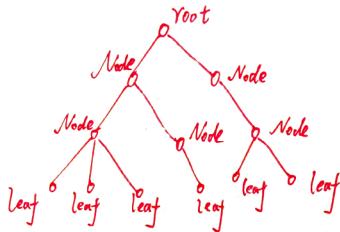
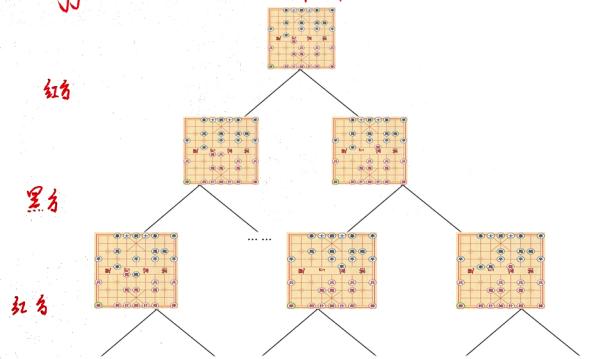
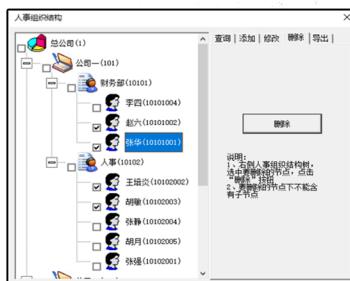


## ▷ 数据结构：树 (Tree)

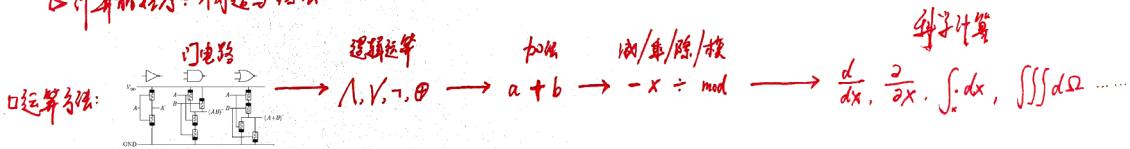


## ▷ (对弈) Chinese Chess Strategy : Decision Tree (决策树)

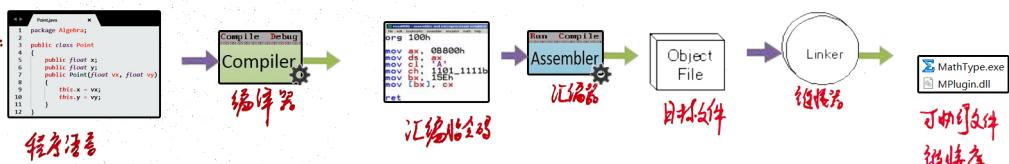


## ▷ (公司人事结构树)

## ▷ 计算机结构：构造与语法



## ▷ 编译的运行



## ▷ 编译器的核心组成部分：语义树

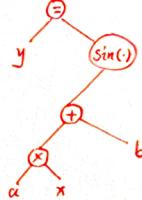


▷ 一杯咖啡刚刚放在我左手的茶角上。

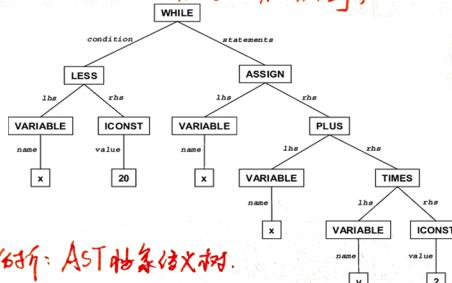
## 句子 (Sentence)



10 (数学表达式)  $y = \sin(ax + b)$



10 (编程语言的 AST: 抽象语法树) while  $x < 20 : x = x + 2y;$



程序语言的表达与分析: AST抽象语法树.

程序语言的构造: 操作符 + 对象 (谓词 + 变元)

Predicate + Variable

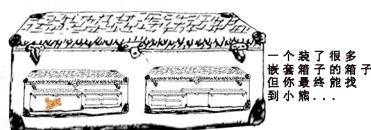
10 (计算圆的面积) 全  $\pi = 3.1415926$ , 半径  $r = \sqrt{2}$ , 计算面积  $S$ ;

10 (条件表达) 计算  $|x| = \begin{cases} x & \text{if } x > 0 \\ 0 & \text{if } x = 0 \\ -x & \text{if } x < 0 \end{cases}$

$$\begin{array}{ll} \text{cond} & c_1 \quad c_2 \\ & c_2 \quad e_2 \\ & \vdots \quad \vdots \\ & c_n \quad e_n \end{array} = (\text{abs } x) \left( \begin{array}{l} ((> x 0) x) \\ ((= x 0) 0) \\ ((< x 0) (-x)) \end{array} \right)$$

$$\left\{ \begin{array}{l} ① = \pi \quad 3.1415926 \\ ② = r \quad \sqrt{2} \\ ③ = S \quad (\star \pi (\star r r)) \\ ④ \text{print } S \end{array} \right.$$

谓词 + 变元



一个装了很多  
数学符号的箱子。



递归即“初始条件 + 递推方法”

10 (Story) 递归往往: 是近邻同学反映.....

同学: 他现正在是近邻同学反映.....

$f_0$

$t(f_0)$

$f(t(f_0))$

递归往往: 是近邻同学反映他现正在是近邻同学反映.....

同学: 他现正在是近邻同学反映他现正在是近邻同学反映.....

$t(f(t(f_0)))$

递归往往: 是近邻同学反映他现正在是近邻同学反映他现正在是近邻同学反映.....

同学: 他现正在是近邻同学反映他现正在是近邻同学反映.....

$t(t(f(t(f_0))))$

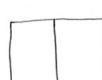
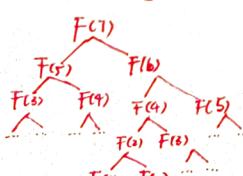
递归往往: 是近邻同学反映他现正在是近邻同学反映他现正在是近邻同学反映.....

全  $f(x)$ : 是近邻同学反映  $X$ ;

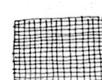
则  $t = f(\cdot')$  = 是近邻同学反映;

令  $t(x)$ : 他现正在说  $X$ ;

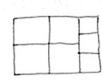
10 (Fibonacci Array)  $F(n) = \begin{cases} 1 & n=0 \\ 1 & n=1 \\ F(n-1) + F(n-2) & n>1 \end{cases}$   $F(0) \quad F(1) \quad F(2) \quad F(3) \quad F(4) \quad F(5) \quad F(6) \quad F(7) \quad \dots \dots$



BOXES ARE  
NOT SQUARE



BOXES ARE TOO  
SMALL



ALL BOXES MUST  
BE SAME SIZE



25m

25m

25m

10 (划分正方形问题) 对  $W \times H$  的区域划分为正方形, 到桌面积尽可能小;

10 描述用递归的方法划分  $640m \times 1680m$  的区域为正方形子区域的过程;

25m