Scripting Languages

Programming Language Theory

Topics

- Midterm Exam Review
- PL Paradigm Overview
- **Scripting Language**

What is Scripting Language?

- Actual use of a computer often requires to combine multiple programs.

  - e.g.) Print a certain type of error messages from all the log files in a directory.

    - A: List up all the log files in a directory.
    - B: Read each log file from the list.
    - C: Find error messages of the type.
    - D: Print the found messages in a specific format.

Glue Language

- Scripting languages are often called ***Glue Languages***.
- Glue multiple programs together to achieve a goal.
- Two Ancestors: Shells/Terminals(sh, bash) + Text Processing (sed, awk).
- General purpose scripting languages.
  - Perl, Python, Ruby, PowerShell, AppleScript, etc.
- For Web.
  - PHP, JSP, Ruby on Rails, JavaScript, etc.

Common Characteristics

- Usually provide both ***batch and interactive*** mode.
- More easy to write - simple expressions.
  - Hello World

```java
public class HelloWorld {
    Run | Debug
    public static void main(String[] args) {
        System.out.println("Hello World!");
    }
}
```

```python
print("Hello World!")
```

Common Characteristics

- Simple Scoping Rules with Optional Declarations.
- Often consider all names as global or local.
- Declarations are not mandatory.
- In Python,

```
a = 10 + 3
b = a + 2
print(a, b)
```

Common Characteristics

- Flexible and Dynamic Typing.
- Mostly employ dynamic type checking.
- One variable is used as different types in different contexts.
- In JavaScript,

```
a = 3
str = "string"
c = str + 3
```

Common Characteristics

- Good for Pattern Matching and String Manipulation.
- High-level Data Structures.
- Tuples, List, Dictionaries.
- In Python, they are supported by basic language features.
- In C++ or Java, they are supported by standard libraries (i.e., extension or pre-implemented libraries).

Problem Domains

- Shell Scripts
  - Manipulating files and directories.
  - Interactively glue unix commands.
- Text Processing and Report Generation.
  - Support of pattern matching and string manipulation.
  - Perl: **P**ractical **E**xtraction and **R**eport **L**anguage
    - Used in Bio Informatics - Gene Sequence Analysis.

Problem Domains

- Mathematics and Statistics
    - Easy to write, easy manipulation of data.
    - R and Python are popularly used in this area.
- General Purpose Glue Language
    - You can connect or redirect one programs output to another programs input.

Problem Domains

- Extension Language
    - Scripting languages are often used to add more useful features (such as new commands) to existing programs.
        - Heavily used Lua in Game Industry.
            - Quest, Skill, Item, Monster Specifications.
            - Add-on development.
- Web Applications
    - Used both in server and client side.

Python Scope Rules

- Python has distinctive, interesting scope rules.
- A variable is assumed to be local, unless it is explicitly imported.
- A variable that is only read, but not written in a block can be found in the closest enclosing scope contains the write.

```
i = 1; j = 3 #these are global
def outer():
    def middle(k):
        def inner():
            global i
            i = 4
        inner()
        return i, j, k
    i = 2
    return middle(j)

print(outer()) #(i, j, k)
print(i, j) #1, 3 -> 4, 3
```

```
(2, 3, 3)
4 3
```

Python Scope Rules

- `outer()` doesn't read `i`, but write a new value to `i`.
- It reads `j` and passes it to `middle()`.
- `middle()` reads both `i` and `j`.
- `inner()` writes global `i`.

```
i = 1; j = 3 #these are global
def outer():
    def middle(k):
        def inner():
            global i
            i = 4
        inner()
        return i, j, k
    i = 2
    return middle(j)
```

```
print(outer()) #(i, j, k)  (2, 3, 3)
print(i, j) #1, 3 -> 4, 3  4 3
```

Summary

- Scripting Language Characteristics
- Problem Domains
- Python Scope Rules