Objectives

- Comparators
- Jar Files
- Standard Error
- Unix Commands

COMPARATOR

Alternative Sorting

- What if object is `Comparable` but does not sort the way you want?
  - Special case
    - Don't want to change class
    - Don't have access to class
  - e.g., sort strings so capital, lowercase letters are the same
- Use `Comparator` interface

Comparator<T> Interface

- Declares two methods:
  - `int compare(T o1, T o2)`
    - Compare two objects and return a value as if we called `o1.compareTo(o2)`
  - `boolean equals(Object other)`
    - Check if this `Comparator` equals other
- Overloaded versions of `sort` in `Arrays` and `Collections`
  - Arrays: `void sort(Object[] array, Comparator c)`
  - Collections: `void sort(Collection col, Comparator c)`
    `ChickenComparator.java`

JAR FILES

Jar (**J**ava **Ar**chive) Files

- Archives of Java files
- Package code into a neat bundle
  - Easier, faster to download
  - Easier for others to use
- `jar` command used to create, view, and extract Jar files
  - Works similarly to `tar`
  - `jar cf myapplication.jar *.class`

Jar/Tar Commands

- Common options:

Option/Operations	Meaning
f	The name of the archive **f**ile
c	**C**reate an archive file
x	E**x**tract the archive file
v	**V**erbose
z	**Z**ip (compress)

- Common use:
  - ➢ `jar cfz archive.tar.gz arch_directory`
  - ➢ `jar xfz archive.tar.gz`

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Jar file: Metadata

- Jar file includes a special metadata file with the path `META-INF/MANIFEST.MF`
  - ➢ Say how Jar file is used
  - ➢ `jar` creates a default metadata file, if not specified

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Jar file: Metadata

- Example metadata file that allows you to execute the JAR with java

```
Manifest-Version: 1.0
Main-Class: MyApplication
```
Note the newline

Specifying the metadata file

- To create the jar file:
  `jar cmf myManifest myapplication.jar *.class`
- Run it, using java
  `java -jar myapplication.jar`

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Creating Jar Files in Eclipse

- Export Java Jar
  - ➢ Options to create a MANIFEST.MF file
  - ➢ Options to include source files or only class files
- Can submit assignments this way
  - ➢ Must include source files

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Using Jars

- Add jar files to `CLASSPATH` to use classes in jar file
- Example: adding a jar file to the current classpath variable (`$CLASSPATH`)

```
CLASSPATH=$CLASSPATH:myapplication.jar

echo $CLASSPATH
```
Current value of CLASSPATH

In Eclipse, you need to "Configure Build Path"

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Importing Jar Files into Eclipse

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STANDARD ERROR

Standard Streams

Text terminal

Keyboard   #0 stdin

#1 stdout   Program

Display   #2 stderr

- Preconnected streams
  - Standard Out: stdout
  - Standard In: stdin
  - *Standard Error: stderr*
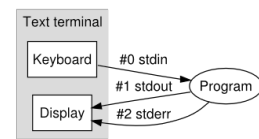   - For error messages and diagnostics
    - In Java: `System.err`
- Benefits of two output streams
  - Redirect to different places
    - Example: separate log files for info and for errors
    - Look at some web logs

Redirecting Output

- Recall earlier this semester
  - `> java OlympicScore > score.out`
  - Redirected `stdout` to `score.out`
  - `stderr` would still go to terminal
- To redirect `stderr` to file as well
  - `> java OlympicScore >& score.out`

UNIX COMMANDS

Regular Expressions

- `*` : wildcard (matches anything)
  - Sometimes . represents any character
- One of possible characters
  - [aeiou]
- One of range of characters
  - [A-D]
  - [0-4]

Regular Expressions

- Practice
  - List the files that begin with D
  - List that files that end in .java
  - List the files that begin with D or d
  - List the files that begin with A, B, C, or D and end in .java
- Can be used in commands, like `rm` (be careful!), `mv`, `cp`, …
  - I test the `rm` command with `ls` first

Short Cuts: {}

- Examples:
  - ➢ `mv file{,.bak}`
    - Expands to `mv file file.bak`
  - ➢ `tar cfz myDir{.tar.gz,}`
    - Expands to `tar cfz myDir.tar.gz myDir`
- You can have text on either side of comma
  - ➢ Even though my examples don't

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Finding Files: `find`

- Typical format: `find . -name "*.java"`
  - ➢ Means find all the files in the current directory and its subdirectories that end in .java
- Can you generalize the syntax of the command?
- Lots of options to `find`
  - ➢ `-type`: used to find just files or directories
  - ➢ `-depth`: how far to go
  - ➢ `-size`: size of the file
- Use `man find` to learn more

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Find Files that Contain Something: `grep`

- Shows all the lines in the file(s) that contain some expression
- Example: `grep System.out *.java`
  - ➢ What is the syntax for the command?
- Options:
- `–v` if you want all the lines without the expression
  - ➢ `grep –v System.out *.java`
- `-w` if you want whole words

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Find Files that Contain Something: `grep`

- Can use regular expressions and special symbols
  - ➢ `^`: begins with
  - ➢ `$`: ends with
  - ➢ `.`: wildcard
- Examples:
  - ➢ `grep c...h /usr/share/dict/words`
  - ➢ `grep -w c...h /usr/share/dict/words`

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`diff`: Show differences between files

- Show lines of files that have differences
  - ➢ Show the line numbers
- Example use
  - ➢ `diff file1 file2`

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Piping Commands Together

- How could we determine the number of Java files we have in a directory?

- How could we determine the number of `System.out.println`'s in a Java file?

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head & tail

- Show the beginning or ending of the file
  - ➢ `head filename`
  - ➢ `tail filename`
- ●`-n` for how many lines to show, where n is a number
  - ➢ `tail -100 filename`
- ●`-f` to watch a file
  - ➢ `tail -f filename`

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Summary of New Commands

Command	Example Use	Meaning
`find`	`find . -name "*.java"`	Find all the files in the current directory that end in .java
`grep`	`grep System.out *.java`	Find all the lines in all the .java files in this directory that contain System.out
`diff`	`diff file1 file1.bak`	Show the lines of the files where there are differences between the files

Use *man* to learn more about the commandsn

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Practice

- Determine the number of lines of code you wrote in CS112 or in CS209
  - ➢ Goal get as little output as possible
- Find the number of functions/methods you wrote in CS112
  - ➢ Find the number of public methods you wrote in CS209

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MIDTERM FEEDBACK

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First Midterm Feedback

- Average: 87%
  - ➢ About where I'd like it to be
- Tough questions
  - ➢ Unchecked/checked exceptions
  - ➢ Problem in the Circle implementation
  - ➢ Encapsulation
  - ➢ Static
  - ➢ Types of streams
- Precision in terminology
  - ➢ Wasn't always clear what the implication was

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First Midterm Feedback

- Polymorphism
  - ➢ Compile-time: overload
  - ➢ Run-time: override
- Bonus questions
  - ➢ Would like you to know but I wasn't sure if you'd know the answers to them

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Final Grade Distribution

- (45%) Individual programming and written homework assignments
- (25%) Two Exams
- (25%) Projects
- (5%) Participation and attendance