Programming Languages

Outline

- Questions re/ Programming Languages
- History of Programming Languages
- Traits of a Good Programming Language
- Programming and Operating Environment
- Four Language Paradigms

Language Family Questions

- Often work at job with 1-2 languages.
- Why is C like FORTRAN like Pascal not like LISP not like Java? What are the characteristics that they share? Differ?
- If we can describe the characteristics that make a family of languages similar, then we can come up with a modeling language to represent the characteristics.

History

- ***1950s:***
  - FORmula TRANslator
    - FORTRAN
  - International Algorithmic Language
    - IAL, became Algol
  - Common Business Oriented Language
    - COBOL
  - LISt Processing Language
    - Lisp

History

- ***1970s:***
  - ***Ada***
  - ***C***
  - ***Pascal***
  - ***Prolog***
  - ***Smalltalk***

History

- ***1980s:***
  - ***C++***
- ***1990s:***
  - ***HTML***
  - ***Java***

Programming Language Families

Common Form for Discussion

- Type
- Traits
- General Form
- Example Program
- Languages in Family

Programming Language Families
Type: Procedural or Imperative

- Traits
  - Command-driven or statement-oriented
  - Basic concept is machine state
  - Often, imperative languages are first view of programming
- General Form

```
statement1;
statement2
```

- Example Program

```
sum = 0;  count = 0;
for i = 1,n
        {sum = sum + array[i];
        count = count + 1}
average = sum/count;
```

- Example Languages
  - FORTRAN
  - C
  - Pascal

Programming Language Families
Type: Functional or Applicative

- Traits
  - look at desired result rather than available data
  - Program development proceeds by developing functions from previously developed functions
- General Form

$funcn_n(..funcn_2(funcn_1(data))..)$

- Example Program

```
divide(sum(data),count(data))
```

- Example Languages
  - LiSP

Programming Language Families
Type: Logic or Rule-Based

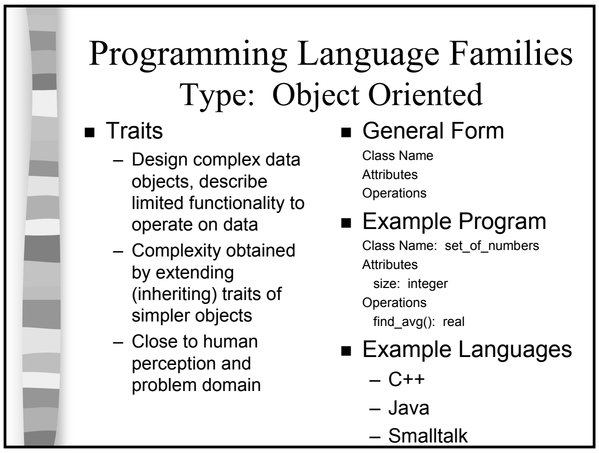
- Traits
  - Check for presence of enabling cond., when satisfied execute appropriate action
  - Execution is not necessarily sequential, but is based upon enabling conditions
- General Form

enabling condition$_1 \Rightarrow$ action$_1$
enabling condition$_2 \Rightarrow$ action $_2$
…
enabling condition$_n \Rightarrow$ action $_n$

- Example Program

```
sum_avail and count_avail ⇒
        avg = sum/count;
data_avail ⇒
        sum(data), sum_avail = T,
        count(data), count_avail = T;
```

- Example Languages
  - Prolog



Programming Language Families
Type: Object Oriented

- Traits
  - Design complex data objects, describe limited functionality to operate on data
  - Complexity obtained by extending (inheriting) traits of simpler objects
  - Close to human perception and problem domain
- General Form

```
Class Name
Attributes
Operations
```

- Example Program

```
Class Name:  set_of_numbers
Attributes
  size:  integer
Operations
  find_avg():  real
```

- Example Languages
  - C++
  - Java
  - Smalltalk