Writing Scripts - Using the Script Builder

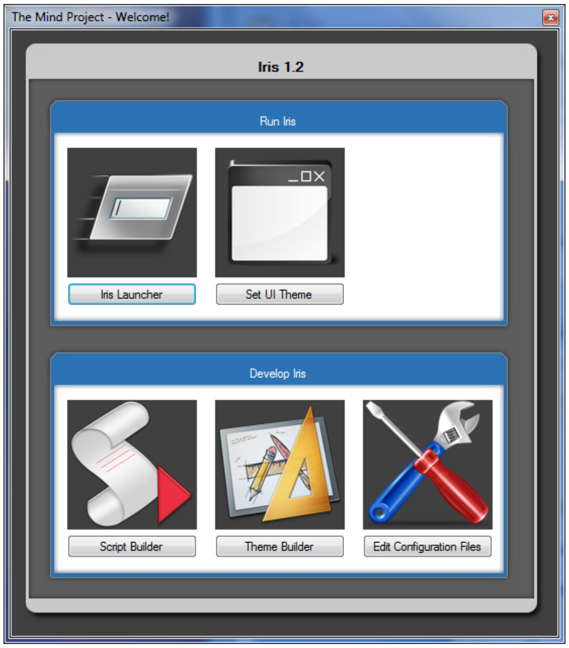
Introduction

The following activities are meant to help you learn how to write scripts to move the robot's robotic arm. Since the robotic arm is used by the robot for its primary interaction with its environment, it is used for a wide variety of tasks. These scripts will command the arm to perform tasks such as picking up blocks, stacking them, and dropping them into cups. Try to write high quality scripts now because the scripts that you write can be utilized by the robot's AI to perform tasks later.

Starting the Script Builder

To launch the Script Builder, you simply need to run the Iris Graphical User Interface (GUI). A shortcut to this should exist on the desktop called "Iris 1". If it does not, see your instructor.

After double clicking the Iris shortcut on the desktop, you should see a screen similar to the following:

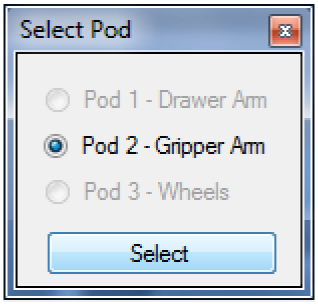


Please note that as features are added to the system, icons may be added to this menu so it may look slightly different from the image pictured to the left.

Once you are on the welcome screen, click on the "Script Builder" button to launch the Script Builder.

Using the Script Builder

Before you can start writing the script, you will be presented with the option to choose which **pod** that you would like to write the script for. A **pod** is a group of **servos** connected to the **servo controller**. A **servo** is essentially a small motor that can move to different positions. The "servo controller" is the board that supplies power to all of the servos and controls all of their positions. The pod selection window will look like the following:



Select Pod

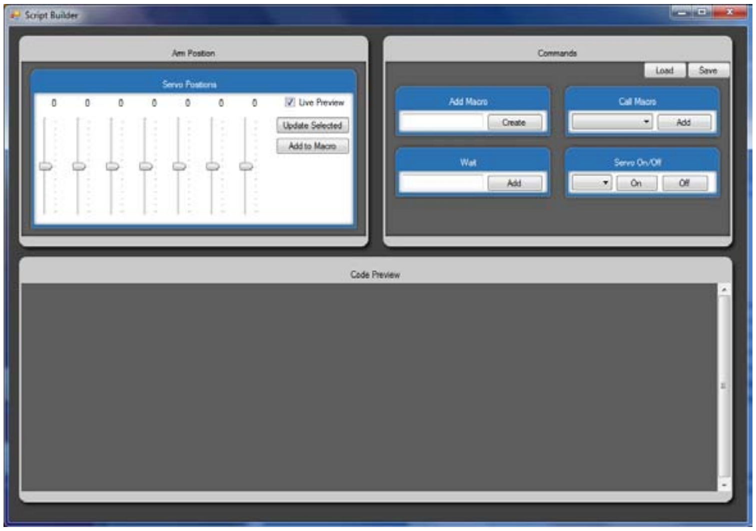
○ Pod 1 - Drawer Arm

● Pod 2 - Gripper Arm

○ Pod 3 - Wheels

For the following exercises, you will want to select Pod 2 to write scripts for the gripper arm. Before you press the "select" button, make sure that the servo controller is connected to the computer with a USB cable and that it is powered on. Once you have ensured the servo controller is plugged in and powered on, select "Pod 2 – Gripper Arm" and press the "Select" button. Upon doing so, the Script Builder window will open and the robotic arm should move to its default, upright position. If the robotic arm does not move to its default position, please see your teacher so he or she can diagnose the issue.

