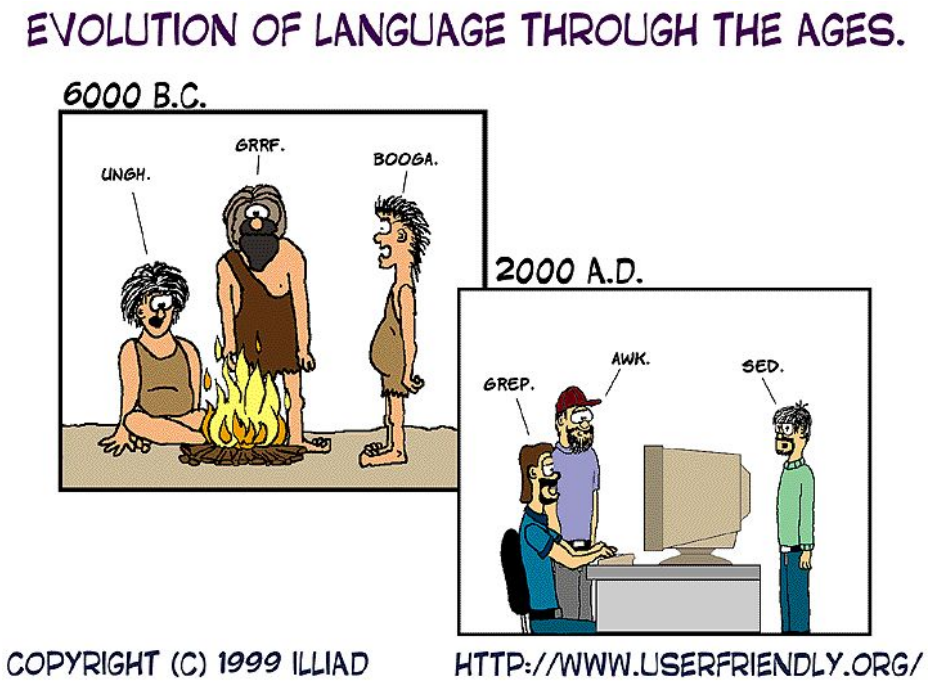
Sed and awk

Kameswari Chebrolu



Sed/Awk

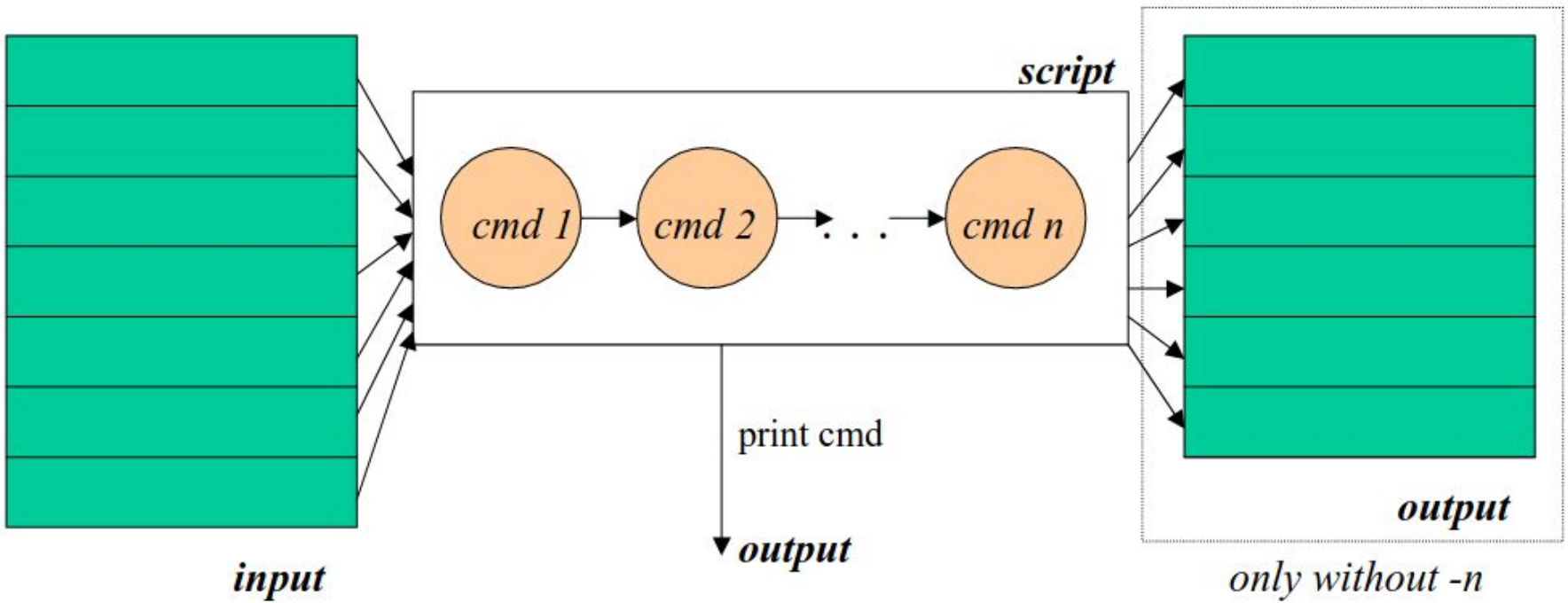
- Powerful text processing utilities
- sed: a non-interactive text editor
- awk: a field-based pattern processing language with a C-style syntax
- Both use
  - regular expressions
  - read input from stdin/files, and output to stdout

