

Building Java Programs

Chapter 6
Lecture 6-3: Searching Files

reading: 6.3 - 6.5

Recall: Line-based methods

Method	Description
<code>nextLine()</code>	returns the next entire line of input
<code>hasNextLine()</code>	returns <code>true</code> if there are any more lines of input to read (always true for console input)

- `nextLine` consumes from the input cursor to the next `\n`.

```
Scanner input = new Scanner(new File("<filename>"));
while (input.hasNextLine()) {
    String line = input.nextLine();
    <process this line>;
}
```

Recall: Tokenizing lines

- A `String Scanner` can tokenize each line of a file.

```
Scanner input = new Scanner(new File("<filename>"));
while (input.hasNextLine()) {
    String line = input.nextLine();
    Scanner lineScan = new Scanner(line);

    <process the contents of this line>;
}
```

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Hours v2 question

- Modify the `Hours` program to search for a person by ID:

- Example:

```
Enter an ID: 456
Brad worked 36.8 hours (7.36 hours/day)
```

- Example:

```
Enter an ID: 293
ID #293 not found
```

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Hours v2 answer 1

```
// This program searches an input file of employees' hours worked
// for a particular employee and outputs that employee's hours data.

import java.io.*; // for File
import java.util.*; // for Scanner

public class HoursWorked {
    public static void main(String[] args) throws FileNotFoundException {
        Scanner console = new Scanner(System.in);
        System.out.print("Enter an ID: ");
        int searchId = console.nextInt(); // e.g. 456

        Scanner input = new Scanner(new File("hours.txt"));
        String line = findPerson(input, searchId);
        if (line.length() > 0) {
            processLine(line);
        } else {
            System.out.println("ID #" + searchId + " was not found");
        }
    }
    ...
}
```

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Hours v2 answer 2

```
// Locates and returns the line of data about a particular person.
public static String findPerson(Scanner input, int searchId) {
    while (input.hasNextLine()) {
        String line = input.nextLine();
        Scanner lineScan = new Scanner(line);
        int id = lineScan.nextInt(); // e.g. 456
        if (id == searchId) {
            return line; // we found them!
        }
    }
    return ""; // not found, so return an empty line
}

// Totals the hours worked by the person and outputs their info.
public static void processLine(String line) {
    Scanner lineScan = new Scanner(line);
    int id = lineScan.nextInt(); // e.g. 456
    String name = lineScan.next(); // e.g. "Brad"
    double hours = 0.0;
    int days = 0;
    while (lineScan.hasNextDouble()) {
        hours += lineScan.nextDouble();
        days++;
    }
    System.out.println(name + " worked " + hours + " hours ("
        + (hours / days) + " hours/day)");
}
}
```

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IMDb movies problem

- Consider the following Internet Movie Database (IMDb) data:

```
1 9.2 590,634 The Shawshank Redemption (1994)
2 9.2 457,173 The Godfather (1972)
3 9.0 279,059 The Godfather: Part II (1974)
```

- Write a program that displays any movies containing a phrase:

Search word: **part**

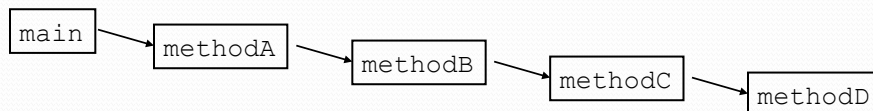
```
Rank   Votes   Rating  Title
3      279059  9.0     The Godfather: Part II (1974)
58     300640  8.4     The Departed (2006)
91     41117   8.3     The Apartment (1960)
3 matches.
```

- Is this a token or line-based problem?

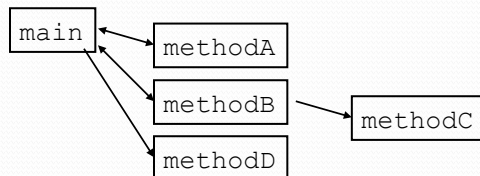
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"Chaining"

- `main` should be a concise summary of your program.
 - It is bad if each method calls the next without ever returning (we call this *chaining*):



- A better structure has `main` make most of the calls.
 - Methods must return values to `main` to be passed on later.



