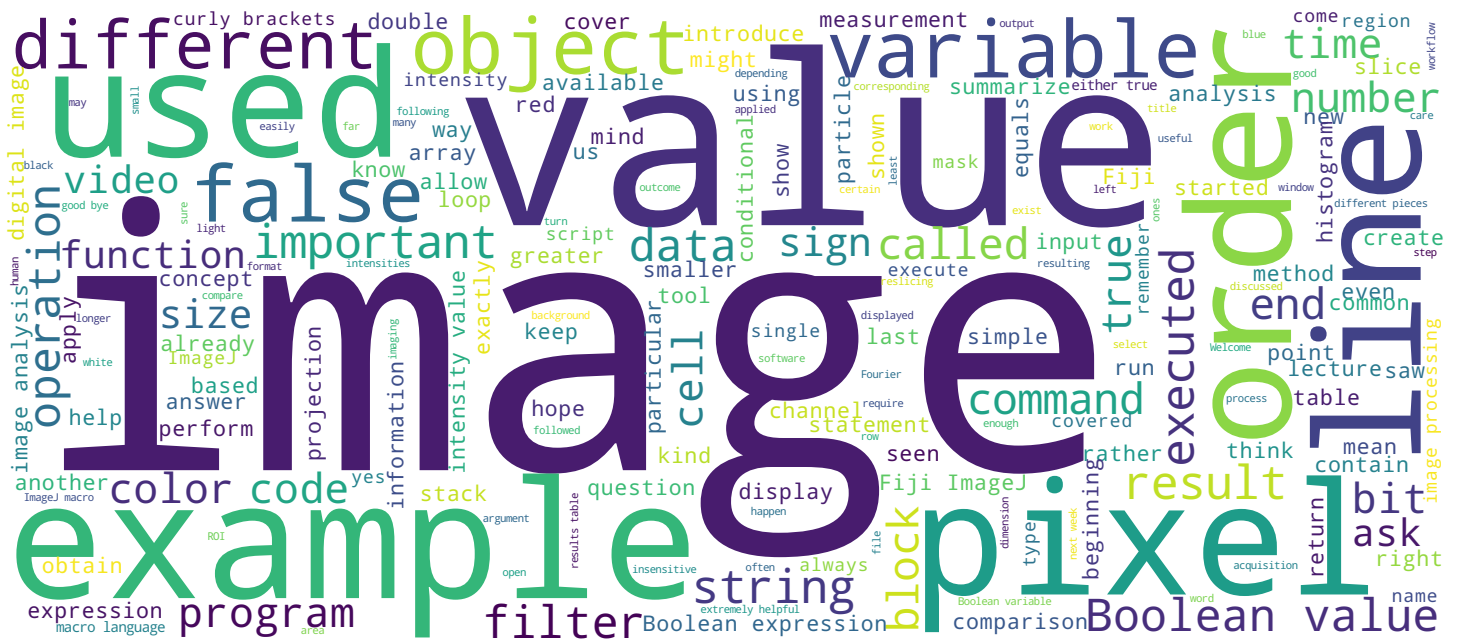


Conditionals

Image Processing & Analysis for Life Scientists

Olivier Burri, Romain Guet & Arne Seitz



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Video





- Booleans
- Conditionals
- Implementation in ImageJ Macro language

Welcome to this lecture dealing with conditionals and their implementation in Fiji/ImageJ. At the beginning we will briefly discuss variables of the type Boolean. Conditional allows a program to execute parts of a program or script based on a condition. And they're often using these kind of variables. At least for the decision making, these variables are extremely helpful. So let's get started and dive into the Boolean world.

