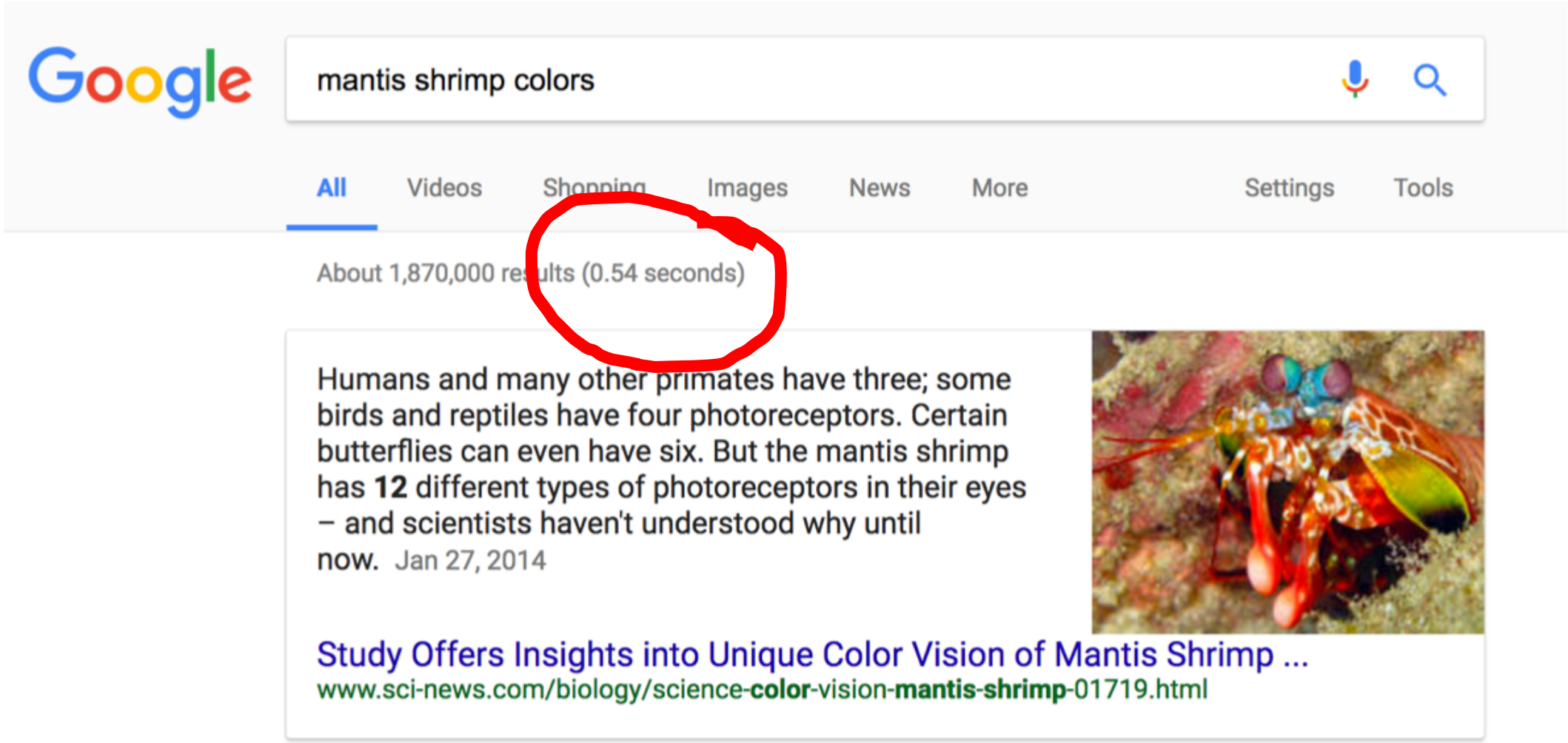

# Maps

Chris Piech
CS106A, Stanford University

# CS106A Winter 2018 Contest

# Why is this so fast?



Where are we?

# Where are we?

- Karel the Robot
- Java
- Console Programs
- Graphics Programs
- Text Processing
- **Data Structures**
- GUIs
- Defining our own Variable Types

# Collections High Level

```
List:    ArrayList<type>
Array:   type[]
Matrix:  type[][]
```



# Collections High Level

```
List:    ArrayList<String>
Array:   double[]
Matrix:  int[][]
```

ArrayList
index -> value

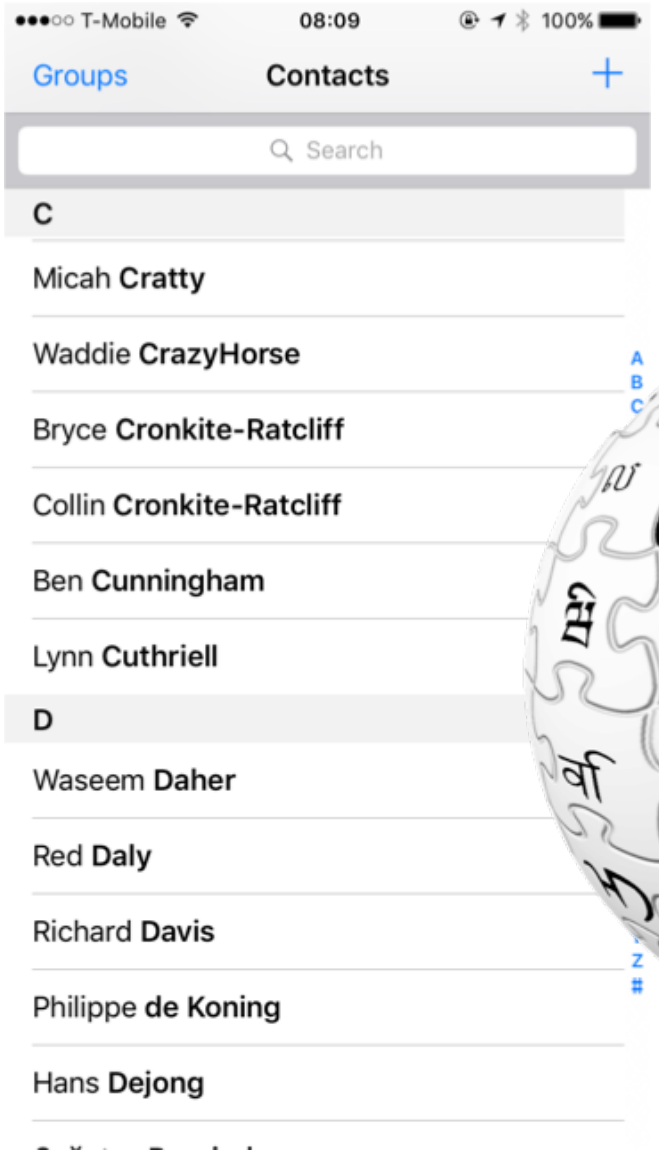
Arrays

index -> value

Matrix

(row, col) -> value

# Maps can have any type for key





Many examples

HashMap

key -> value

# Simple Example

1. Make a new HashMap of animal sounds

2. Add elements:
   Put [key = "dog", value = "bark"]
   Put [key="cat", value="meow"]
   Put [key="seal", value="ow ow ow"]

3. Get elements:
   Get [key = "dog"]

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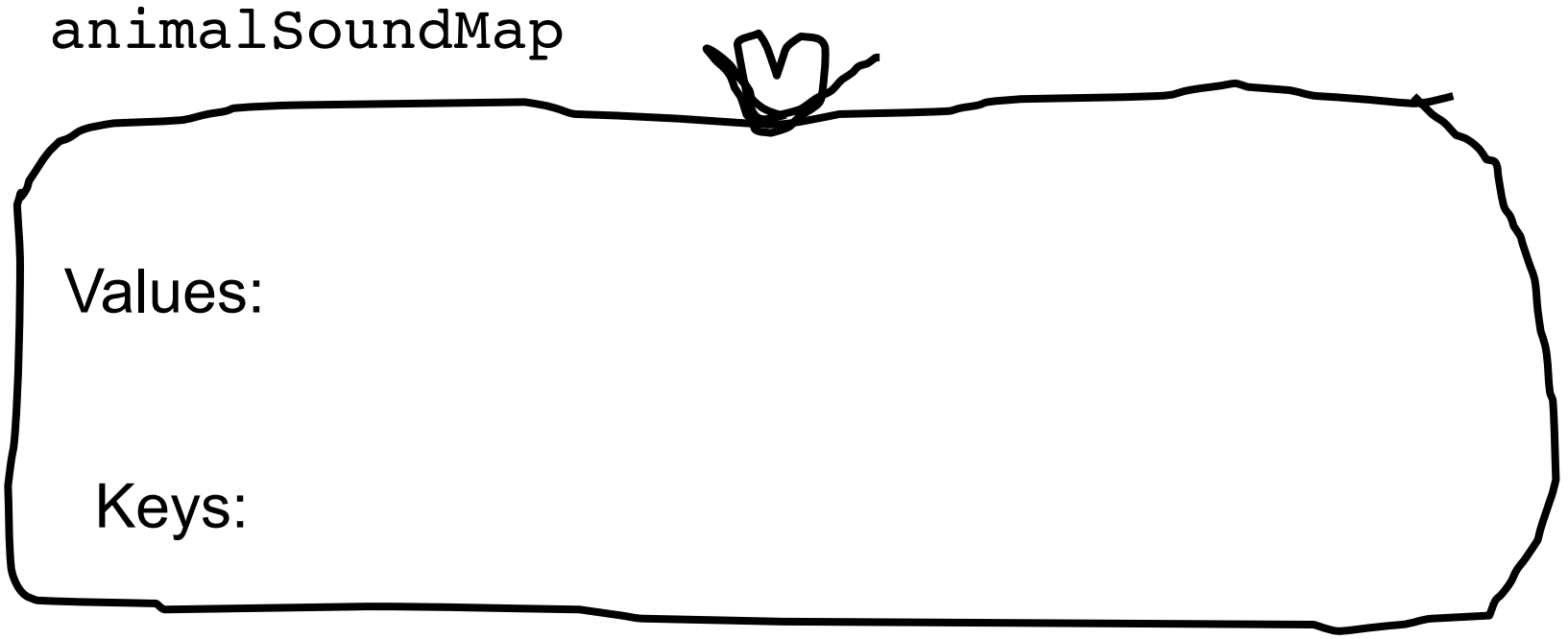


