Arrays

INFO/CSE 100, Spring 2006

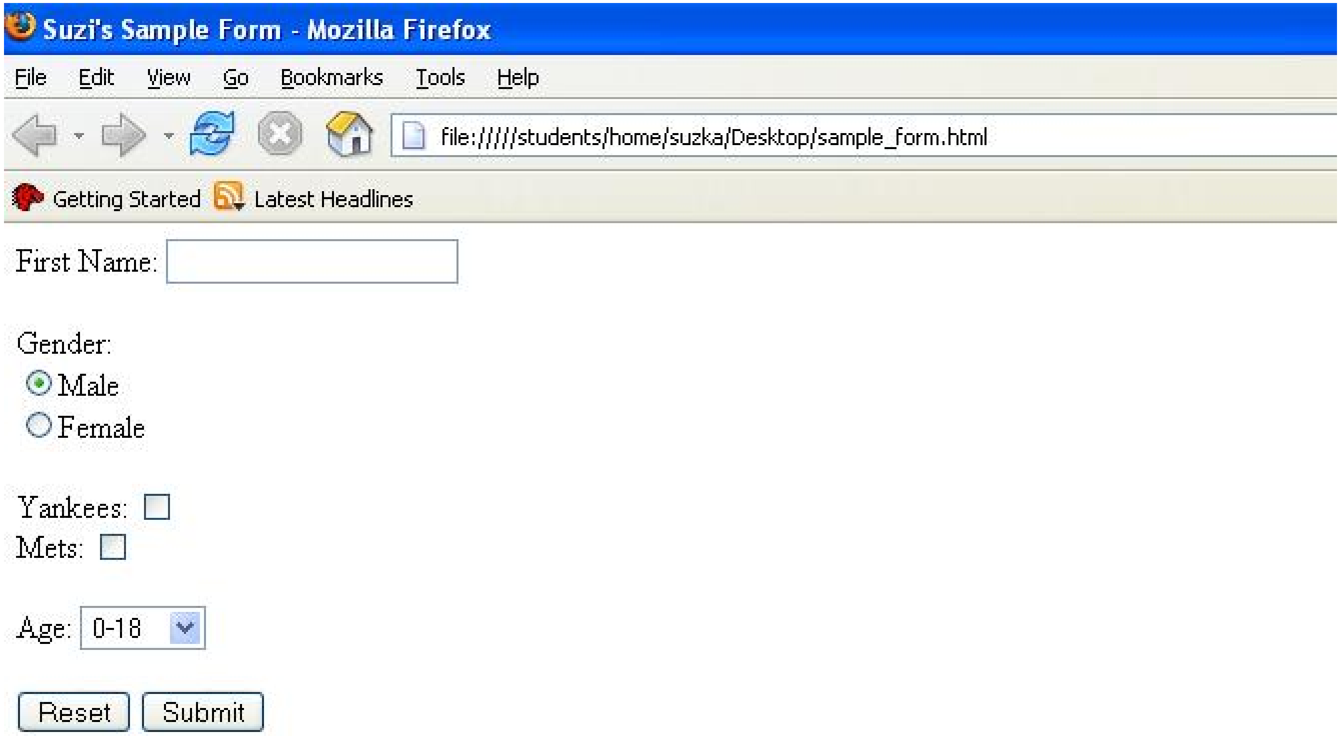
Fluency in Information Technology

http://www.cs.washington.edu/100

HTML Form Controls

```
<form name="sample_form">
   First Name: <input type="text" name="fName" id="fName" size="20"
   maxlength="20" />

   Gender: <input type="radio" name="gender" id="male" checked />
   <input type="radio" name="gender" id="female" />

   Yankees: <input type="checkbox" id="yankees" />
   Mets: <input type="checkbox" id="mets" />

   Age: <select>
                 <option value="0-18">0-18</option>
                 <option value="19-62">19-62</option>
                 <option value="63+">63 +</option>
        </select>


   <button type="reset">Reset</button>
   <button type="submit">Submit</button>
</form>
```