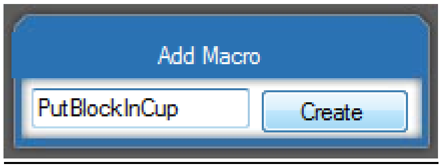
The Script Builder will look like the following:



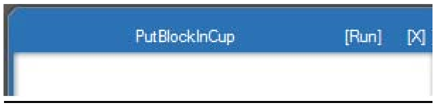
The script builder is divided into 3 panels. The bottom panel is the "Code Preview" panel which shows the script as you construct it. The top left panel is the "Arm Position" panel which controls the current position of the arm. The "Commands" panel consists of all of the possible commands to add to the script that do not pertain to movement.

Adding Macros

A script is organized into **macros**. A **macro** is essentially a collection of commands that tell the arm what to do. When a macro is run, the commands in the macro are run in order.

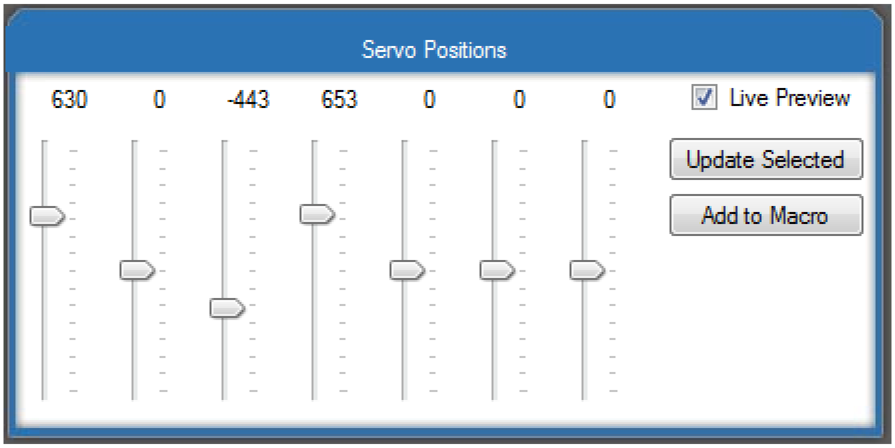


PutBlockInCup



In the "Commands" panel, you can use the Add Macro subpanel to create macros. Upon creating a macro, it will be added to the "Code Preview" panel where it is automatically selected and ready for you to add each command that will be included in the macro.

Arm Movement

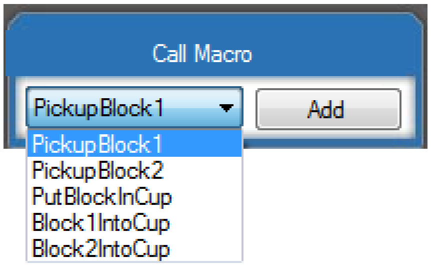


630 0 -443 653 0 0 0

☑ Live Preview

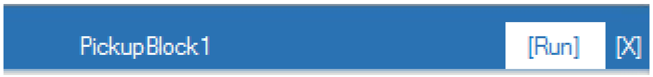
In the "Arm Movement" panel you can use the sliders to control the positions of the arm. If the arm is attached to the computer, moving a slider will directly move the arm. This makes it very easy to write scripts as you can move the arm as you create the script. Selected "Add to Macro" will add a command to the selected macro to move the arm to the current position of the sliders.

Calling Macros



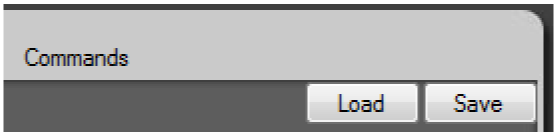
Macros are capable of calling other macros. It is sometimes very useful to create a small macro that will implement functionality that can be used frequently by other macros. It makes it so that you don't have to rewrite script code multiple times! To add a macro call, simply select the macro from the drop down list and click add. It will be added to the macro selected in the "Code Preview" panel.

Running a Macro



In order to run a macro, select the run button on the macro's title bar in the "Code Preview" panel. When you "run" a macro, the arm will move according to the commands that you included in the macro

Loading / Saving



To load or save a script, simply press the corresponding buttons in the "Commands" panel. It will save the script in the Iris\bin\Parallax folder in your computer. By default, the Iris folder is in the root folder of the C drive.

Script Builder - Exercise 1: “Running a Sample Script”

Introduction

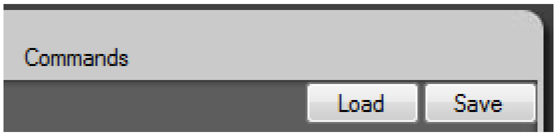
This is a short lab that is designed to teach you how to load and run a script using the Script Builder GUI.

Setup

Launch the Script Builder. Select to create a script for “Pod 2”. Remember, when you launch the Script Builder the robotic arm that is plugged into the computer should move to its default position. If it does not, see your instructor.

