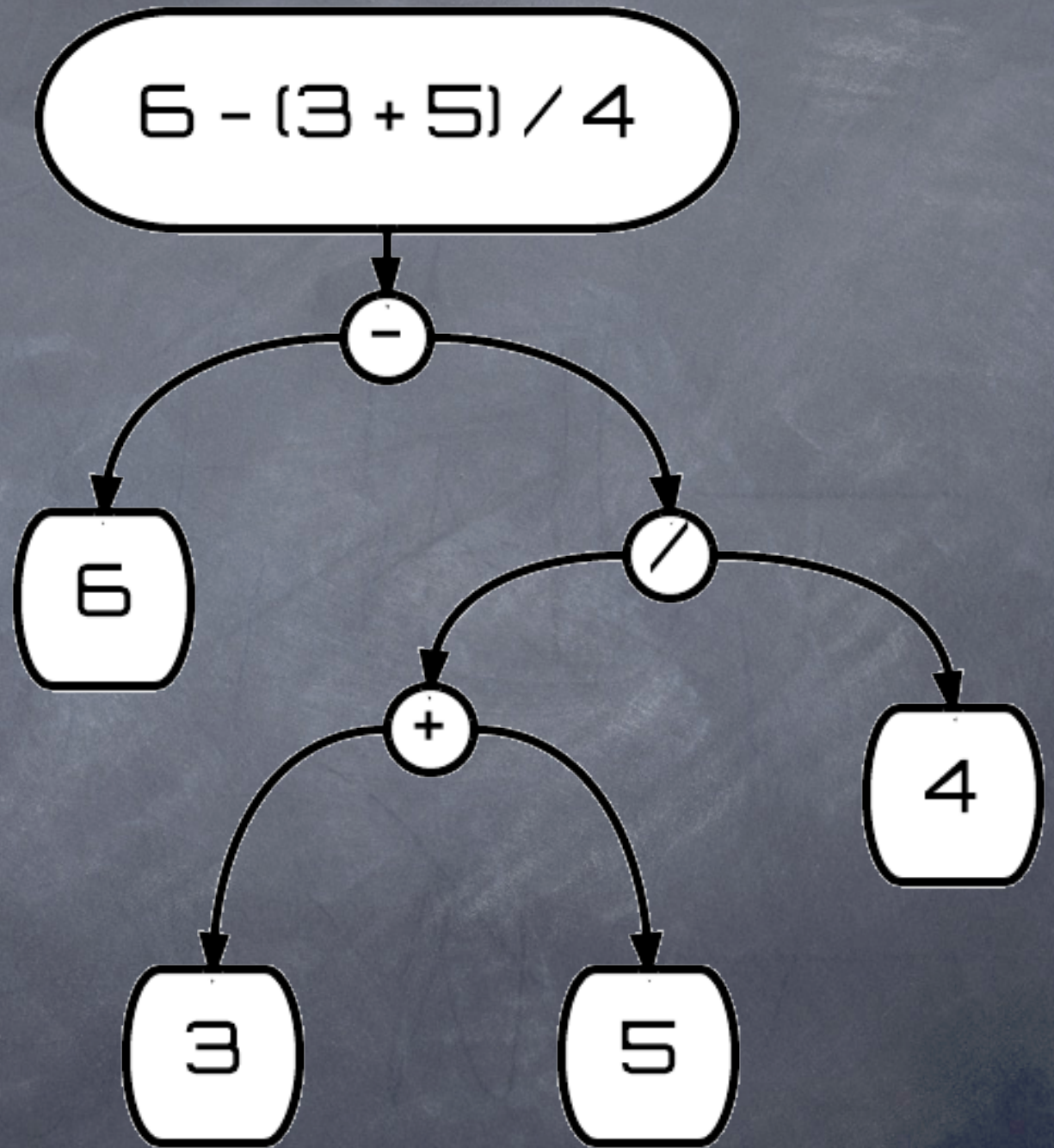
S- 表达式 VS 结构化

```
((if (> x y)
      +
      -) x y)
```

```
if (x > y)
    return x + y;
else
    return x - y;
```


$$6 - (3 + 5) / 4$$

$$(- 6$$
$$(/ (+ 3 5)$$
$$4))$$




```
program mine(output);
```

```
var i : integer;
```

```
procedure print(var j: integer);
```

```
    function next(k: integer): integer;
```

```
    begin
```

```
        next := k + 1
```

```
    end;
```

```
begin
```

```
    writeln('The total is: ', j);
```

```
    j := next(j)
```

```
end;
```

```
begin
```

```
    i := 1;
```

```
    while i <= 10 do print(i)
```

```
end.
```



```
(define (fib n)
  (fib-iter 1 0 0 1 n))
```

```
(define (fib-iter a b p q n)
  (cond ((= n 0)
        b)
        ((even? n)
         (fib-iter a
                   b
                   (+ (square p) (square q))
                   (+ (* 2 p q) (square q))
                   (/ n 2)))
        (else
         (fib-iter (+ (* b q) (* a q) (* a p))
                   (+ (* b p) (* a q))
                   p
                   q
                   (- n 1))))))
```