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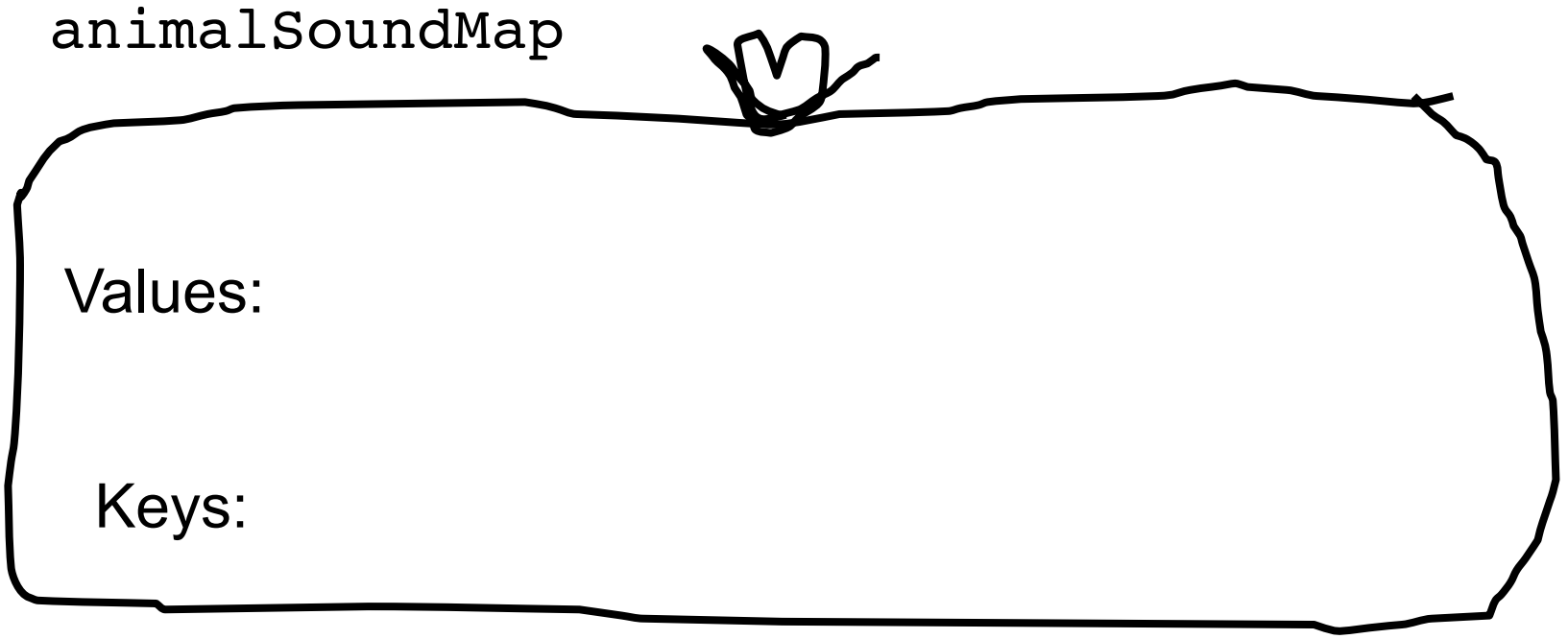


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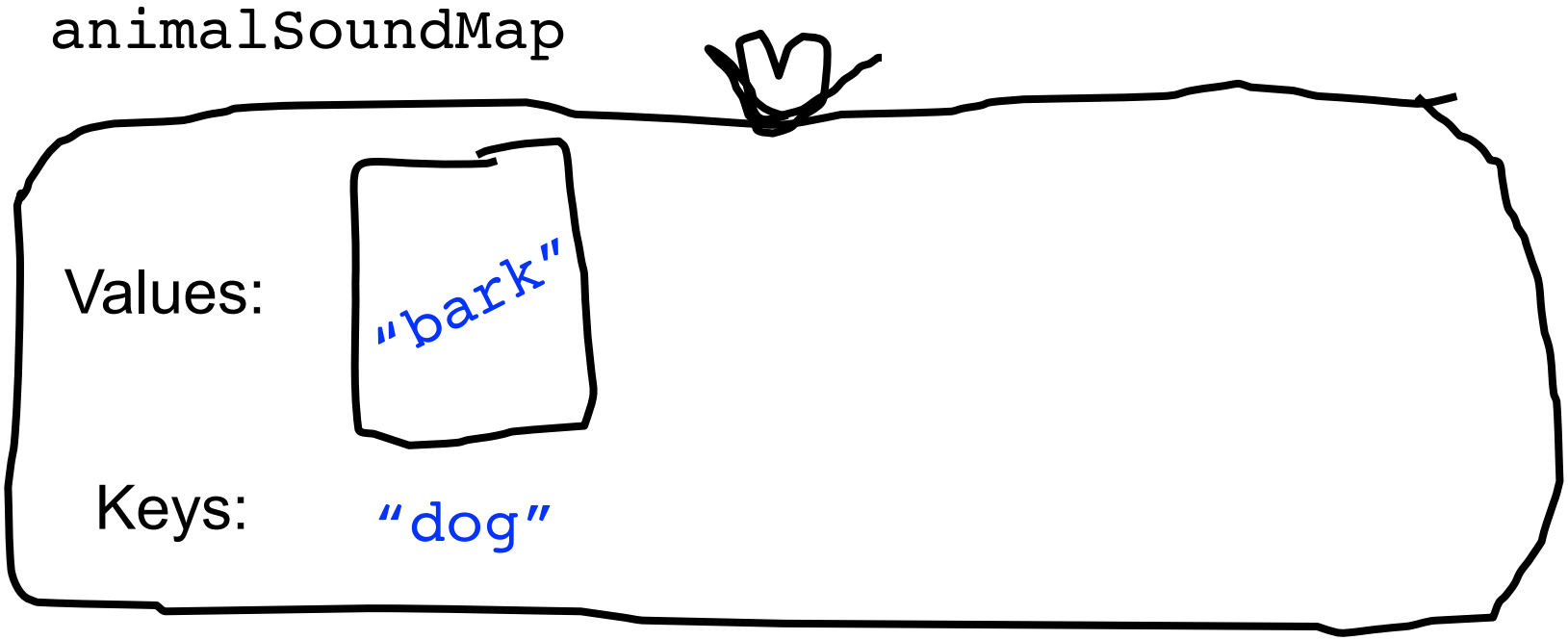


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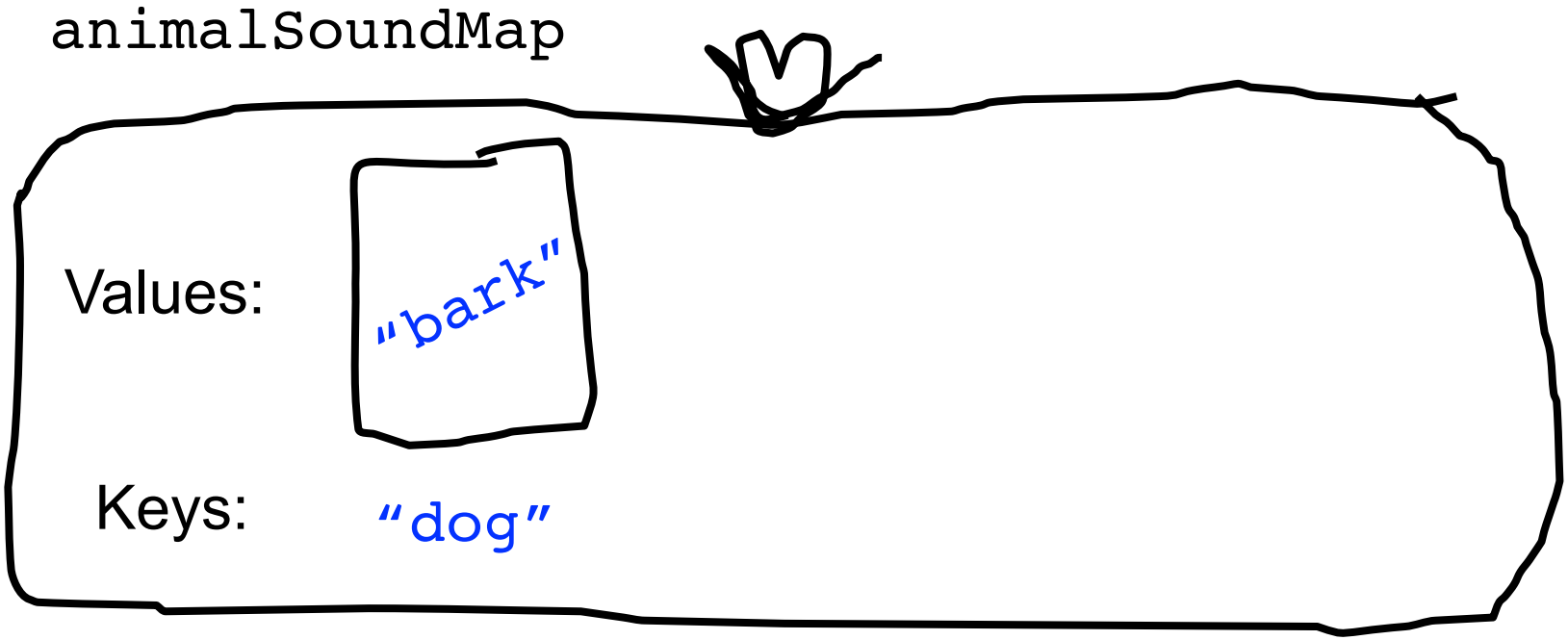


