Ray Wenderlich para mim 11:00

Hi again José,

Welcome back to the **raywenderlich.com iOS Apprentice Email Course**!

At this point, your game is fully playable. The gameplay rules are all implemented and the logic doesn't seem to have any big flaws. As far as I can tell, there are no bugs either. But there's still some room for improvement.

So it's time to add some polish to the app! Get ready to twerk - err, I mean tweak.

> **Note:** Prefer learning via video? You might like to check out videos #24 and #27-31 of the free video version of this course, which correspond to this email.

Tweaks

Obviously, the game is not very pretty yet and you will get to work on that soon. In the mean time, there are a few smaller tweaks you can make.

The alert title

Unless you already changed it, the title of the alert still says "Hello, World!" You could give it the name of the game, **Bull's Eye**, but I have a better idea. What if you change the title depending on how well the player did?

If the player put the slider right on the target, the alert could say: "Perfect!" If the slider is close to the target but not quite there, it could say, "You almost had it!" If the player is way off, the alert could say: "Not even close..." And so on. This gives the player a little more feedback on how well they did.

> **Challenge:** Stop reading this email for a moment, and think of a way to accomplish this. Where would you put this logic and how would you program it? Hint: there are an awful lot of "if's" in the preceding sentences.

Once you've got some ideas in mind, open up the Bull's Eye project where you left it off last time (or download the starter project from the corresponding forum discussion thread), and open up **ViewController.swift**.

The right place for this logic is `showAlert()`, because that is where you create the `UIAlertController`. You already do some calculations to create the message text and now you will do something similar for the title text.

➤ Here is the changed method in its entirety - replace the existing method with it:

```
@IBAction func showAlert() {
  let difference = abs(targetValue - currentValue)
  let points = 100 - difference
  score += points

  // add these lines
  let title: String
  if difference == 0 {
    title = "Perfect!"
  } else if difference < 5 {
    title = "You almost had it!"
  } else if difference < 10 {
    title = "Pretty good!"
  } else {
    title = "Not even close..."
  }

  let message = "You scored \(points) points"

  let alert = UIAlertController(title: title,  // change this
                                message: message,
                                preferredStyle: .alert)

  let action = UIAlertAction(title: "OK", style: .default,
                             handler: nil)
  alert.addAction(action)
  present(alert, animated: true, completion: nil)

  startNewRound()
}
```

You create a new local string named `title`, which will contain the text that is set for the alert title. Initially, this `title` doesn't have any value. (We'll discuss the `title` variable and how it is set up a bit more in detail just a little further on.)

To decide which title text to use, you look at the difference between the slider position and the target:

- If it equals 0, then the player was spot-on and you set `title` to “Perfect!” .
- If the difference is less than 5, you use the text “You almost had it!”
- A difference less than 10 is “Pretty good!”
- However, if the difference is 10 or greater, then you consider the player’s attempt “Not even close...”

Can you follow the logic here? It’s just a bunch of `if` statements that consider the different possibilities and choose a string in response.

When you create the `UIAlertController` object, you now give it this `title` string instead of a fixed text.

Constant initialization

In the above code, did you notice that `title` was declared explicitly as being a `String` value? And did you ask yourself why type inference wasn't used there instead? Also, you might have noticed that `title` is actually a constant and yet the code appears to set its value in multiple places. How does that work?

The answer to all of these questions lies in how constants (or `let` values, if you prefer) are initialized in Swift.

You could certainly have used type inference to declare the type for `title` by setting the initial declaration to:

```
let title = ""
```

But do you see the issue there? Now you've actually set the value for `title` and since it's a constant, you can't change the value again. So, the following lines where the `if` condition logic sets a value for `title` would now throw a compiler error since you are trying to set a value to a constant which already has a value. (Go on, try it in your own project! You know you want to … :])

One way to fix this would be to declare `title` as a variable rather than a constant. Like this:

```
var title = ""
```

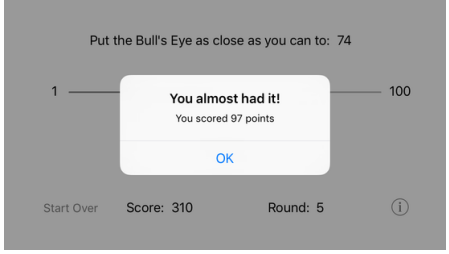
The above would work fine, and the compiler error would go away and everything would work fine. But you've got to ask yourself, do you really need a variable there? Or, would a constant do? I personally prefer to use constants where possible since they have less risk of unexpected side-effects because the value was accidentally changed in some fashion - for example, because one of your team members changed the code to use a variable that you had originally depended on being unchanged. That is why the code was written the way it was. But you can decide to carve out your own path since either approach would work.

But if you do declare `title` as a constant, how is it that your code above assigns multiple values to it? The secret is in the fact that while there are indeed multiple values being assigned to `title` , only one value would be assigned per each call to `showAlert` since the branches of an `if` condition are mutually exclusive. So, since `title` starts out without a value (the `let title: String` line only assigns a type, not a value), as long as the code ensures that `title` would always be initialized to a value before the value stored in `title` is accessed, the compiler will not complain.

