

# ElephantROBOTICS

**The RoboFlowScript Programming Language**

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# 1. The RoboFlowScript Programming Language

The RoboFlowScript is the programming language that controls the robot. The RoboFlowScript includes variables, types, and the flow control statements. There are also built-in variables and functions that monitor and control I/O and robot movements.

## 1.1. Numbers, Variables, and Types

In RoboFlowScript arithmetic expression syntax is standard:

```
1+4-5
5*1/2
(4+5)*3/(7-6)
```

In boolean expressions, boolean operators are spelled out:

```
true or false and (2 == 5)
52 > 19 or 5 != -62 and -7 < 24
not 46 >= 73 and 39 <= 92
```

Variable assignment is done using the equal sign =:

```
num = 68
test = false or true and not false
num_expr = 39-90/3.19024
string = "This is string text"
p = [ 1, 2, 3, 4, 5, 6 ]
p[Z] = p[0] + 5
```

The type of a variable is deduced from the assignment of the variable. In the example above num is a Number, test is a Boolean, num\_expression is a Number, string is a String, p is Array.

The RoboFlowScript types are:

- Number (floating-point number or integer)
- Boolean
- String

- Array

Array is a collection of 6 numbers: X, Y, Z coordinates of the robot and RX, RY, RZ rotation values of the toolhead.

## 1.2. Flow of Control

The flow of control of a program is controlled by if and switch statements:

```
if (cond1) {  
    stmt1  
    stmt2  
} else if (cond2) {  
    stmt3  
    stmt4  
} else {  
    stmt5  
    stmt6  
}
```

```
switch (var) {  
case 1:  
    stmt1;  
case2:  
    stmt2;  
default:  
    def_stmt;  
}
```

and while-loops:

```
while (num < 5) {  
    num = num + 1  
    stmt  
}
```

## 1.3. Keywords

- **return** – returns from a function
- **call** – calls user-defined function
- **function** – defines user-defined function
- **import** – imports OS variable to the script scope
- **export** – exports script variable to the OS variables list
- **global** – directly access variables from the OS

## 1.4. Function

A function is declared as follows:

```
function add(a, b)
{
    return a + b
}
```

The function can then be called like this:

```
sum = call add(1, 4)
```

All the function arguments are passed-by-value. This means that any modification done to the content of the argument within the scope of the function will not be reflected outside that scope.

## 2. Built-in Functions

### 2.1. GetAngles

#### **GetAngles()**

Returns current joints angle values of the robot.

#### **Parameters:**

None.

#### **Example Code:**

```
angles = GetAngles()
```

### 2.2. GetCoords

#### **GetCoords()**

Returns current coordinates & rotation angle value of the toolhead of the robot.

#### **Parameters:**

None.

### Example Code:

```
coords = GetCoords()
```

## 2.3. GetDigitalIn

### GetDigitalIn(pin\_number)

Returns requested input pin signal (0 or 1).

#### Parameters:

pin\_number – Integer between 0-31 of input pin number

### Example Code:

```
if (GetDigitalIn(5) == 1) {  
    pin_7 = GetDigitalIn(7)  
}
```

## 2.4. GetDigitalOut

### GetDigitalOut(pin\_number)

Returns requested output pin signal (0 or 1).

#### Parameters:

pin\_number – Integer between 0-31 of output pin number

### Example Code:

```
if (GetDigitalOut(9) == 1) {  
    pin_7 = GetDigitalOut(8)  
}
```

## 2.5. ReceiveData

### ReceiveData(IP\_address, port, timeout)

Receives data from the specified IP address and port and returns received data. Timeout specifies time to wait in seconds. If timeout is reached, string “connect timeout” returned.

#### Parameters:

IP\_address – IP address as string

port – port number

timeout – time to wait for data in seconds

#### **Example Code:**

```
ReceiveData("192.168.1.154", 3001, 10.5)
```

## 2.6. SendData

### **SendData(IP\_address, port, data, is\_string)**

Sends given data to the specified IP address and port. If `is_string` is true, sends data as string.

#### **Parameters:**

IP\_address – IP address as string

port – port number

data – buffer with the data

is\_string – boolean value. If true, sends data as string.

#### **Example Code:**

```
SendData("192.168.1.154", 3000, buffer, true)
```

## 2.7. SetAnalogOut

### **SetAnalogOut(pin\_number, pin\_value)**

Sets requested analog output pin to the specified value.

#### **Parameters:**

pin\_number – Integer between 0-31 of output analog pin number

pin\_value – Floating-point number

#### **Example Code:**

```
SetAnalogOut(2, 3.1415)
```

## 2.8. SetAngle

### **SetAngle(joint, angle, speed)**

Moves requested joint to the specified angle with the given speed.

#### **Parameters:**

joint – J1-J6 or integer 0-5 representing joint number

angle – angle of the joint to move to

speed – speed of moving of the joint

#### **Example Code:**

```
SetAngle(J1, 30.33, 3000)
```

## 2.9. SetAngles

### **SetAngles(angles, speed)**

Moves robot joints to the specified position with the given speed. Position is specified with angle values of each joint

#### **Parameters:**

angles – angle values of each joint

speed – speed of moving of the robot

#### **Example Code:**

```
SetAngles(angles, 3000)
```

## 2.10. SetCoord

### **SetCoord(axis, coord, speed)**

Moves robot along requested axis to the specified coordinate with the given speed.

#### **Parameters:**

axis – any of X, Y, Z, RX, RY, RZ or integer 0-5 representing axis by number



coord – coordinate of the specified axis where to move the robot

speed – speed of moving along the requested axis

**Example Code:**

```
SetCoord(X, 250.22, 3000)
```

## 2.11. SetCoords

**SetCoords(coords, speed)**

Moves robot to the specified position with the given speed. Position is specified with coordinates of each axis.

**Parameters:**

coords – array of coordinates for each axis

speed – speed of moving of the robot

**Example Code:**

```
SetCoords(coords, 3000)
```

## 2.12. SetDigitalOut

**SetDigitalOut(pin\_number, pin\_signal)**

Sets requested digital output pin to the specified value.

**Parameters:**

pin\_number – Integer between 0-31 of output digital pin number

pin\_signal– Integer 0 or 1 value

**Example Code:**

```
SetDigitalOut(12, 1)
```

## 3. Built-in Constants

### 3.1. true & false

Represent boolean values true and false and can be used in variable assignments, conditions and expressions.

### 3.2. X, Y, Z, RX, RY, RZ

Can be used to access and set individual elements of array using respective coordinates and rotation values.

### 3.3. J1, J2, J3, J4, J5, J6

Can be used to access and set individual elements of array using angle values of each joint.