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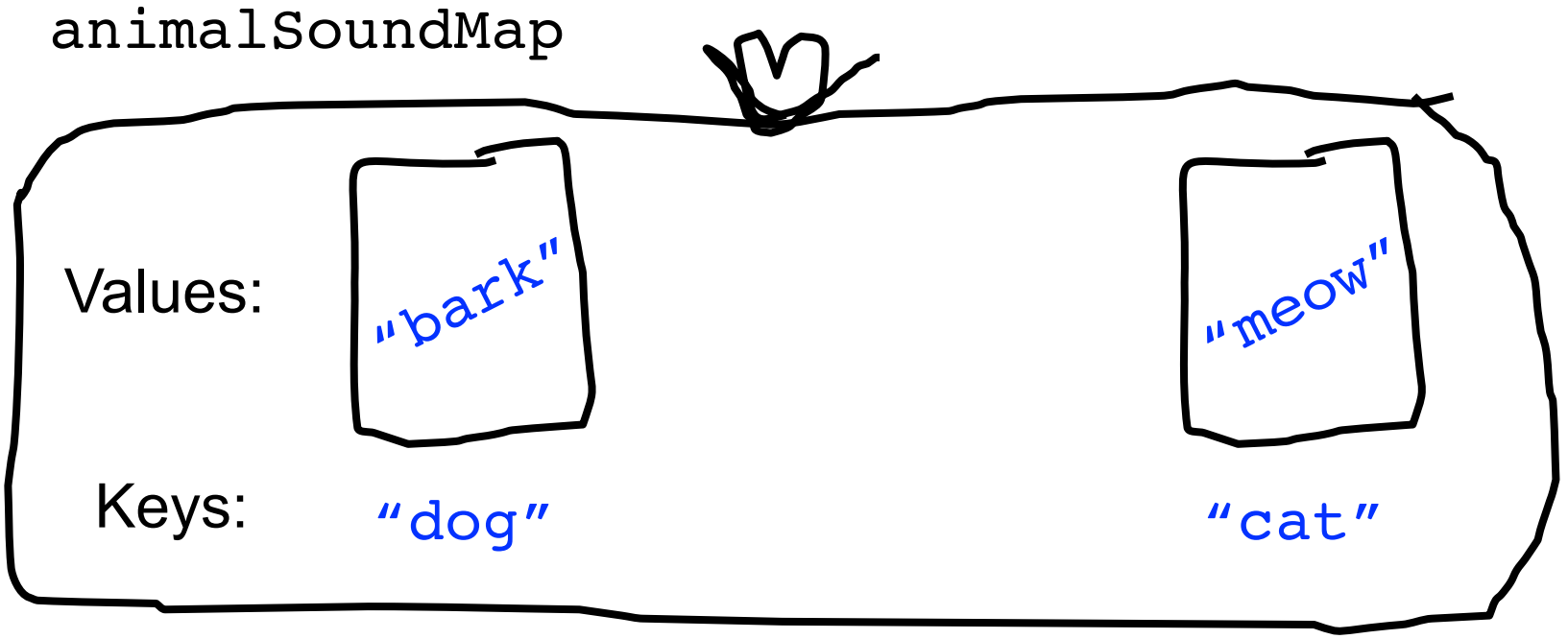


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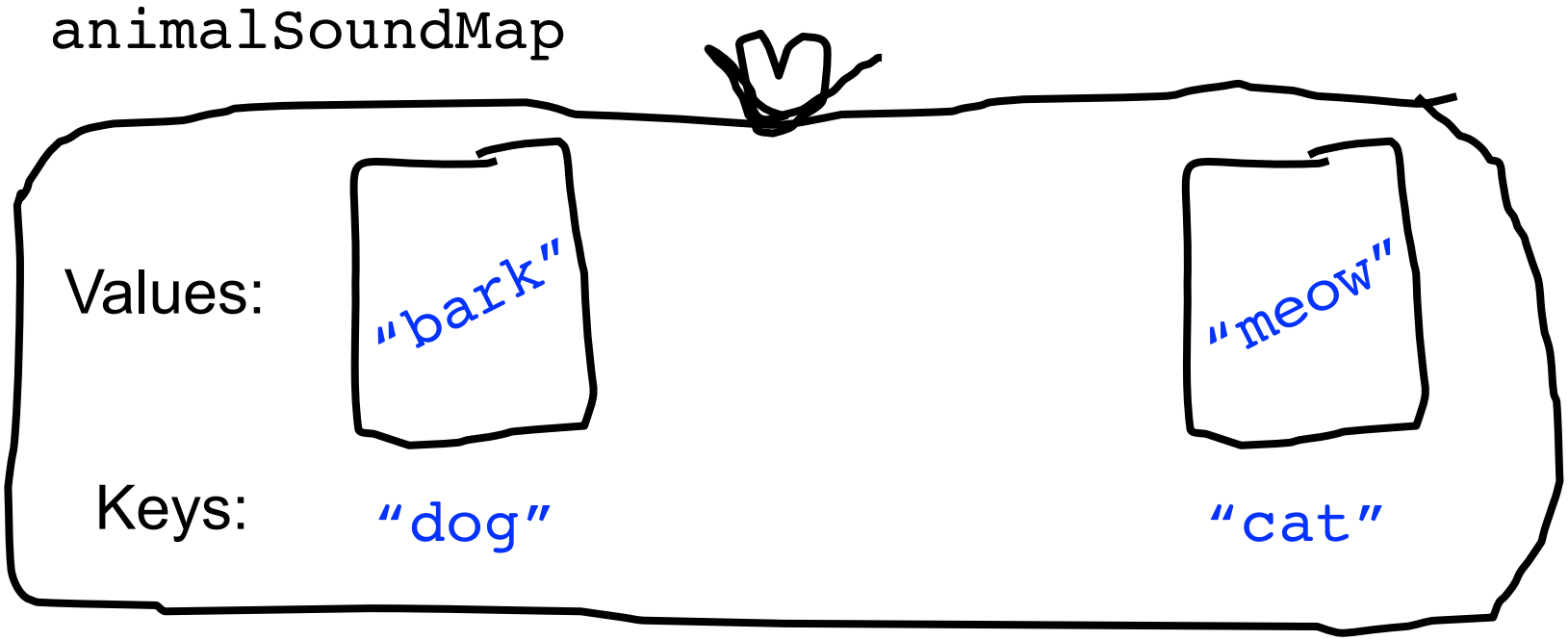


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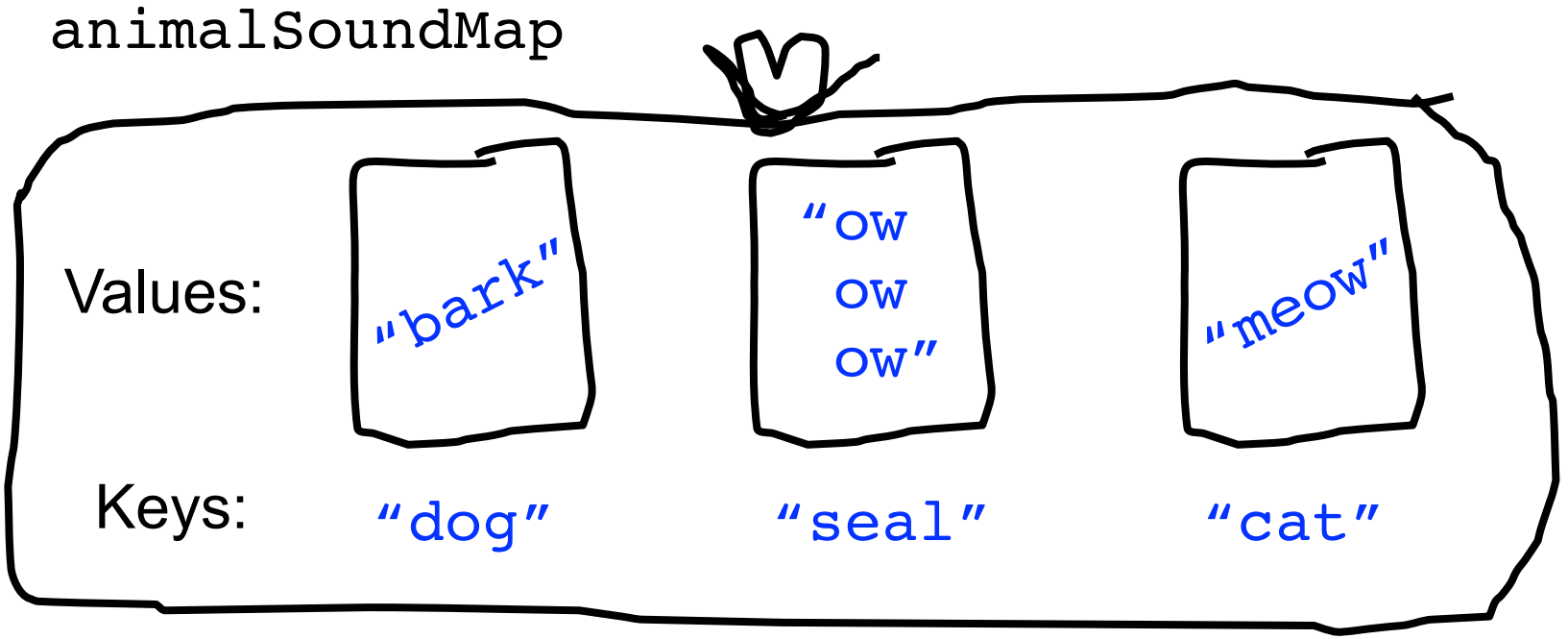