Again, you can test for this by removing the `else` condition in the block of code where a value is assigned to `title`. Since an `if` condition is only one branch of a test, you need an `else` branch in order for the tests (and the assignment to `title`) to be exhaustive. So, if you remove the `else` branch, Xcode will immediately complain with an error like: "Constant 'title' used before being initialized".

```
59      let title: String
60      if difference == 0 {
61        title = "Perfect!"
62      } else if difference < 5 {
63        title = "You almost had it!"
64      } else if difference < 10 {
65        title = "Pretty good!"
66  //    } else {
67  //      title = "Not even close..."
68      }
69
70      let message = "You scored \(points) points"
71
72      let alert = UIAlertController(title: title,     ● Constant 'title' used before being initialized
73                                    message: message,
74                                    preferredStyle: .alert)
```

Run the app and play the game for a bit. You’ll see that the title text changes depending on how well you’re doing. That `if` statement sure is handy!



Bonus points

And now, it's time for a challenge!

Your challenge is to give players an additional 100 bonus points when they get a perfect score. This will encourage players to really try to place the bull's eye right on the target. Otherwise, there isn't much difference between 100 points for a perfect score and 98 or 95 points if you're close but not quite there.

Now there is an incentive for trying harder – a perfect score is no longer worth just 100 but 200 points! Maybe you can also give the player 50 bonus points for being just one off.

> **Challenge:** If you haven't already, stop reading this email and try writing some code to give the player 100 bonus points when they get a perfect score. If you'd like to compare what you wrote with ours, stop by the discussion thread on our forums. We'd love to see what you came up with! :]

When you're done, run the app to see if you can score some bonus points!

Local variables recap

I would like to point out once more the difference between local variables and instance variables. As you should know by now, a local variable only exists for the duration of the method that it is defined in, while an instance variable exists as long as the view controller (or any object that owns it) exists. The same thing is true for constants.

In `showAlert()`, there are six locals and you use three instance variables:

```
let difference = abs(targetValue - currentValue)
var points = 100 - difference
let title = . . .
score += points
let message = . . .
let alert = . . .
let action = . . .
```

> **Challenge:** Stop reading for a moment, and point out which are the locals and which are the instance variables in the `showAlert()` method. Of the locals, which are variables and which are constants?

Locals are easy to recognize, because the first time they are used inside a method their name is preceded with `let` or `var`:

```
let difference = . . .
var points = . . .
let title = . . .
let message = . . .
let alert = . . .
let action = . . .
```

This syntax creates a new variable (`var`) or constant (`let`). Because these variables and constants are created inside the method, they are locals.

Those six items – `difference`, `points`, `title`, `message`, `alert`, and `action` – are restricted to the `showAlert()` method and do not exist outside of it. As soon as the method is done, the locals cease to exist.

You may be wondering how `difference`, for example, can have a different value every time the player taps the Hit Me button, even though it is a constant – after all, aren't constants given a value just once, never to change afterwards?

Here's why: each time a method is invoked, its local variables and constants are created anew. The old values have long been discarded and you get brand new ones.

When `showAlert()` is called, it creates a completely new instance of `difference` that is unrelated to the previous one. That particular constant value is only used until the end of `showAlert()` and then it is discarded.

The next time `showAlert()` is called after that, it creates yet another new instance of `difference` (as well as new instances of the other locals `points`, `title`, `message`, `alert`, and `action`). And so on… There's some serious recycling going on here!

But inside a single invocation of `showAlert()`, `difference` can never change once it has a value assigned. The only local in `showAlert()` that can change is `points`, because it's a `var`.

The instance variables, on the other hand, are defined outside of any method. It is common to put them at the top of the file:

```
class ViewController: UIViewController {
  var currentValue = 0
  var targetValue = 0
  var score = 0
  var round = 0
```

As a result, you can use these variables inside any method, without the need to declare them again, and they will keep their values till the object holding them (the view controller in this case) ceases to exist.

If you were to do this:

```
@IBAction func showAlert() {
  let difference = abs(targetValue - currentValue)
  var points = 100 - difference

  var score = score + points       // doesn't work!
  . . .
}
```

Then things wouldn't work as you'd expect them to. Because you now put `var` in front of `score`, you have made it a new local variable that is only valid inside this method.

In other words, this won't add `points` to the **instance variable** `score` but to a new **local variable** that also happens to be named `score`. The instance variable `score` never gets changed, even though it has the same name.

Obviously that is not what you want to happen here. Fortunately, the above won't even compile. Swift knows there's something fishy about that line.

Good news - at this time, you're more than halfway through the course! And I'm betting you're ready for a break. :]

So next time, we'll switch gears I'll send you a little surprise. Hint: it's fun, entertaining, and maybe even a little inspirational. Stay tuned!

- Ray