“

因不超过果之所需。

WILLIAM OF OCCAM ”



方法链

```
Array.new(20).map{rand(10)}  
  .uniq.sort  
  .select{|e| e%2 ==0}  
  .reverse.inspect
```


管道

```
mka 20 -r 10  
  | uniq | sort | reverse  
  | select '$1 %2 == 0'  
  | print
```


命令式

```
print(  
    reverse(  
        select(  
            sort(  
                uniq(newa(20), bd_fun)  
            ), sel_fun)  
        )  
    );
```




计算过程之抽象

- 计算模型
 - 图灵 - 冯·诺依曼模型
 - Lambda 演算
- 求值策略
- 高阶过程

$$1+2+3+\cdots+100$$

$$\frac{1}{1} - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \cdots = \frac{\pi}{4}$$

$$\sum_{i=a}^b f(i) = f(a) + \cdots + f(b)$$

$$\bigodot_{i=a}^b f_i = f_a \odot f_{a+1} \odot \cdots \odot f_b$$


```
class Fruit
  def have_it
    wash
    peel_off
    spec_deal
    eat_it
  end

  def wash; end
  def peel_off; end
  def spec_deal; end
  def eat; end
end
```

```
class Apple < Fruit

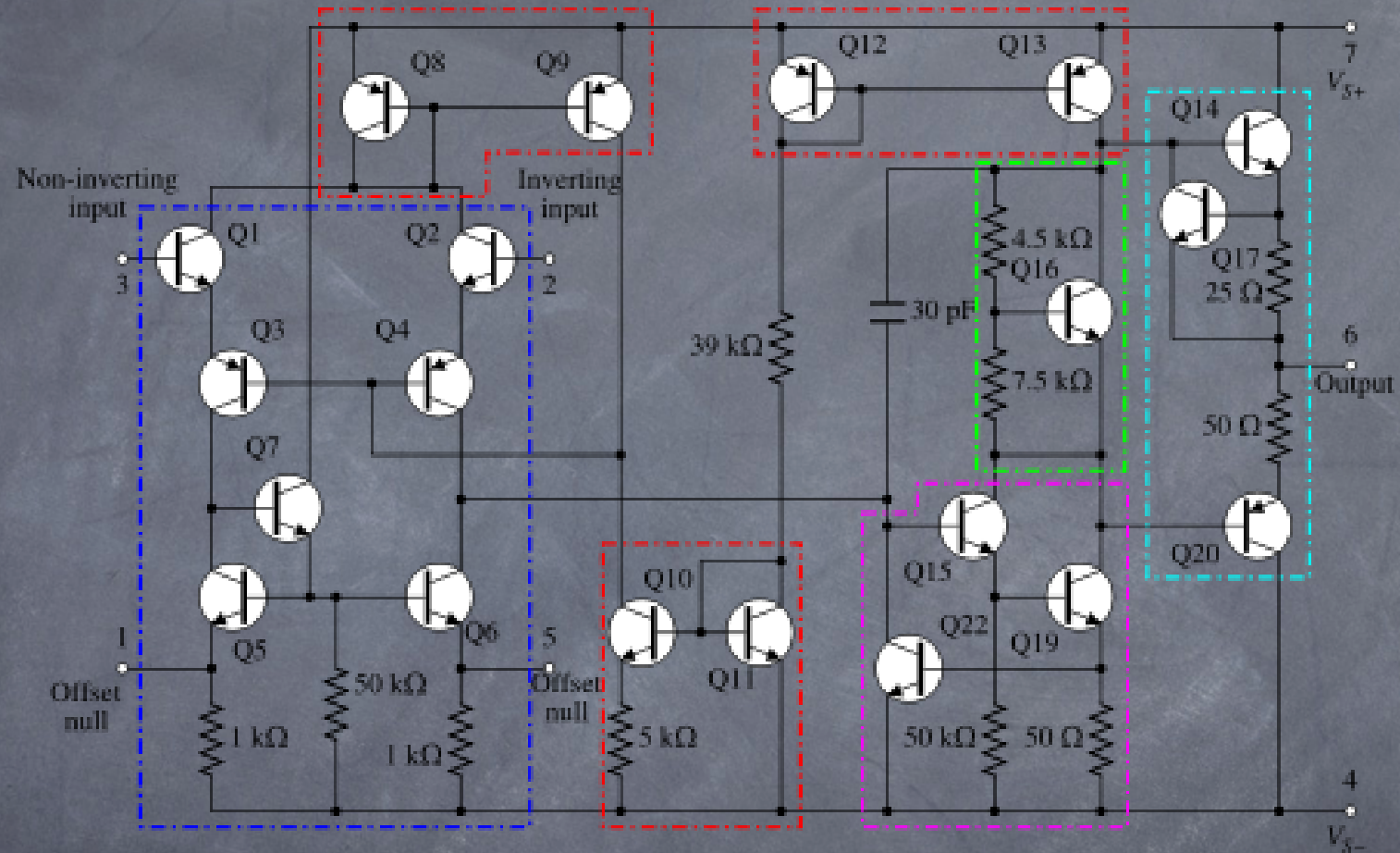
  def wash
    wash_with("Water")
  end
  def peel_off
    peel_off_with("knift")
  end
  def eat
    eat_it("directly")
  end
end

end
```