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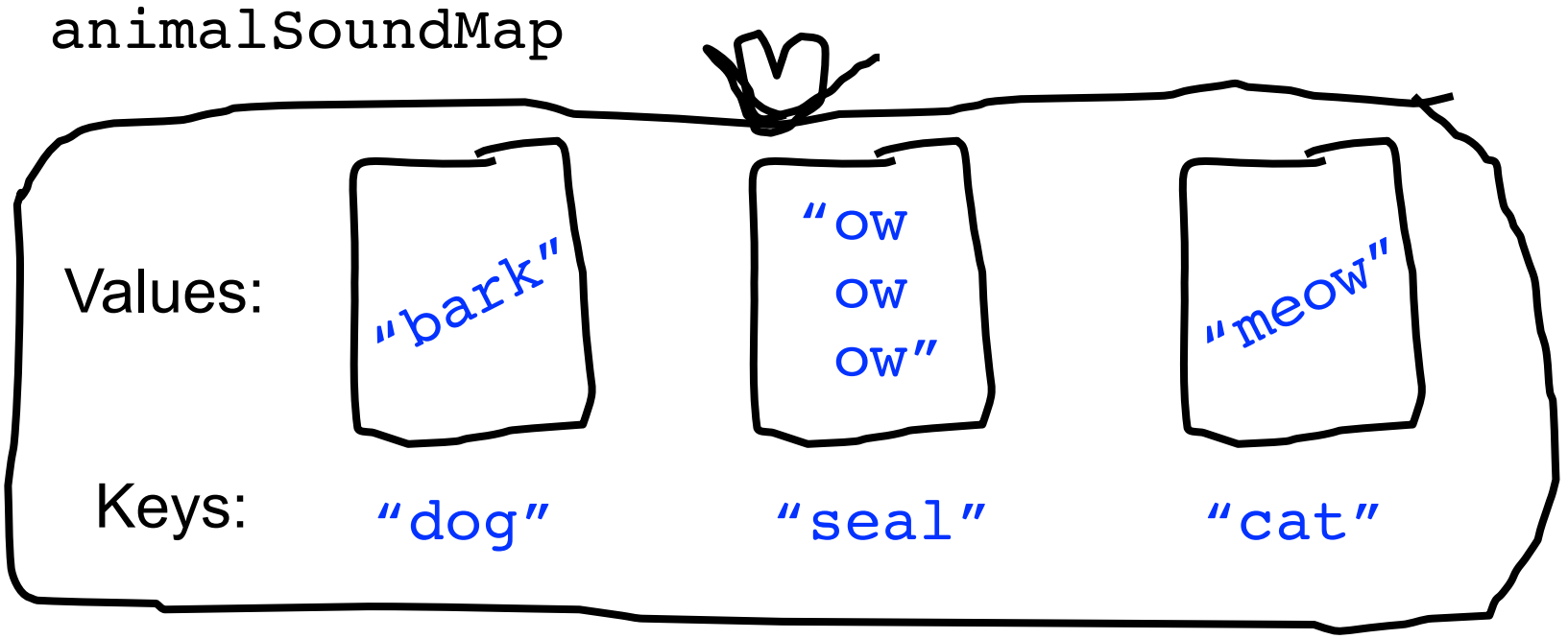


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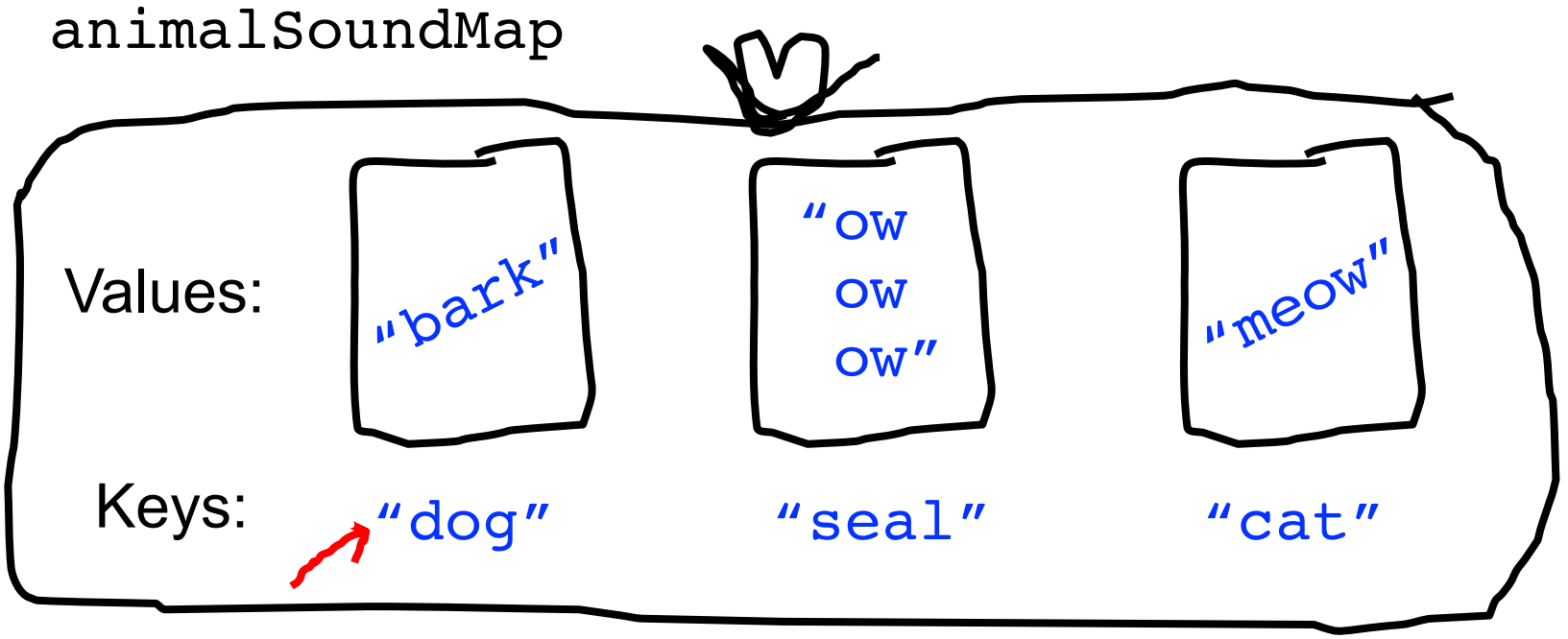


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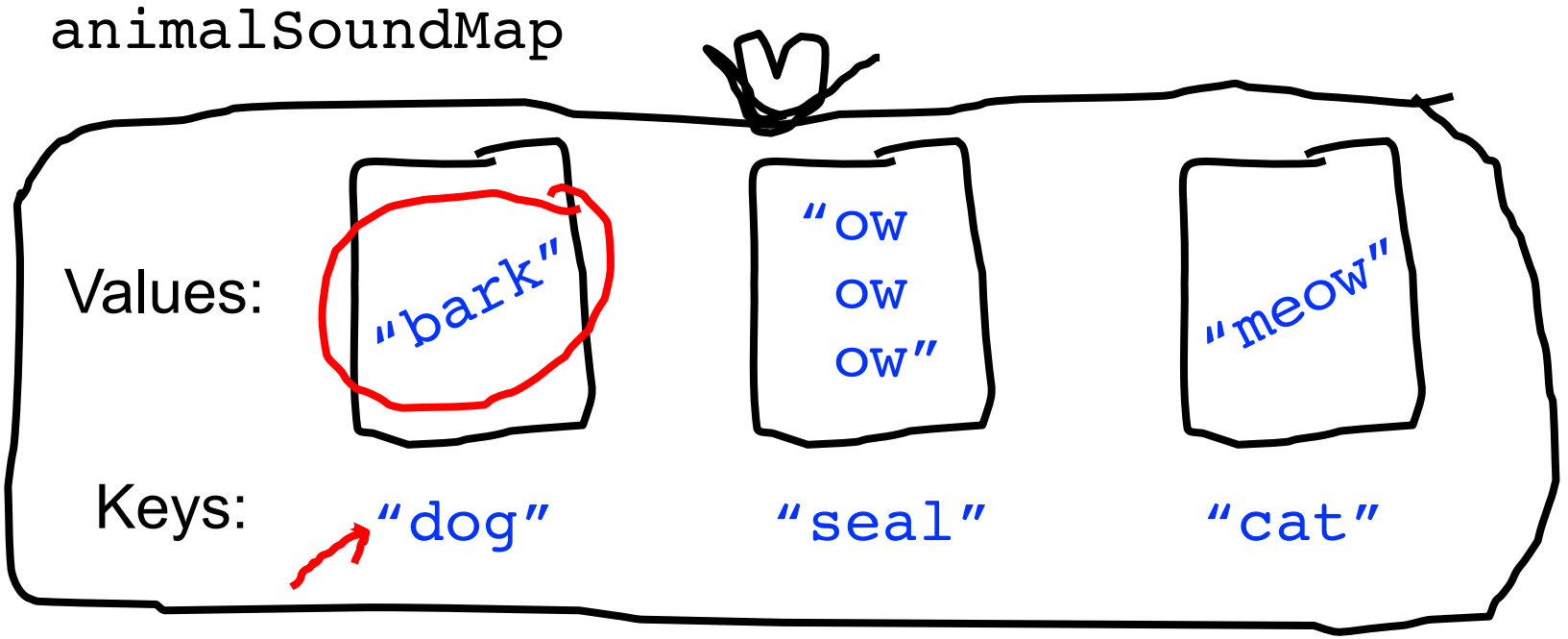