Sed (stream editor)

sed: Stream-oriented, Non-Interactive, Text Editor

- Stream: Look one line at a time
- Non-interactive: editing commands come in as script
- Text editor: change lines of a file
  - Sed is more a filter
  - Original input file is unchanged
  - Results sent to standard output (can be redirected to a file)

Sed Control Flow



- A script is a file made of commands
- Commands also specify
  - regular expression to match a pattern (and/or)
  - an address range (line nos in a file)

- Commands are applied in order to each input line
  - sed reads the first command and checks address/pattern against the current input line
    - match, command is executed
    - no match, command is ignored
  - sed then repeats this action for every command in the script file
    - Note: If a command changes the input, subsequent command will be applied to the modified line
  - Reached end of the script? output the (modified?) line unless “-n” option is set

Delete Command

- Syntax: sed ‘ADDRESSd’ filename or sed ‘/PATTERN/d’ filename
- Examples:
  - ‘6d’ (deletes line 6)
  - '1, 5d’ (deletes lines 1 to 5)

Substitute Command

- Syntax: sed ‘address(es) s/pattern/replacement/[flags]’ filename
  - n: a number from 1 to 512 indicating address
  - g: global, replace all occurrences of pattern in pattern space
  - p: print contents
  - E.g.
    - sed 's/wolf/fox/' bigfile
    - sed '3 s/wolf/fox/' bigfile
    - echo "Welcome To The Course CS104" | sed 's/\(\b[A-Z]\)/\(\1\)/g'

Print Command

- Syntax: sed 'ADDRESSp’ filename or sed '/PATTERN/p' filename
- Used to print the matched pattern
  - Often used with the -n option
- Syntax: [address/pattern]p
  - sed '1p' bigfile
  - sed -n '1p' bigfile

Append/Insert/Replace

- Append: [address/pattern]a file
  - Append places text after the current line in pattern space
  - sed '2a tomato' fruits
- Insert
  - Insert places text before the current line in pattern space
  - sed '2i tomato' fruits
- Replace
  - Replaces
  - sed '2c aam ' fruits

quit

- Quit causes sed to stop reading new input lines
  - Once a line matches the pattern/address, the script terminated
  - Can help save time when you want to process just some portion at beginning of file
  - sed '5q' fruits (print first 5 lines and quit)

Multiple Commands

- Separate instructions with a semicolon
  - sed 's/mango/aam/; s/banana/kela/;' fruits
- Precede each instruction by -e
  - sed -e 's/mango/aam/' -e 's/banana/kela/' fruits
- Order is important ! see earlier figure for work flow
  - echo "please fix the light bulb!" | sed 's/light/tube/g; s/bulb/light/g'
  - echo "please fix the light bulb!" | sed 's/bulb/light/g; s/light/tube/g'

Script

- Not practical to enter many commands on the command line
- Create a script file that contains instruction and use -f option
  - sed -f script-file file

Drawbacks

- Not possible to go backward in the file
- No way to do forward references
- No facilities to manipulate numbers
- Cumbersome syntax

References

- https://www.gnu.org/software/sed/manual/sed.html
- https://linuxhint.com/50_sed_command_examples/

