## CS1110 Stepwise refinement, wrapper classes 29 Sept

Purpose of lecture: Give you examples of the stepwise-refinement development of methods that process strings; while showing you the OO structure of a real program.

**Thursday's lecture**: no reading, *but be there or be square (or lost)*!
•Recursion can be a difficult topic, but we'll make it easy.

**Prelim: 8PM Thursday 8 October (next week)**
If you have a conflict and have not been contacted, email Maria Witlox. We will give a makeup. Do not ask the instructor of a course with a prelim conflict to give you a Makeup.

• Thursday: A handout will explain what is on prelim 1
• Sunday: 1-3PM. Review Session

•A3 is due Wed night on the CMS



## Best. Study tip. Ever.

Cornell's Learning Strategies Center posts a lot of great information on study skills, taking exams, time & stress management, etc.
lsc.sas.cornell.edu/Sidebars/Study_Skills_Resources/SKResources.html

Every day after classes, retrieve your notes …
--- you *do* take notes, don't you? ---
…and read them over.

This takes very little time, and yet:
1. really makes material "stick" in one's mind, and
2. helps you figure out what you don't understand early on, so you can get it straightened out faster.

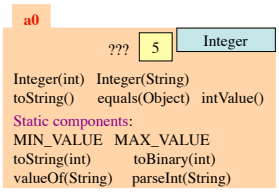
*This was a real game-changer for me.*



## Wrapper classes. Read Section 5.1 of class text

Soon, we'll wish to deal with an **int** value as an object.

"Wrapper class" Integer provides this capability.




An instance of class Integer contains, or "wraps", one **int** value.

You can't change the value. The object is *immutable*.

Instance methods: constructors, toString(), equals, intValue.

Static components provide important extra help.



## Class Vector

An instance of class Vector maintains an expandable/ shrinkable list of objects. Use it whenever you need to maintain a list of things.

Values of primitive types cannot be placed directly into the list of a Vector. That's why we have the wrapper classes. In the interactions pane, we will do a few things, like these:

```
import java.util.*;
Vector v= new Vector();
v
v.add(new Integer(2));
v.add(3);
v.add('c');
```

In newer versions of Java, v.add (1) is allowed; the 1 is wrapped in an Integer object and the name of that object is added to v. Doesn't work in older versions.



**Each primitive type has a corresponding wrapper class.** When you want to treat a primitive value of that type as an object, then just wrap the primitive value in an object of the wrapper class!

| Primitive type | Wrapper class |
|---|---|
| **int** | Integer |
| **long** | Long |
| **float** | Float |
| **double** | Double |
| **char** | Character |
| **boolean** | Boolean |

Each wrapper class has:
- Instance methods, e.g. equals, constructors, toString,
- Useful static constants and methods.

```
Integer k= new Integer(63);        int j= k.intValue();
```

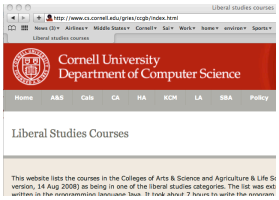
You don't have to memorize the methods of the wrapper classes. But be aware of them and look them up when necessary. Use Gries/ Gries, Section 5.1, and ProgramLive, 5-1 and 5-2, as references.



## Example of a program that deals with Strings
## Creating a web page giving liberal studies courses
## http://www.cs.cornell.edu/gries/ccgb/index.html

Java program reads the online Courses of Study webpages and extracts the courses that are liberal studies courses in A&S and CALS.

It builds tables of A&S, CALS, CA, HA, KCM, LA, and SBA courses and produces the liberal studies course website

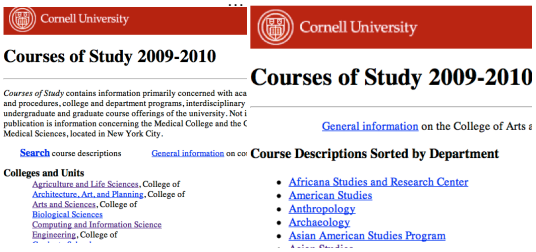



String manipulation is key concern of this lecture. But OO structure of the program will also be discussed

## Class Webpage

Fields contain:
url, as a String
url, as an object of class
set of links on the page
…

Methods:
Webpage(String url) (constructor)
isHtmlPage()
getLinks()
getReader() = an object that lets one read the webpage line by line
…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**Courses of Study 2009-2010**

*Courses of Study* contains information primarily concerned with aca
and procedures, college and department programs, interdisciplinary
undergraduate and graduate course offerings of the university. Not
publication is information concerning the Medical College and the
Medical Sciences, located in New York City.