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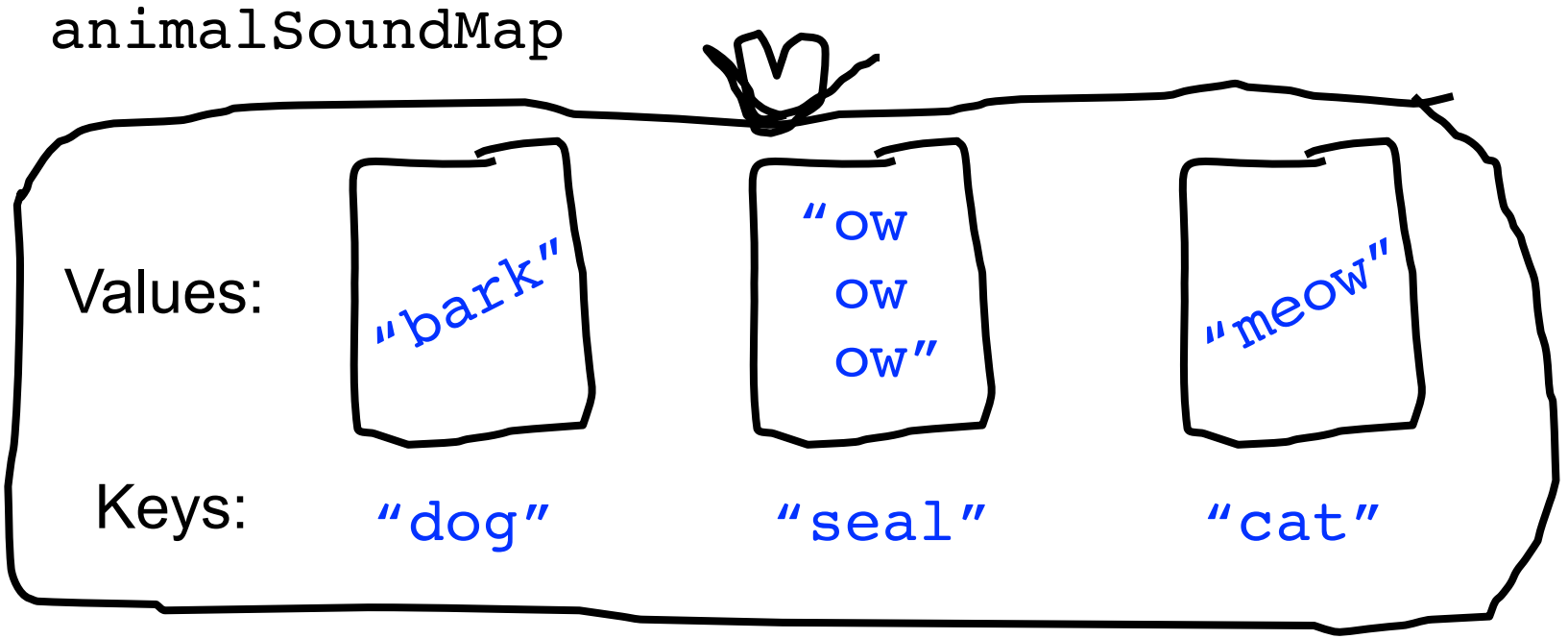


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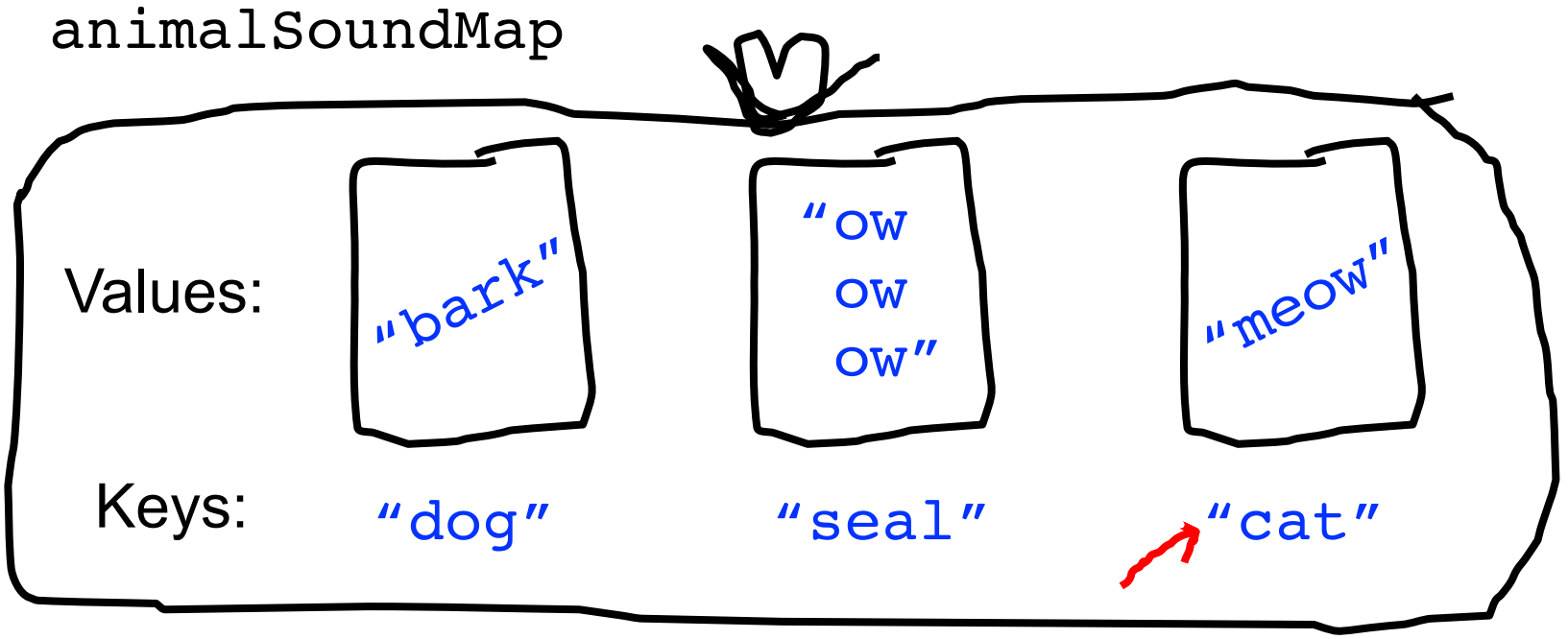


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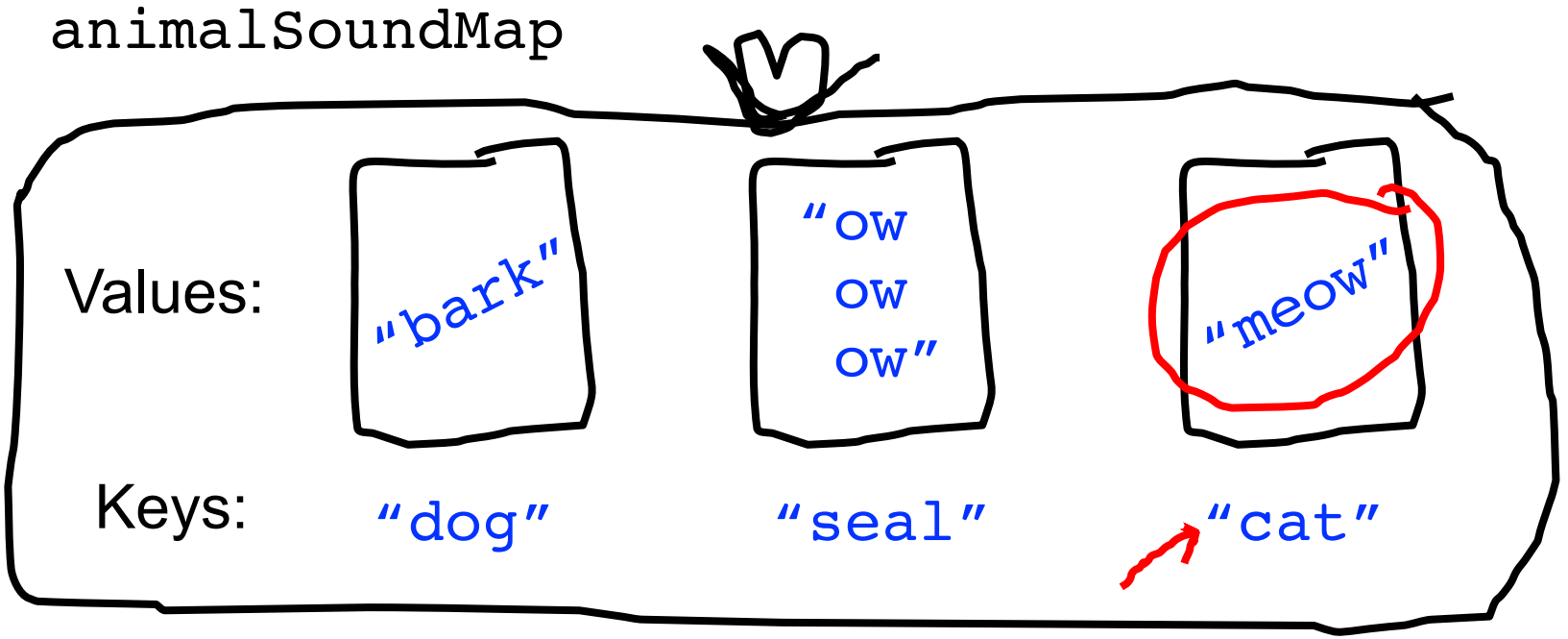