Sample_form.html



Suzi's Sample Form - Mozilla Firefox
File Edit View Go Bookmarks Tools Help
file://///students/home/suzka/Desktop/sample_form.html
Getting Started Latest Headlines

First Name:

Gender:
● Male
○ Female

Yankees: □
Mets: □

Age: 0-18

Collections in the Real World

- Think about:
  - » words in a dictionary
  - » list of pets in your household
  - » deck of cards
  - » books in a library
  - » songs on a CD
  - » controls in an HTML form
- These things are all *collections* of objects

A Collection of Form Elements

- **Lets check the gender radio buttons:**

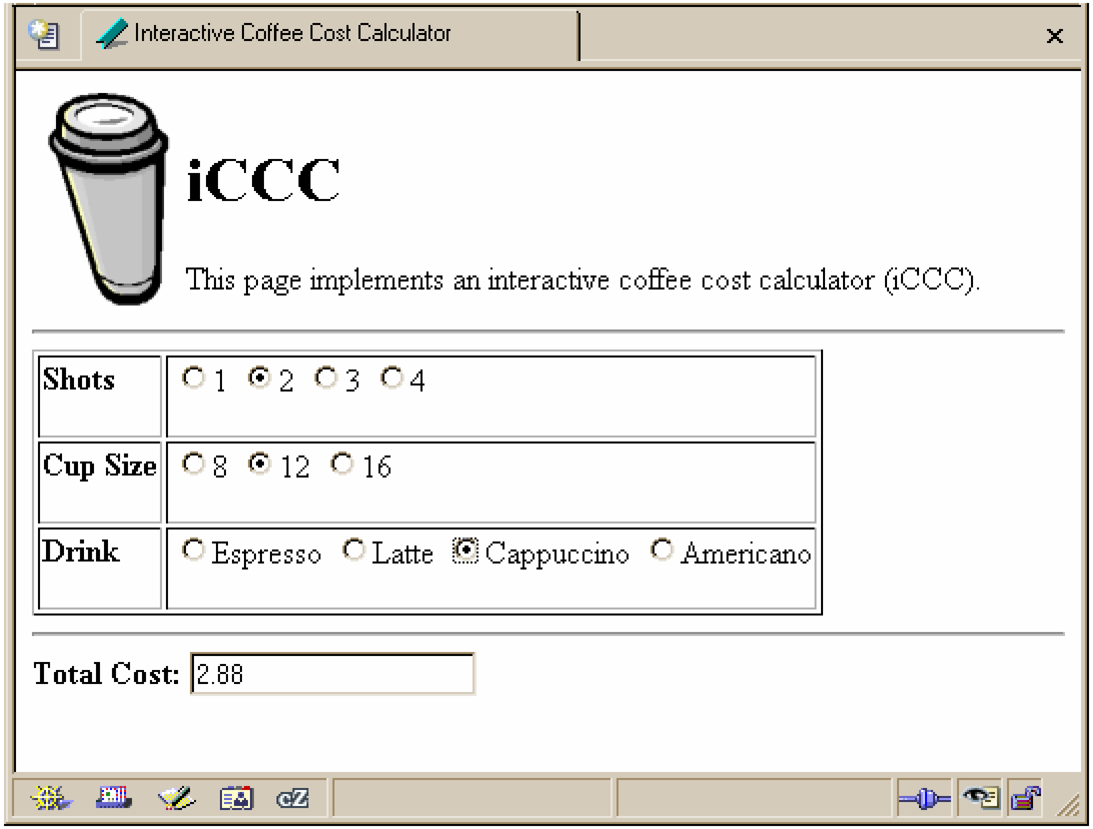
```
var elements = new Array();
elements = document.getElementById("gender");

for (var i=0; i < elements.length; i++) {
    var element = elements[i];
    if (element.checked) {
      document.writeln("Your gender is: " + element.value);
    }
```

How can we manage lists of objects?

