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Data Structures

Elements of Graphics
CS324e
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Arrays

- Structure that can hold any object of a declared type
  - `int[] values = new int[10];`
- Index accesses data stored within the array
- Length of array has a fixed size upon array creation
  - `values.length;`
ArrayLists

- Structure of mutable length that can hold any object of a declared type
  - `ArrayList<Type> values = new ArrayList<Type>();`
- Size of ArrayList adapts as data is added or removed
  - `values.add(object);`
  - `values.remove(index);`
- `get(index)` returns the object stored at index
- `set(index, object)` sets the value of the object stored at index
- `size()` returns the length of the ArrayList
Lists

- ArrayList provides flexibility for object creation at the cost of Array efficiency
- FloatList, IntList and StringList are specialized ArrayLists that are both flexible and efficient
- Can only work with floats, ints and Strings respectively
- `append(value)` adds value (of given type) to the List
- Other convenience features can be found within Processing website’s Reference
Dictionaries

- Provide key-value pairs for efficient lookup
  - Key is a String
  - Value is the data
- FloatDict, IntDict and StringDict provide dictionary lookup for floats, ints and Strings respectively
- `set("key", value)` adds the key-value pair to the dictionary
- `get("key")` retrieves the value assigned to "key"
- `hasKey("key")` returns a boolean whether or not "key" is part of the dictionary
HashMaps

- Provide a more flexible key-value pair than Dicts
- Key and value can be of any type
- Access functionality with `import java.util.Map;`
- Constructor assigns key-value pair upon object creation
  - `HashMap<String, Integer> hm = new HashMap<String, Integer>();`
- `put(key, value)` adds key-value pair to HashMap
- `get(key)` retrieves the value associated with key
HashMap Functionality

- Not native to Processing — built from Java library
- Reference at: http://docs.oracle.com/javase/6/docs/api/java/util/HashMap.html
Objects

- Also a type of data structure!
- Some objects are defined in Processing (String, Color, PImage etc)
- Other objects are defined by the program-specific classes or libraries of classes
- When should you create an Object class versus store object data in one of the pre-existing containers?
Hands-on: Reviewing Data Structures

❖ Today’s activities:

1. Create an array of colors, so that the background color changes at random on a timer
2. Create an ArrayList of particles, so that the user can add a particle upon clicking the mouse
3. Create a StringDict containing key-value pairs of countries and their capitals, so that the capital displays when the user types in a country