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# My First Map

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HashMap<String, String> animalSoundMap =
                new HashMap<String, String>();
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# My First Map

Key Type

Value Type

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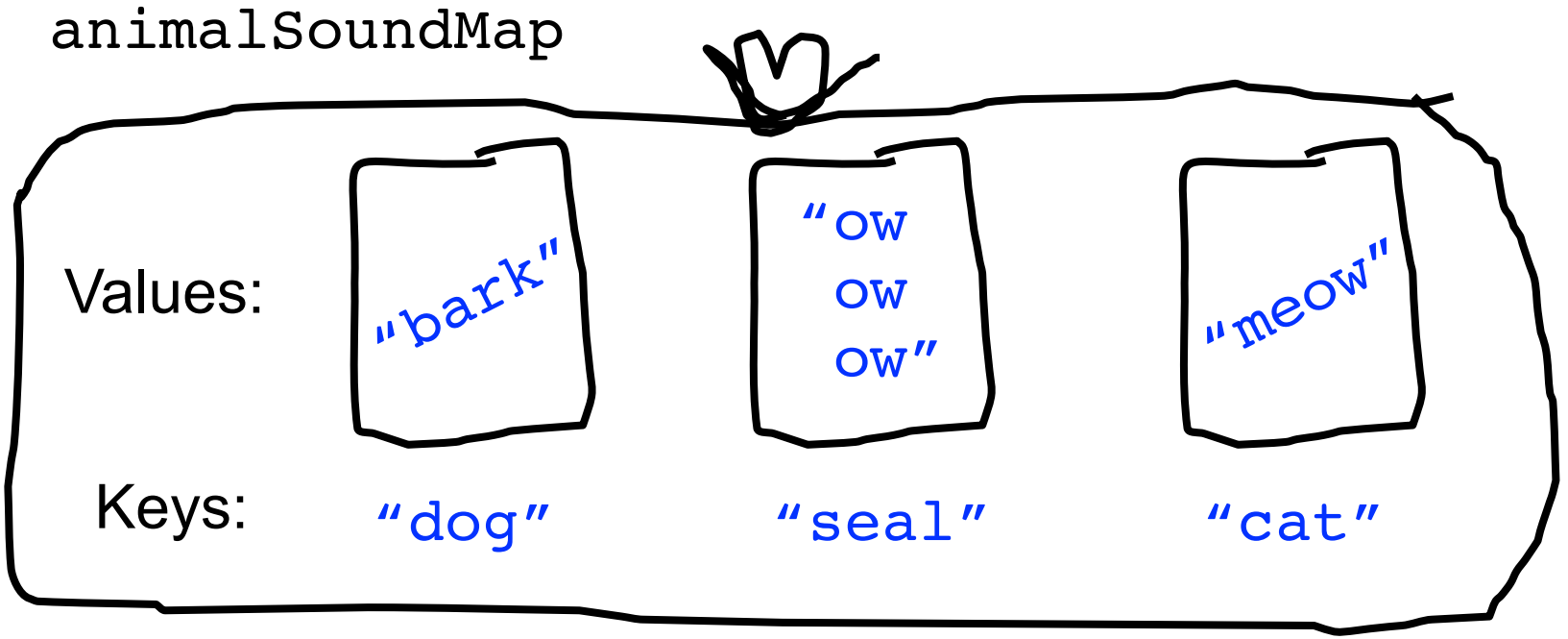


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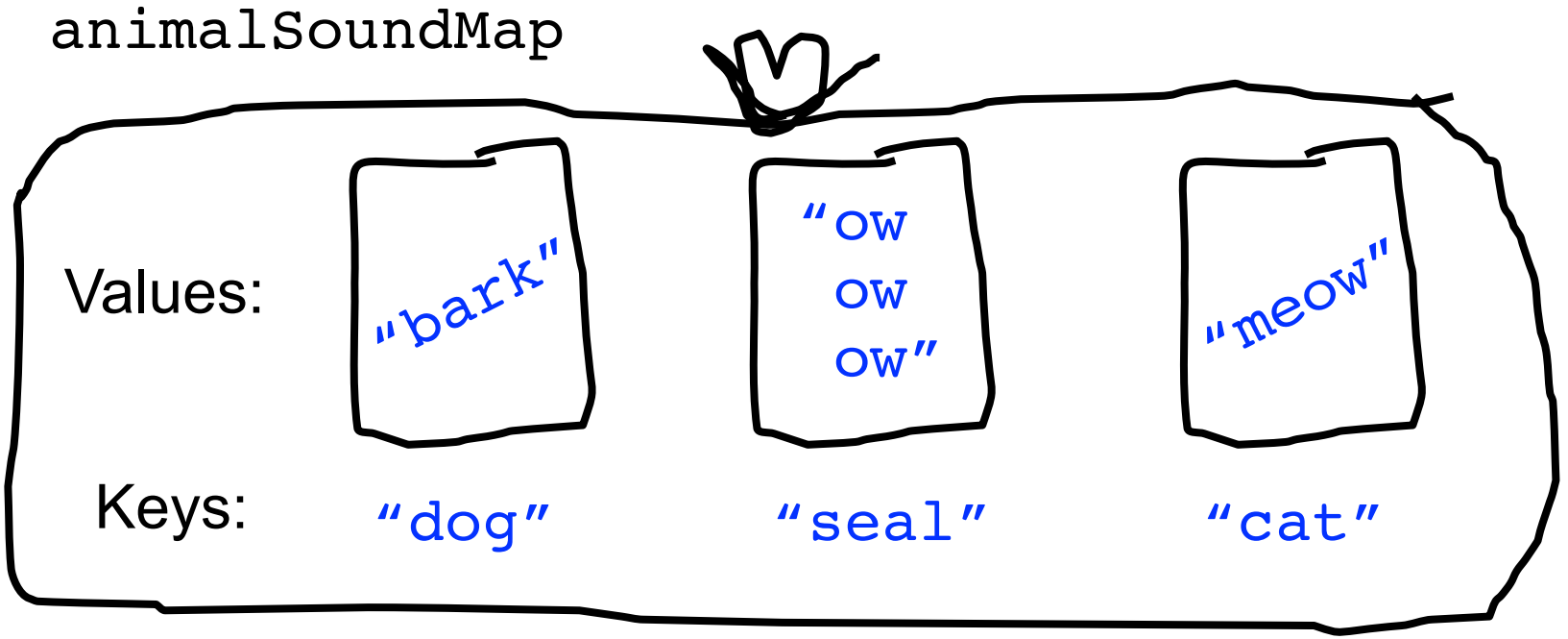


```
// 1. Make a new map
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// 2. Put things into the map
animalSoundMap.put("dog", "woof");
animalSoundMap.put("cat", "meow");
animalSoundMap.put("seal", "ow ow ow");

// 3. Get things out of the map
animalSoundMap.get("dog"); // "woof"
```