- We'd like to be able to ...
  - » add things to the list
  - » look at the elements of the list one by one
  - » find out how many things have been put in the list
  - » remove things from the list
  - » … among other things

iCCC example

- Consider the iCCC example program
  - There are 4 radio buttons for shot count, 3 radio buttons for cup size, and 4 radio buttons for drink
  - We could give each radio button an `id` and check it individually to see if it is currently selected
  - But it's much cleaner to treat the buttons in each group the same way, and just look at them in turn
- Looping over the elements of a group is often simpler and more flexible than treating them individually



Interactive Coffee Cost Calculator

iCCC

This page implements an interactive coffee cost calculator (iCCC).

Shots	○ 1 ● 2 ○ 3 ○ 4
Cup Size	○ 8 ● 12 ○ 16
Drink	○ Espresso ○ Latte ● Cappuccino ○ Americano

Total Cost: 2.88

```
for (var i=0; i<document.getElementById("shotForm").elements.length; i++) {
  element = document.getElementById("shotForm").elements[i];
  if (element.checked) {
    shotCount = parseInt(element.value,10);
  }
}
```

Arrays

- JavaScript (and most other languages) includes *arrays* as the most basic kind of collection.
  - » Simple, ordered collections
  - » Special syntax for accessing elements by position
- JavaScript arrays can be created
  - » by the programmer in the script
  - » by the system and provided to the script
    - for example, the elements array in the iCCC program

Array Example

```
<head>
<title>Arrays example</title>
<script type="text/javascript">
var petNames = new Array();
petNames[0] = "Jaba";
petNames[1] = "Bingo";
petNames[2] = "Jessica";
petNames[3] = "Sumi";
petNames[4] = "Jennifer";
</script>
</head>
```