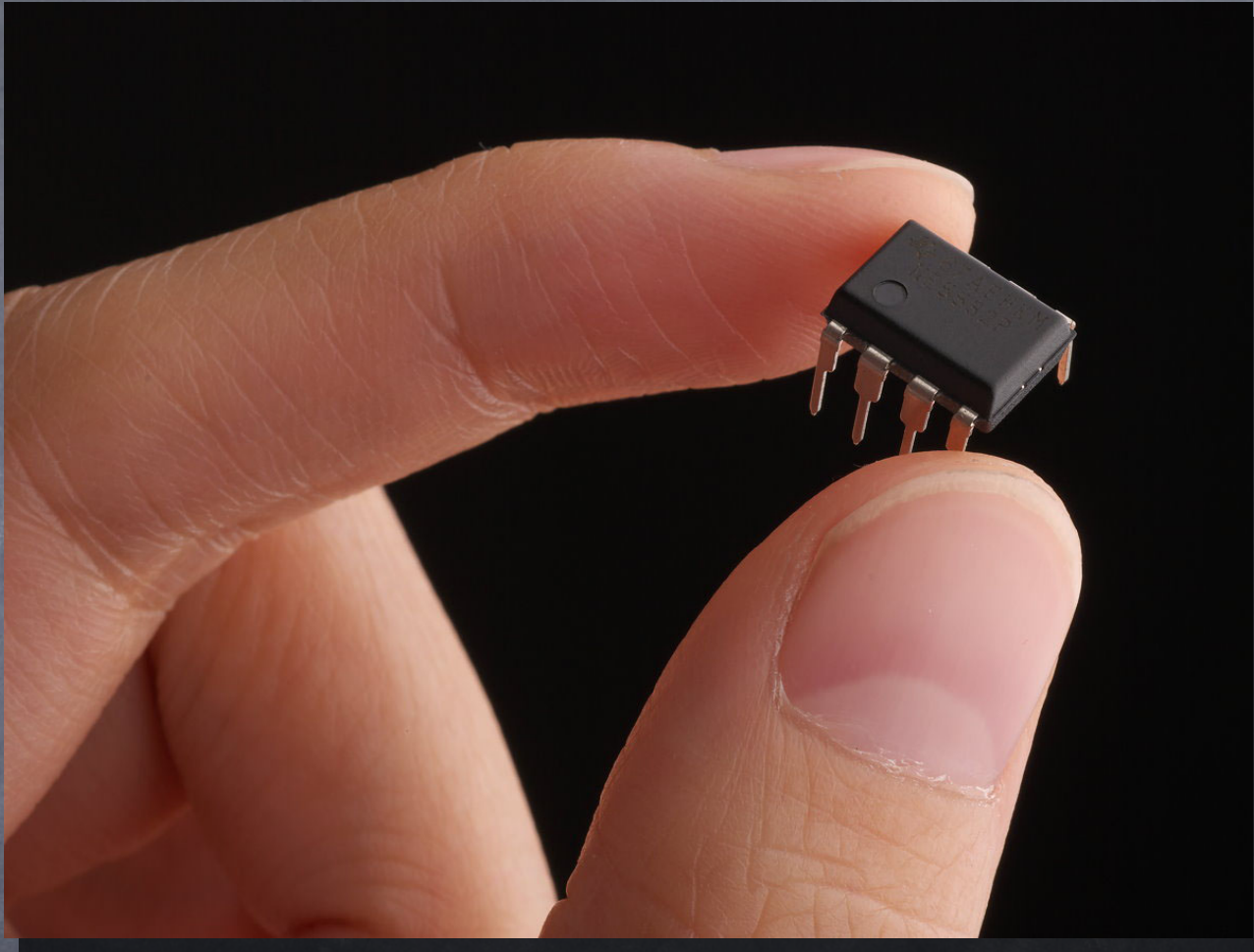



封装之抽象

- 黑盒抽象
 - 约定接口
 - 模组化设计
- 信息隐藏
 - 迭代器



THE INTERNAL STRUCTURE OF A AMPLIFIER



ABSTRACTION & PACKAGE
AS A UNIT

“ 当我看到一只鸟，它走路
像鸭子，游泳像鸭子，叫声像
鸭子，我就称其为鸭子。

JAMES WHITCOMB RILEY ”