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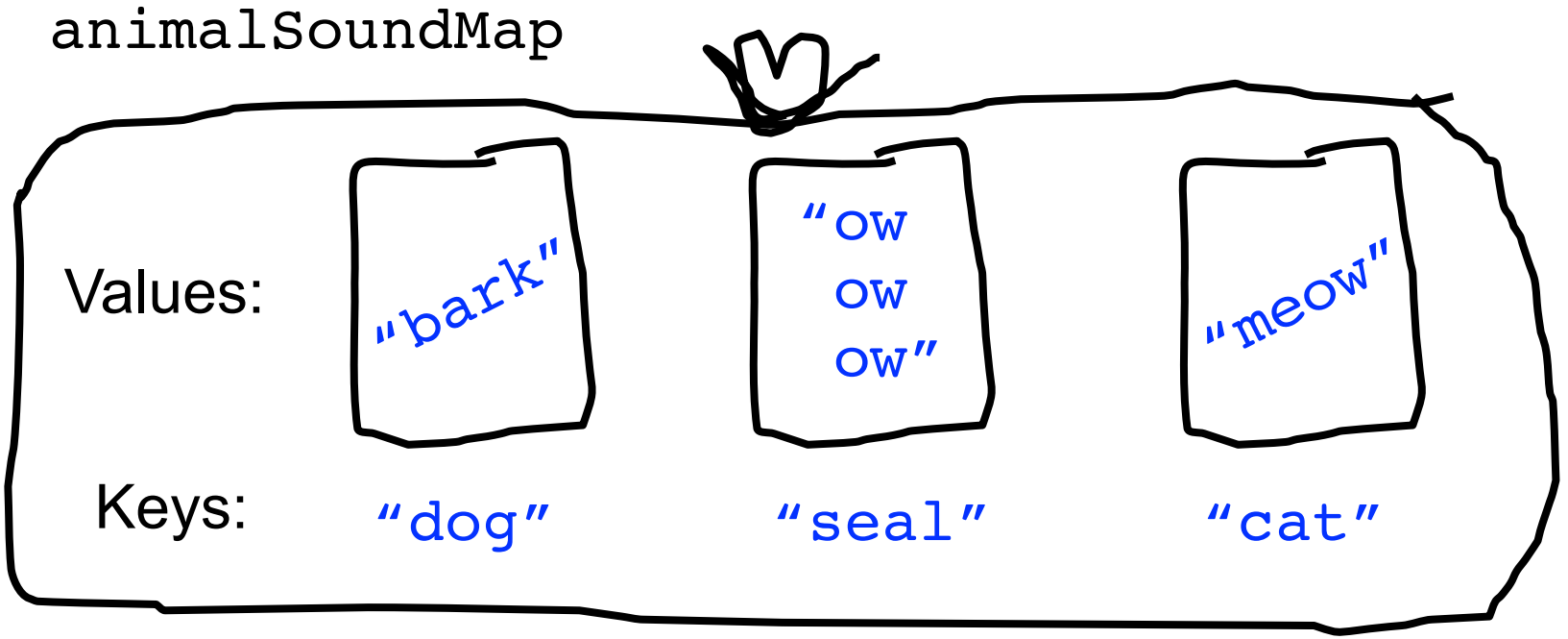


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// 3. Get things out of the map
animalSoundMap.get("dog"); // "woof"
animalSoundMap.get("fox"); // ?
```

# brothers Vegard and Bård Ylvisåker

Circa 2013


Ylvis – “The Fox”. Permission asked. Pending.

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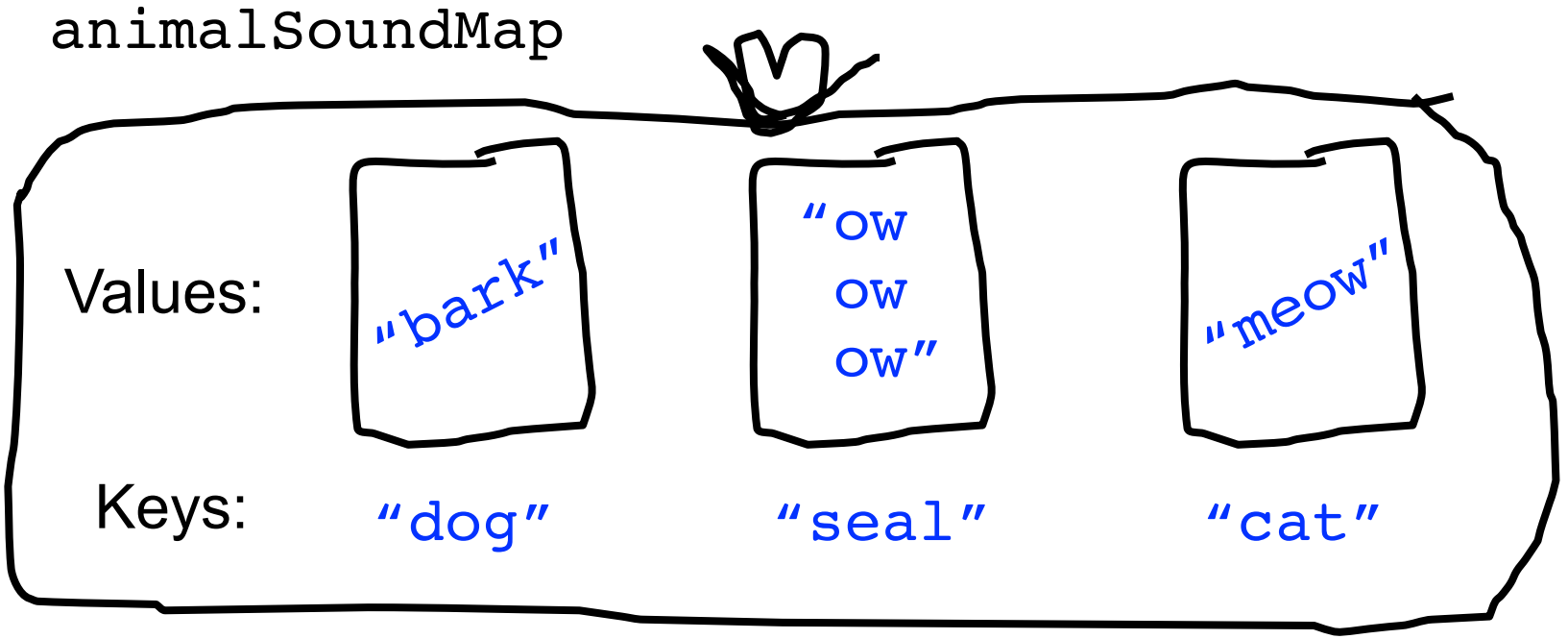


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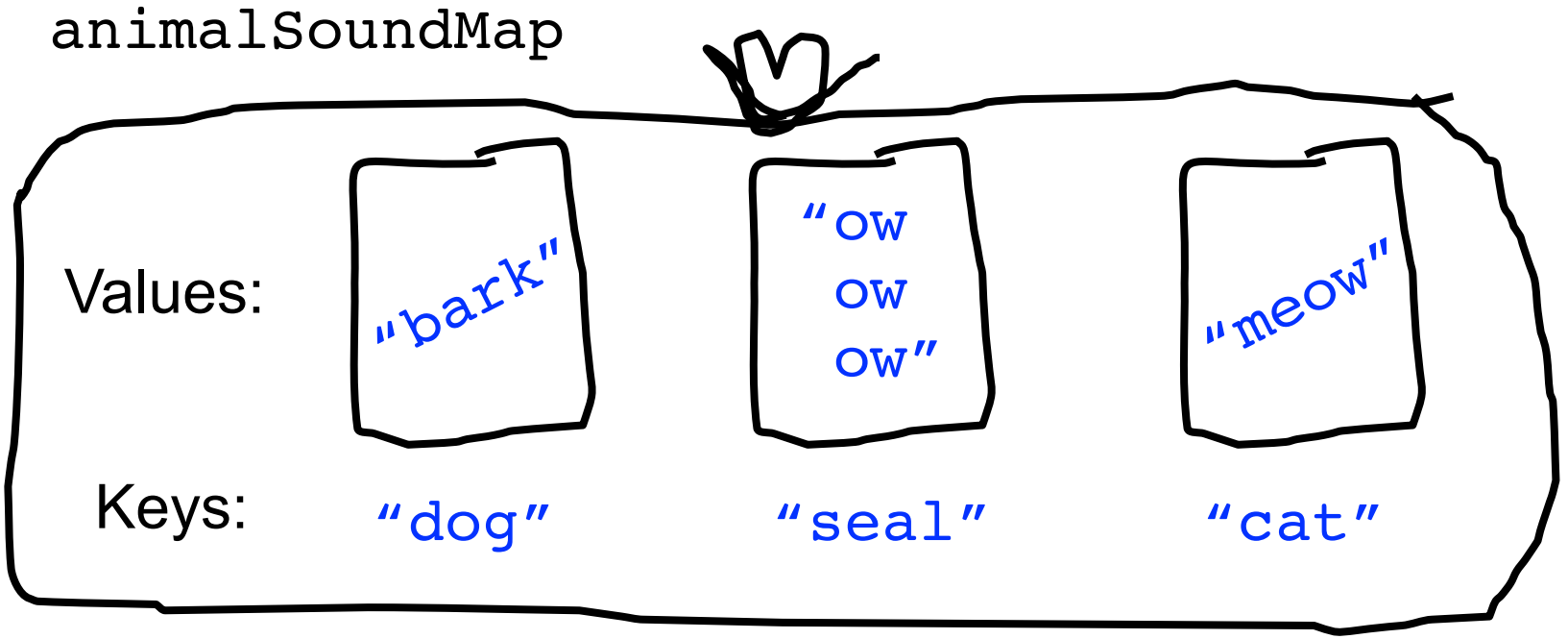


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animalSoundMap.get("fox"); // null
```