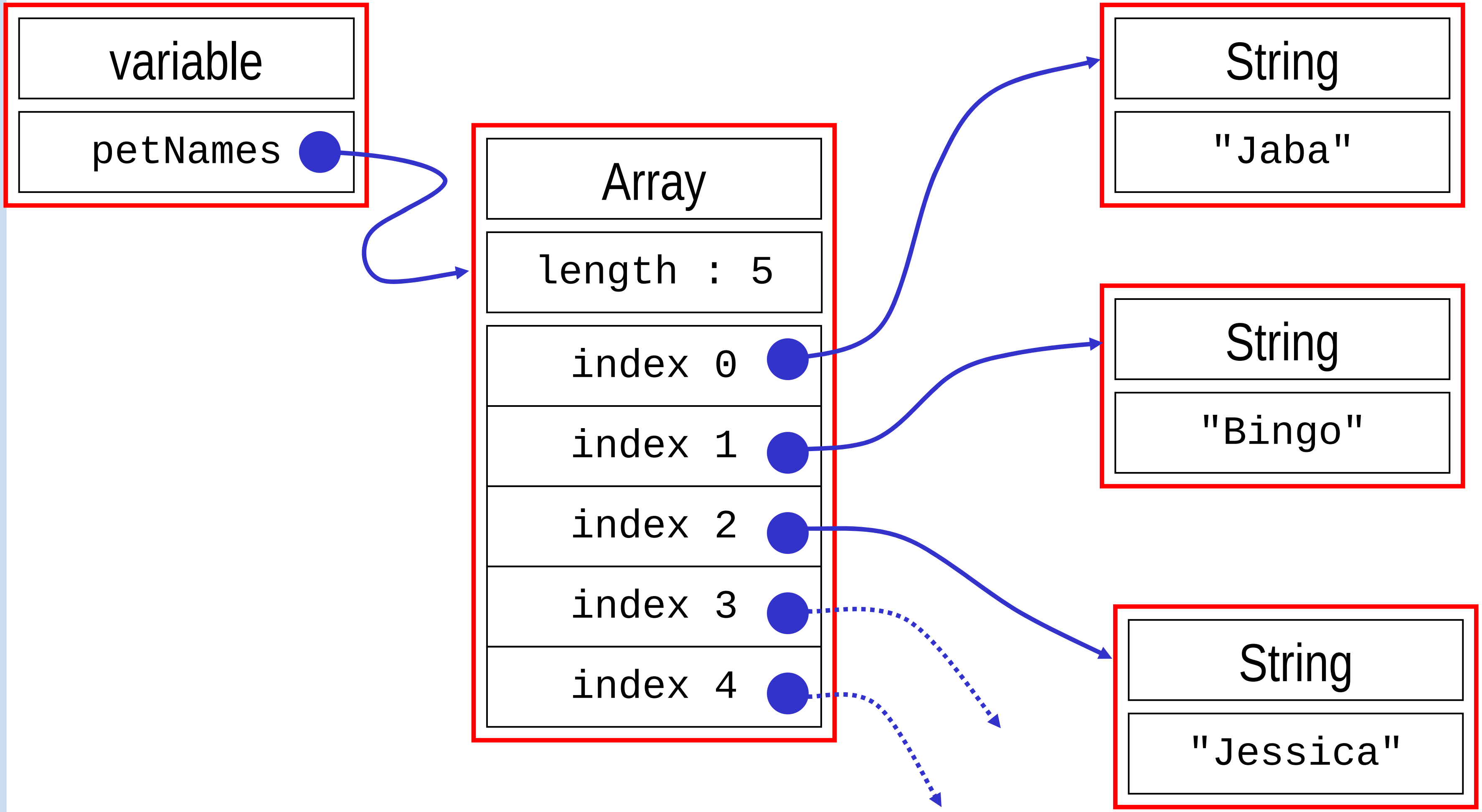
create the array

store a reference to the array in variable `petNames`

add new entries to the array

arraysA.html

Array Example



variable

petNames

Array

length : 5

index 0

index 1

index 2

index 3

index 4

String

"Jaba"

String

"Bingo"

String

"Jessica"

JavaScript Indexed Arrays

- An indexed array is a data type that stores a collection of values, accessible by number
  - » the values in the array are called the *elements* of the array
  - » the elements (or values) are accessed by *index*
    - the index of the first value is 0
  - » the values in the array can be any type
    - usually all the values are the same type
    - but they can be different from one another if necessary

Array Declaration and Creation

- Arrays can be created several different ways
  - » `var petNames = new Array();`
    - 0-length array with no elements in it yet
  - » `var studentNames = new Array(102);`
    - 102-element array, all of which have the value *undefined*
  - » `var myList = ["Sally", "Splat", "Google"];`
    - 3-element array initialized with an *array literal*
- Arrays have a property that stores the length

  <*array name*>`.length`
  - » you can lengthen or shorten an array by setting the length to a new value

Array Element Access

- Access an array element using the array name and position: <*array name*> [<*position*>]
- Details:
  - » <*position*> is an integer expression.
  - » Positions count from zero
- Update an array element by assigning to it:

<*array name*> [<*position*>] = <*new element value*> ;

```
myCurrentCarNo = carList.length-1;
myCurrentCar = carList[myCurrentCarNo];
```

```
<html>
<head>
<title>Arrays Example B</title>
<script type="text/javascript">
var petNames = new Array();
var studentNames = new Array(102);
var myList = ["Sally", "Splat", "Google"];
</script>
</head>

<body>
<script type="text/javascript">
document.write("<br>petNames has "+petNames.length+" elements.");
document.write("<br><br>studentNames has "+studentNames.length+" elements.");
if (studentNames.length > 0) {
  document.write("<br>The first student name is "+studentNames[0]+".");
}
document.write("<br><br>myList has "+myList.length+" elements.");
if (myList.length > 0) {
  document.write("<br>"+myList.join(", ")+".");
}
</script>
</html>
```

create the arrays

use the length property

arraysB.html

Array References

```
var dwarf = new Array(7);
var deux = 2;
dwarf[0] = "Happy";
dwarf[1] = "Sleepy";
dwarf[deux] = "Dopey";
dwarf[deux+1] = "Sneezy";
```