Search course descriptions General information on co

**Colleges and Units**

Agriculture and Life Sciences, College of
Architecture, Art, and Planning, College of
Arts and Sciences, College of
Biological Sciences
Computing and Information Science
Engineering, College of


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**Courses of Study 2009-2010**

General information on the College of Arts

**Course Descriptions Sorted by Department**

- Africana Studies and Research Center
- American Studies
- Anthropology
- Archaeology
- Asian American Studies Program

## Class DeptLink


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**Courses of Study 2009-2010**

General information on the College of Arts

**Course Descriptions Sorted by Department**

- Africana Studies and Research Center
- American Studies
- Anthropology
- Archaeology
- Asian American Studies Program

Fields contain:
- dept name
- link to its webpage in CoS
- Vector of all its courses

```
<li>
<a href="CoScourses.php?college=AS&dept=American+Studies">
American Studies</a>
</li>
```

```
<li>
<a href="CoScourses.php?college=AS&dept=American+Studies">
American Studies</a>
</li>
```

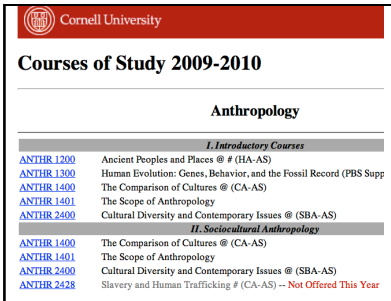
The form is: … <a href="xxx">dept name</a> …

```
/** Constructor: an instance who dept name and link are
    contained in s.  s has the form
      … <a href="xxx">dept name</a> …
    where the xxx is a relative URL in directory LibStudies.prefix
    Note: if s is not proper, dept name and link will be null.
    */
```



```
/** Constructor: an instance who dept name and link are
    contained in s.  s has the form
      [redacted]dept name</a> …
    where the xxx is a relative URL in directory LibStudies.prefix
    Note: if s is not proper, dept name and link will be null.
    */
public DeptLink(String s) {
    Remove   … <a href="   from s;
    Set k to index of "> of the a tag;
    Store the link xxx in local variable lk;
    s= s.substring(k+2);
    Set k to index of </a>;
    Store dept name and lk in dept and link.
}
```

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**Courses of Study 2009-2010**

**Anthropology**

| | |
|---|---|
| ***I. Introductory Courses*** | |
| ANTHR 1200 | Ancient Peoples and Places @ # (HA-AS) |
| ANTHR 1300 | Human Evolution: Genes, Behavior, and the Fossil Record (PBS Supp |
| ANTHR 1400 | The Comparison of Cultures @ (CA-AS) |
| ANTHR 1401 | The Scope of Anthropology |
| ANTHR 2400 | Cultural Diversity and Contemporary Issues @ (SBA-AS) |
| ***II. Sociocultural Anthropology*** | |
| ANTHR 1400 | The Comparison of Cultures @ (CA-AS) |
| ANTHR 1401 | The Scope of Anthropology |
| ANTHR 2400 | Cultural Diversity and Contemporary Issues @ (SBA-AS) |
| ANTHR 2428 | Slavery and Human Trafficking # (CA-AS) -- Not Offered This Year |

## Class Courses

Fields contain:
course
e.g. ANTHR 1200
title
everything else you see to the left
category
HA-AS, HA
CA-AS, CA
SBA-AS, SBA
etc.

```
<tr><td nowrap>
<a href="CoSdetail.php college=AS&number=1400&prefix=ANTHR&
title=The+Comparison+of+Cultures+%40+%28CA-AS%29">
ANTHR 1400</a></td><td>The Comparison of Cultures @
(CA-AS)</td></tr>
```



```
/** Constructor: instance for course given by s, in form:
    [redacted]title</td></tr>
    cat contains the category.
    If s not proper, course, title, category will be null. */
public Course (String s, String cat) {
    If s doesn't start with <tr><td nowrap><a >, return;
    Remove from s everything before the course name;
    Save course name in local variable courseName;
    Remove from s everything before the title;
    Save title in local variable t;
    Store courseName, t, cat in the fields;
}
```