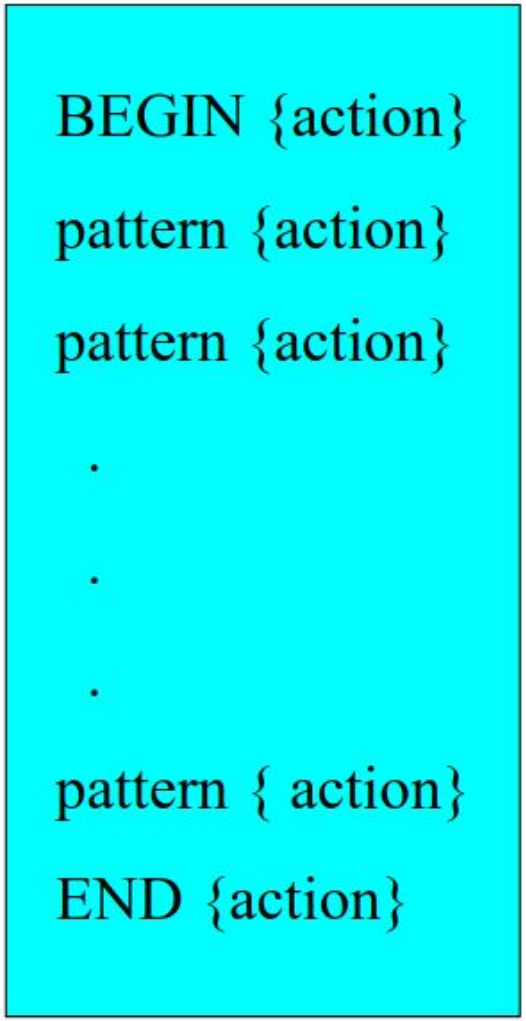
awk

- awk named after inventors: Alfred V. Aho, Peter J. Weinberger, and Brian W. Kernighan.
- Like sed, stream-oriented and interprets a script of editing commands
- Unlike sed
  - Supports a programming language modeled on C Language
    - expressions, conditional statements, loops etc
  - awk processes fields while sed only processes lines
- nawk (new awk) is the new standard for awk
  - Designed to facilitate large awk programs
  - gawk is a free nawk clone from GNU

Structure

An awk program consists of:

- An optional BEGIN segment
  - To execute prior to reading input
- Pattern - action pairs
  - Processing input data
  - Action enforced in { }
- An optional END segment
  - To execute after end of input data



Simple Example

```
ls | awk '
BEGIN { print "List of jpg files:" }
/\.jpg$/ { print }
END { print "All done!" }
'
```

Records

Awk views each input line as a record
Default record separator is newline

Each word on that line is delimited by spaces or tabs or comma etc, as a field
$0 represents the entire input line
$1, $2, ... refer to the individual fields on the input line
Awk splits the input record before the script is applied

Built in Variables

NR: number of current records
RS: record separator
FS: field seperator
OFS: output field separator
ORS: output record separator

Variables

- Variables need no declaration
  - variables take on numeric or string value based on context
  - By default, variables are initialized to the null string which has numerical value 0

Arithmetic

- Much better support than bash
- Examples
  - x = x + 1
  - y = y + $2 * $3
- Lot of built-in functions: sin, cos, atan, exp, int, log, rand, sqrt etc

Conditionals

- If
- If else
- If else if
- Use a script?
  - awk -f example.awk file

```
if (condition) {
   action-1
   action-2
   .
   .
}

if (condition) {
   action-1
   action-2
   .
   .
else
   action-a
   Action-b
   .
   .
}
```

Relation Operators

- x < y True if x is less than y
- x <= y True if x is less than or equal to y
- x > y True if x is greater than y
- x >= y True if x is greater than or equal to y
- x == y True if x is equal to y
- x != y True if x is not equal to y
- x ~ y True if the string x matches the regexp denoted by y
- x !~ y True if the string x does not match the regexp denoted by y

Other Operators

- = assignment operator
- == equality operator, returns TRUE if both sides are equal
- != inverse equality operator
- && logical AND
- || logical OR
- ! logical NOT

Loops

- Loops: for, while, do--while
- Break, continue and exit also possible

```
for (initialization; condition; increment/decrement)
   Action


while (condition)
   action


do
   action
while (condition)
```

Arrays

- Supports associative arrays i.e. the index need not be continuous or even numbers
  - Array index can be strings or numbers
    - E,g, arr[2]=6 or grade[ram]=AA
  - No need to declare the size of an array in advance
  - Supports one dimensional arrays

Built in functions

- Arithmetic
  - sin, cos, atan, exp, int, log, rand, sqrt
- String
  - length, substr
- Output
  - print, printf
- Special
  - system - executes a Unix command
  - system(“clear”) to clear the screen

sed+awk

- Can combine through pipe command

References

https://www.tutorialspoint.com/awk/index.htm