Looping Over Array Contents

- The length attribute makes it easy to loop over all the elements of an Array:

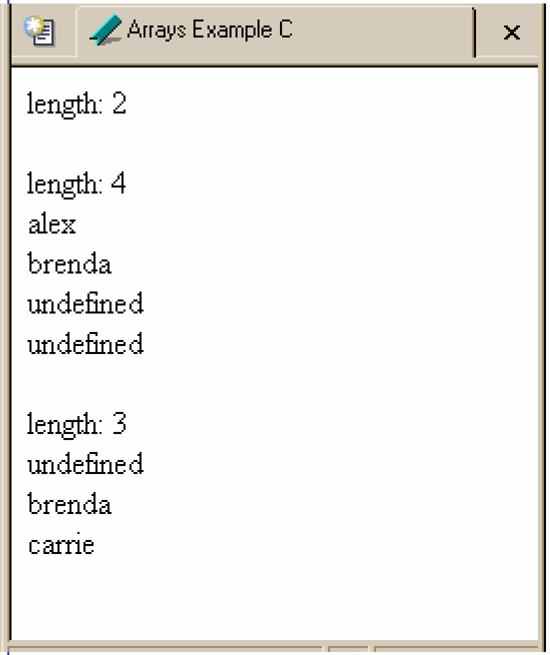
```
document.write("<br>Unsorted list of pet
names.<br>");
for (var i=0; i<petNames.length; i++) {
  if (i != 0) {
    document.write(", ");
  }
  document.write(petNames[i]);
}
```

deleting elements

- Change the length property to change the number of elements in the array
  - » `names.length = 4;`

- Use the delete operator to set a particular entry to the value undefined
  - » `delete names[0];`

```
<body>
<script type="text/javascript">
// 2-element array literal
var names = ["alex","brenda"];
document.write("length: "+names.length);

// extend it to 4 elements
names.length = 4;
document.write("<br><br>length: "+names.length);
for (var i =0; i<names.length; i++) {
 document.write("<br>"+names[i]);
}

// delete, assign, and shorten
delete names[0];
names[2] = "carrie";
names.length = 3;
document.write("<br><br>length: "+names.length);
for (var i =0; i<names.length; i++) {
 document.write("<br>"+names[i]);
}
</script>
</body>
```



```
length: 2

length: 4
alex
brenda
undefined
undefined

length: 3
undefined
brenda
carrie
```

interesting functions

- There are several predefined functions available for working with arrays
  - join() ← join all the elements in one long string
  - reverse() ← reverse the order of the elements
  - sort() ← sort the elements in the array
  - concat(...) ← add elements to the array
  - etc

```
document.write("<br><br>Sorted list of pet names.<br>");
petNames.sort();
...
```

Sort function

```
var petNames = ("Jaba",
  "Bingo", "Jessica", "Sumi",
  "Jennifer");


petNames.sort();
document.write(petNames);
```

Output:

```
Bingo, Jaba, Jennifer, Jessica,
  Sumi
```

Array Summary

- Arrays are a collection data type built in to the JavaScript language.
  - » Also found in essentially all programming languages
- Indexed access to elements
  - » remember, it's 0-based, the first element is element 0
- Elements can be added to an array by specifying the index value in the assignment statement

```
petNames[5] = "Eleanor";
```

- There are useful functions available for manipulating arrays

Some Built-in Javascript Functions

- Getting a document object

```
var element = document.getElementById("shotforms");
```

- Getting today's date

```
var today = new Date();
document.write("Today is: "+ today.toString() );
```

- Random Numbers

```
math.random();  << produces a random number between
   0 and 1
aRandomNumber = 75 * math.random();  << produces a
   random number between 0 and 75.
```