# HashMaps on one slide

1. Make a HashMap

```
HashMap<keyType, valueType> myMap =
            new HashMap<keyType, valueType>();
```

2. Put and get values into a map

```
myMap.put(key, value);
myMap.get(key) // returns the corresponding value
```

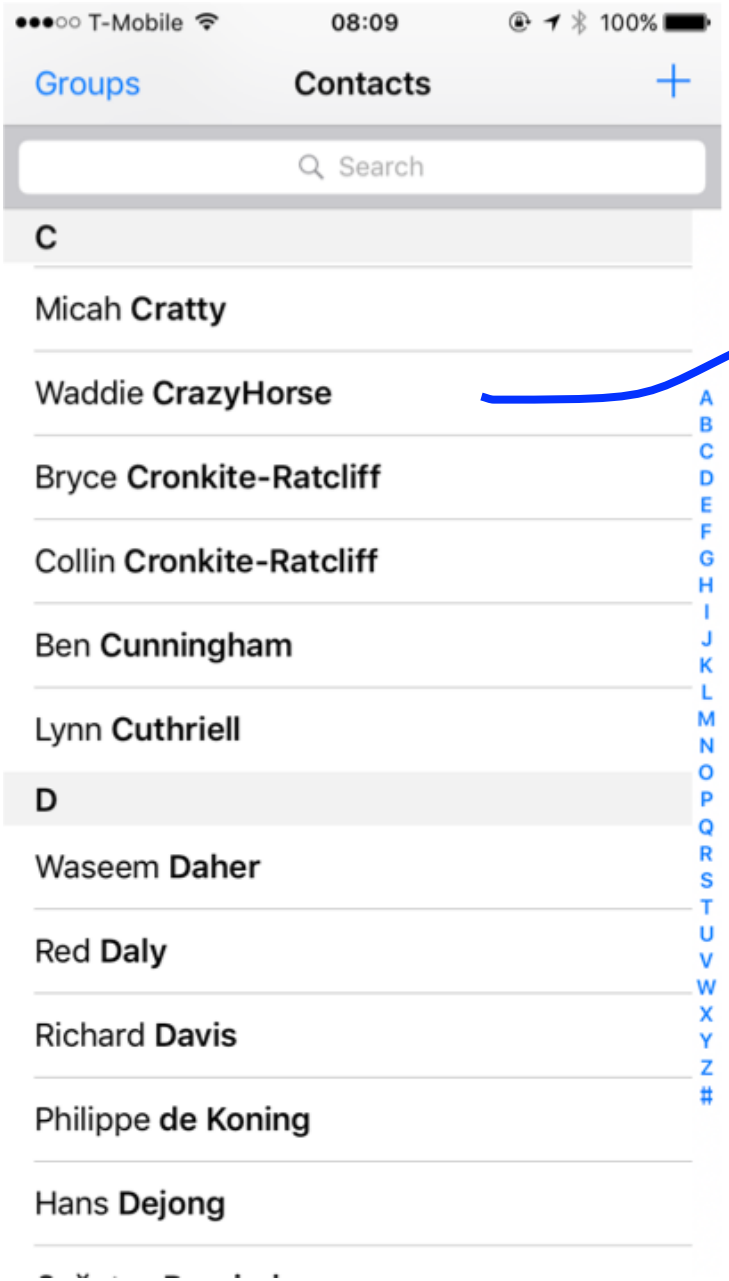
3. Some useful other methods

```
int size = myMap.size();
myMap.containsKey(key); // returns true or false if key is in map
myMap.keySet();
myMap.remove(key); // make like a tree and leave!
```

4. Iterate using a foreach loop

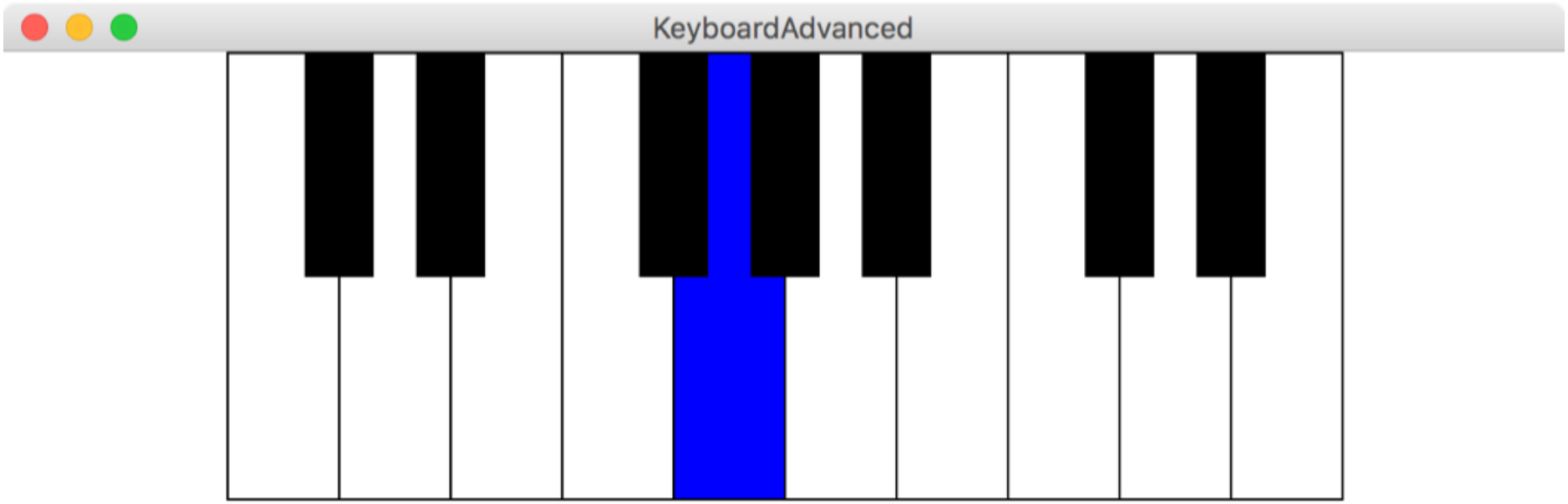
```
for(keyType key : myMap.keySet()){  // not ordered
   myMap.get(key); // do something with the key/value pair
}
```

# Phone Book




6701678

# Make a keyboard



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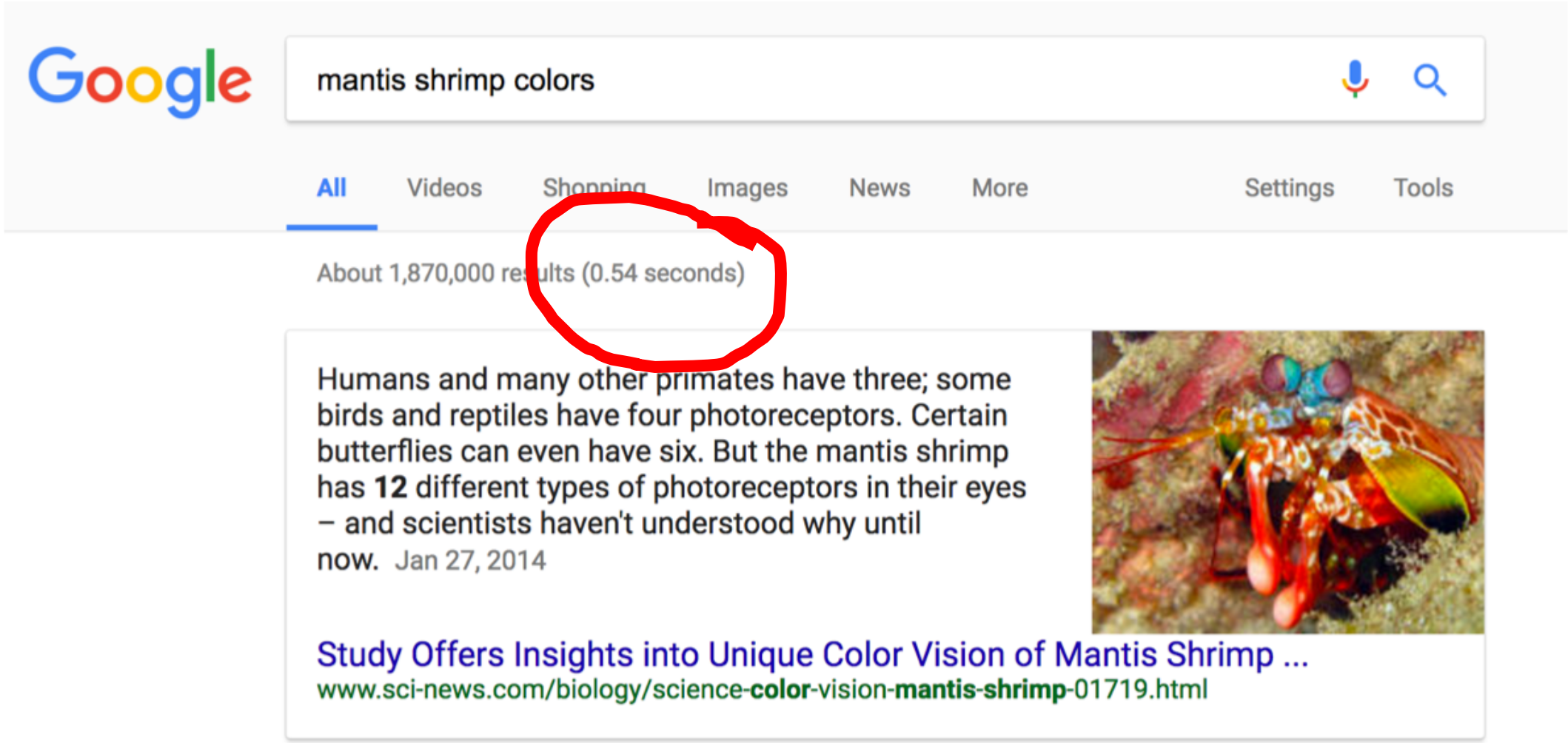

# Why is this so fast?


```
int hash(string key);
```

* Learn more in CS106B