Notes

Summary



0m 05s



- Binary variable
 - Values: True, False
- Example:
 $a=2, b=3$.
 - Is a greater than b ($a>b$)? False
 - Is a smaller than b ($a<b$)? True
 - Is a equal to b ($a==b$)? False
 - Is a NOT equal to b ($a!=b$)? True

A Boolean variable is nothing else than a binary variable. It has exactly two values: true or false. That might sound a bit trivial, but it turns out to be extremely helpful in certain cases. Let's have a look at an example. We have the variable "a" which equals 2 and another variable "b" which equals three. For a human, it is obvious that b is greater than a. However for a computer this is less obvious. There we need to connect the variables with certain operators and ask whether the expression is true or false. In other words the decision is resulting in a Boolean value. If we ask: is a greater than b? The answer is "no", or, translated in a Boolean value: false. If we ask: is a smaller than b. The answer is yes, or true respectively. Is a equal to b? Rather not. So the corresponding Boolean value is false. But if we ask: is a NOT equal to b? then the answer is yes or true. Especially the last case is a bit confusing and requires to some time to think about it.

Notes

Summary





- Binary variable
 - Values: True, False
- Example:
a=2, b=3.
 - Is a greater than b ($a > b$)? False
 - Is a smaller than b ($a < b$)? True
 - Is a equal to b ($a == b$)? False
 - Is a NOT equal to b ($a != b$)? True
- a=3, b=3.
 - Is a greater than b ($a > b$)? False
 - Is a smaller than b ($a < b$)? False
 - Is a equal to b ($a == b$)? True
 - Is a NOT equal to b ($a != b$)? False

We can now slightly modify the example and set a to 3 and b to 3 as well. If we ask the same questions as above we obtain false for the first question, as a is not greater than b. Also the statement "a is smaller than b" is false. However a equals b. Therefore this statement is true. Logically, statement 4 needs to be the opposite of statement 3. Therefore, the outcome of the question is false. There is a lot more one can do with Boolean values. But for the moment, this shall be enough.

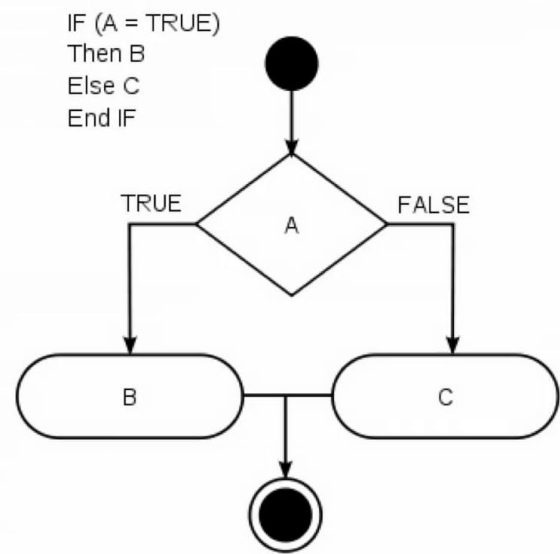
Notes

Summary



2m 01s

Conditionals



In case we want to branch a program, we need to introduce such called conditionals. We feed in a Boolean value into that routine. And based on its value, we execute two different parts of the program. If a is true we execute block b. In case it is false we execute c.

Notes

Summary



2m 39s

Conditionals



- if ... else...
- Allows for a program to execute different code depending on some criterion

```
if(**Condition**) {  
    **Code if condition is true**  
} else {  
    **Code if condition is false**  
}
```

In practice, this is realized with a so called if/else conditional. In case a condition/Boolean is true, the first block is executed. Otherwise, the block b is executed. If the blocks a is longer than a single line, the curly brackets are used in order to mark the beginning and the end of the block. The else block is optional. In case it is missing, nothing happens, in case the condition is not met.

Notes

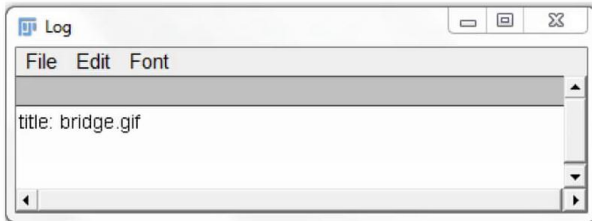
Summary



3m 03s

Example if...else statement

true



```
if (nImages>0) {
```

```
    title = getTitle();  
    print("title: " + title);
```

```
} else print ("Please open an image");
```

So let's get a bit more practical and let's have a look at the following piece of code. The first line is consisting of the conditional. The expression in brackets is delivering a Boolean value, as the function `nImages` returns the number of images which are currently opened in Fiji/ImageJ. It is followed by the block which contains the commands to be executed in case the Boolean is true. Here, it consists of two lines. In the first one we are defining the string `title` by the help of the function `getTitle()`. In the second line we are outputting the title as can be seen next to the code. It is important to end each line with a semicolon. Feel free to try out what happens if you delete it.

