

CS 475 Go Programming

Material taken/derived from:

- Princeton COS-418 materials created by Michael Freedman and Wyatt Lloyd.

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Preview

- Go basic syntaxes
 - Package, variable, loop, and function
- Go build-in data structures
 - Slices and Maps
- Go object-oriented programming concept
 - Struct
- Go concurrent programming
 - Goroutine and channels

// All files start with a package declaration

package main

// Import statements, one package on each line

import (
 "errors"
 "fmt"
)

// Main method will be called when the Go executable is run

func main() {
 fmt.Println("Hello world!")
 basic()
 add(1, 2)
 divide(3, 4)
 loops()
 slices()
 maps()
 sharks()
}

```
// Function declaration
func basic() {
    // Declare x as a variable, initialized to 0
    var x int
    // Declare y as a variable, initialized to 2
    var y int = 2
    // Declare z as a variable, initialized to 4
    // This syntax can only be used in a function
    z := 4

    // Assign values to variables
    x = 1
    y = 2
    z = x + 2 * y + 3

    // Print the variables; just use %v for most types
    fmt.Printf("x = %v, y = %v, z = %v\n", x, y, z)
}
```

// Function declaration; takes in 2 ints and outputs an int

```
func add(x, y int) int {  
    return x + y  
}
```

// Function that returns two things; error is nil if successful

```
func divide(x, y int) (float64, error) {  
    if y == 0 {  
        return 0.0, errors.New("Divide by zero")  
    }  
    // Cast x and y to float64 before dividing  
    return float64(x) / float64(y), nil  
}
```

```
func loops() {  
    // For loop  
    for i := 0; i < 10; i++ {  
        fmt.Print(".")  
    }  
    // While loop  
    sum := 1  
    for sum < 1000 {  
        sum *= 2  
    }  
    fmt.Printf("The sum is %v\n", sum)  
}
```

```
func slices() {  
    slice := []int{1, 2, 3, 4, 5, 6, 7, 8}  
    fmt.Println(slice)  
    fmt.Println(slice[2:5]) // 3, 4, 5  
    fmt.Println(slice[5:]) // 6, 7, 8  
    fmt.Println(slice[:3]) // 1, 2, 3  
    slice2 := make([]string, 3)  
    slice2[0] = "tic"  
    slice2[1] = "tac"  
    slice2[2] = "toe"  
    fmt.Println(slice2)  
    slice2 = append(slice2, "tom")  
    slice2 = append(slice2, "radar")  
    fmt.Println(slice2)  
    for index, value := range slice2 {  
        fmt.Printf("%v: %v\n", index, value)  
    }  
    fmt.Printf("Slice length = %v\n", len(slice2))  
}
```

```
func maps() {  
    myMap := make(map[string]int)  
    myMap["yellow"] = 1  
    myMap["magic"] = 2  
    myMap["amsterdam"] = 3  
    fmt.Println(myMap)  
    myMap["magic"] = 100  
    delete(myMap, "amsterdam")  
    fmt.Println(myMap)  
    fmt.Printf("Map size = %v\n", len(myMap))  
}
```


// Object oriented programming
// Convention: capitalize first letter of public fields

```
type Shark struct {  
    Name string  
    Age int  
}
```

// Declare a public method
// This is called a receiver method

```
func (s *Shark) Bite() {  
    fmt.Printf("%v says CHOMP!\n", s.Name)  
}
```

// Because functions in Go are pass by value
// (as opposed to pass by reference), receiver
// methods generally take in pointers to the
// object instead of the object itself.

```
func (s *Shark) ChangeName(newName string) {  
    s.Name = newName  
}
```

// Receiver methods can take in other objects as well

```
func (s *Shark) Greet(s2 *Shark) {  
    if (s.Age < s2.Age) {  
        fmt.Printf("%v says your majesty\n", s.Name)  
    } else {  
        fmt.Printf("%v says yo what's up %v\n",  
            s.Name, s2.Name)  
    }  
}
```

```
func sharks() {  
    shark1 := Shark{"Bruce", 32}  
    shark2 := Shark{"Sharkira", 40}  
    shark1.Bite()  
    shark1.ChangeName("Lee")  
    shark1.Greet(&shark2) // pass in pointer  
    shark2.Greet(&shark1)  
}
```

```
// Launch n goroutines, each printing a number  
// Note how the numbers are not printed in order  
func goroutines() {  
    for i := 0; i < 10; i++ {  
        // Print the number asynchronously  
        go fmt.Printf("Printing %v in a goroutine\n", i)  
    }  
    // At this point the numbers may not have been printed yet  
    fmt.Println("Launched the goroutines")  
}
```

// Channels are a way to pass messages across goroutines

```
func channels() {
```

```
    ch := make(chan int)
```

// Launch a goroutine using an anonymous function

```
go func() {
```

```
    i := 1
```

```
    for {
```

```
        // This line blocks until someone
```

```
        // consumes from the channel
```

```
        ch <- i * i
```

```
        i++
```

```
    }
```

```
}()
```

// Extract first 10 squared numbers from the channel

```
for i := 0; i < 10; i++ {
```

```
    // This line blocks until someone sends into the channel
```

```
    fmt.Printf("The next squared number is %v\n", <-ch)
```

```
}
```

```
}
```

```
// Buffered channels are like channels except:  
// 1. Sending only blocks when the channel is full  
// 2. Receiving only blocks when the channel is empty  
func bufferedChannels() {  
    ch := make(chan int, 3)  
    ch <- 1  
    ch <- 2  
    ch <- 3  
  
// Buffer is now full; sending any new messages will block  
// Instead let's just consume from the channel  
    for i := 0; i < 3; i++ {  
        fmt.Printf("Consuming %v from channel\n", <-ch)  
    }  
  
// Buffer is now empty; consuming from channel will block  
}
```

Excellent resources:

Go tutorial: <https://tour.golang.org/list>

Hello World: <https://play.golang.org>

Basic syntax code in playground:

<https://tinyurl.com/y7rdgqj3>

Exercise (Q1-5)

Exercise (Q6-7)