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Bad IMDb "chained" code 1

```
// Displays IMDb's Top 250 movies that match a search string.
import java.io.*; // for File
import java.util.*; // for Scanner

public class Movies {
    public static void main(String[] args) throws FileNotFoundException {
        getWord();
    }

    // Asks the user for their search word and returns it.
    public static void getWord() throws FileNotFoundException {
        System.out.print("Search word: ");
        Scanner console = new Scanner(System.in);
        String searchWord = console.next();
        searchWord = searchWord.toLowerCase();
        System.out.println();

        Scanner input = new Scanner(new File("imdb.txt"));
        search(input, searchWord);
    }
    ...
}
```

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Bad IMDb "chained" code 2

```
...
// Breaks apart each line, looking for lines that match the search word.
public static String search(Scanner input, String searchWord) {
    int matches = 0;
    while (input.hasNextLine()) {
        String line = input.nextLine();
        Scanner lineScan = new Scanner(line);
        int rank = lineScan.nextInt();
        double rating = lineScan.nextDouble();
        int votes = lineScan.nextInt();
        String title = lineScan.nextLine(); // all the rest

        if (title.toLowerCase().indexOf(searchWord) >= 0) {
            matches++;
            System.out.println("Rank\tVotes\tRating\tTitle");
            display(line);
        }
    }
    System.out.println(matches + " matches.");
}
```

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Bad IMDb "chained" code 3

```
...
// Displays the line in the proper format on the screen.
public static void display(String line) {
    Scanner lineScan = new Scanner(line);
    int rank = lineScan.nextInt();
    double rating = lineScan.nextDouble();
    int votes = lineScan.nextInt();
    String title = "";
    while (lineScan.hasNext()) {
        title += lineScan.next() + " "; // the rest of the line
    }
    System.out.println(rank + "\t" + votes + "\t" + rating + "\t" + title);
}
}
```

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Better IMDb answer 1

```
// Displays IMDb's Top 250 movies that match a search string.
import java.io.*; // for File
import java.util.*; // for Scanner

public class Movies {
    public static void main(String[] args) throws FileNotFoundException {
        String searchWord = getWord();
        Scanner input = new Scanner(new File("imdb.txt"));
        String line = search(input, searchWord);
        int matches = 0;

        if (line.length() > 0) {
            System.out.println("Rank\tVotes\tRating\tTitle");
            while (line.length() > 0) {
                matches++;
                display(line);
                line = search(input, searchWord);
            }
        }

        System.out.println(matches + " matches.");
    }

    // Asks the user for their search word and returns it.
    public static String getWord() {
        System.out.print("Search word: ");
        Scanner console = new Scanner(System.in);
        String searchWord = console.next();
        searchWord = searchWord.toLowerCase();
        System.out.println();
        return searchWord;
    }
}
```

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Better IMDb answer 2

```
...
// Breaks apart each line, looking for lines that match the search word.
public static String search(Scanner input, String searchWord) {
    while (input.hasNextLine()) {
        String line = input.nextLine();
        Scanner lineScan = new Scanner(line);
        int rank = lineScan.nextInt();
        double rating = lineScan.nextDouble();
        int votes = lineScan.nextInt();
        String title = lineScan.nextLine(); // all the rest
        if (title.toLowerCase().indexOf(searchWord) >= 0) {
            return line;
        }
    }
    return ""; // not found
}

// Displays the line in the proper format on the screen.
public static void display(String line) {
    Scanner lineScan = new Scanner(line);
    int rank = lineScan.nextInt();
    double rating = lineScan.nextDouble();
    int votes = lineScan.nextInt();
    String title = "";
    while (lineScan.hasNext()) {
        title += lineScan.next() + " "; // the rest of the line
    }
    System.out.println(rank + "\t" + votes + "\t" + rating + "\t" + title);
}
}
```

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Mixing tokens and lines

- Using `nextLine` in conjunction with the token-based methods on the same `Scanner` can cause bad results.

```
23 3.14
Joe "Hello world"
45.2 19
```

- You'd think you could read 23 and 3.14 with `nextInt` and `nextDouble`, then read Joe "Hello world" with `nextLine`.

```
System.out.println(input.nextInt()); // 23
System.out.println(input.nextDouble()); // 3.14
System.out.println(input.nextLine()); //
```

- But the `nextLine` call produces no output! Why?

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Mixing lines and tokens

- Don't read both tokens and lines from the same Scanner:

```
23 3.14
Joe "Hello world"
    45.2 19

input.nextInt() // 23
23\t3.14\nJoe\t"Hello world"\n\t\t45.2 19\n
  ^

input.nextDouble() // 3.14
23\t3.14\nJoe\t"Hello world"\n\t\t45.2 19\n
  ^

input.nextLine() // "" (empty!)
23\t3.14\nJoe\t"Hello world"\n\t\t45.2 19\n
  ^

input.nextLine() // "Joe\t\"Hello world\""
23\t3.14\nJoe\t"Hello world"\n\t\t45.2 19\n
  ^
```

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Line-and-token example

```
Scanner console = new Scanner(System.in);
System.out.print("Enter your age: ");
int age = console.nextInt();

System.out.print("Now enter your name: ");
String name = console.nextLine();
System.out.println(name + " is " + age + " years old.");
```

Log of execution (user input underlined):

```
Enter your age: 12
Now enter your name: Sideshow Bob
is 12 years old.
```

- Why?
 - Overall input: 12\nSideshow Bob
 - After nextInt(): 12\nSideshow Bob
 - After nextLine(): 12\nSideshow Bob

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