Notes

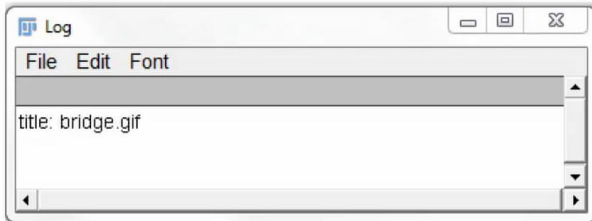
Summary



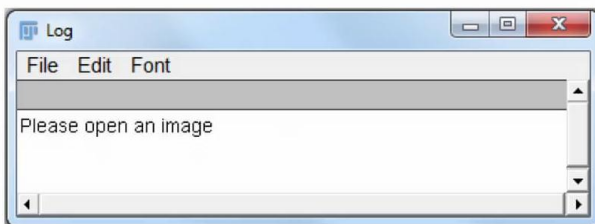
3m 35s

Example if...else statement

true



false



```
if (nImages>0) {
```

```
    title = getTitle();  
    print("title: " + title);
```

```
} else print ("Please open an image");
```

Note that the "==" operator is used for comparisons and the "=" operator is used for assignments.

In case the boolean expression is false the line after the else command is executed. As we are only having one line to be executed, we do not need to put the expression inside curly brackets. However in case of the block contained several lines, we would need to place them as well. Any if/else statement consists of a Boolean expression which can be either true or false. Depending on its value, different pieces of code are executed. It is important to keep in mind that one equal sign is used for assignments, For example to assign a value to a variable. The double equal sign is used for comparisons and returns a Boolean value. In case you use one equal sign in an if/else expression, the compiler will complain.

Notes

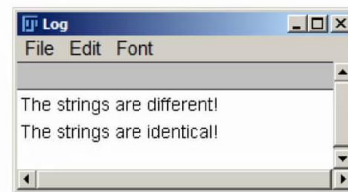
Summary



Conditionals with Strings



```
1  
2 print("\\Clear")  
3  
4 a="Olivier";  
5 b="Romain";  
6  
7 if (a==b){;print("The strings are identical!");}  
8 else print("The strings are different!");  
9  
10 a="Olivier";  
11 b="olivier";  
12  
13 if (a==b){;print("The strings are identical!");}  
14 else print("The strings are different!");  
15  
16  
17
```



Towards the end of the lecture I want to briefly touch on Conditionals using expressions with strings. In particular in workflows with more than one image they are extremely useful in order to make sure that a certain image processing routine is applied to the correct image. However, comparison of strings is tricky as they are an array of characters and more difficult to compare than just numbers. On my left hand side you can see an example of a conditional with Strings. You can see that strings can be compared with the double equal sign in the Fiji/ImageJ macro language. However it is important to keep in mind that this comparison is case insensitive.

Notes

Summary



5m 15s



- Booleans
- Conditionals
 - If...else statement
- Implementation ImageJ Makro language
 - If...else statement works for numeric variables.
 - If...else statement works for strings (case insensitive).

So let's summarize: I have introduced Boolean variables and Boolean expressions. They have in common that they can only have two values: either true or false. They are used in if/else statement. There, depending on the value of the variable of the Boolean expression, different pieces of code are executed. This enables us to make decisions within a program or script. The if/else statement works with numerical variables as well as with strings. In the latter case, it is important to remember that the comparison is case insensitive. I hope to see you next week. Take care and good bye!

Notes

Summary



6m 00s