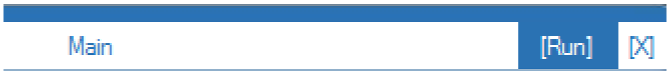
Activity

1. Select the load button in the “Commands” Panel and load the “DemoScript” script file from the load form that appears.



(Load and Save buttons)

2. Select the “Run” button on the control bar of the “Main” macro. This will run the script and the arm will move.



(Macro bar with [Run] button selected)

Script Builder - Exercise 2: “Creating a Simple Script”

Introduction

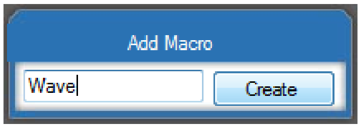
In this lab you will learn how to create a macro in a script and how to utilize the “move” commands to get the arm to perform a simple animation. Your goal is to get the arm to wave at you as if it is waving goodbye.

Setup

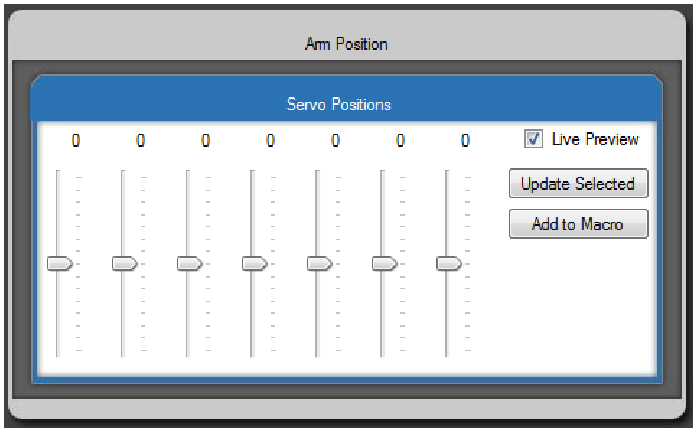
Launch the Script Builder. Select to create a script for “Pod 2”. Remember, when you launch the Script Builder the robotic arm that is plugged into the computer should move to its default position. If it does not, see your instructor.

Activity

1. Create a new macro called “Wave”. Do this by typing “Wave” into the text box in the “Add Macro” panel. Once the desired macro name is typed into the text box, click the “Add Macro” button. This will create a macro in the script editor pane. This macro will automatically be selected upon adding it.



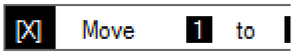
2. Use the sliders in the Arm Position panel to move the arm to what you think is the best starting position for it to start waving. Once you are in this position, click the “Add to Macro” button. You will see a line of code added to the Macro in the “Code Preview” panel. This particular line of code is called a “Servo Move” because it moves the servos to a particular position.



3. Use the sliders to position the arm all the way to the other side of the wave (Note: if you chose to start the wave in the middle, simply pick a side to move to). When you are in the desired position, please click the “Add to Macro” button to create another “Servo Move”.

4. At this point, you may preview your animation by clicking the [Run] button in the “Move” macro’s title bar. The arm will move to the default position and then to the second position you specified.

5. Repeat the steps of adding a “Servo Move” until you are satisfied with your animation. If you wish to delete a “Servo Move” at any time, you can do it by pressing the “[X]” button at the beginning of the line.



Script Builder - Exercise 3: “Picking up a block”

Introduction

In this lab you will use your existing scripting knowledge to create a more elaborate script.

Setup

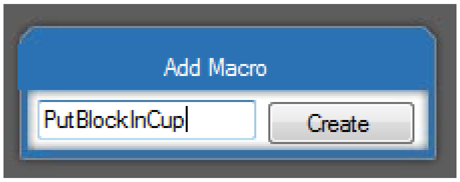
Launch the Script Builder. Select to create a script for “Pod 2”. Remember, when you launch the Script Builder the robotic arm that is plugged into the computer should move to its default position. If it does not, see your instructor. You will need a block and a cup to complete this lab.

Activity

6. Make an 17”x11” piece of paper by taping two 8.5”x11” papers together. Put this piece of paper in front of the gripper arm and secure it with tape so that it won’t move. You will use it to mark where objects should be placed for the arm to pick up.

7. Put the block and cup on top of a piece of paper so that they are within reach of the robotic arm. Mark the location of the block on the piece of paper so that you can put it back in the same location every time.

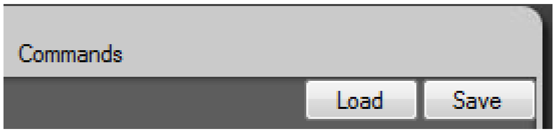
8. Create a macro called PutBlockInCup



PutBlockInCup

9. Add the appropriate "Servo Move" commands to the PutBlockInCup macro so that when it is run, it picks up the block and drops it in the cup. Ensure that the macro can be run repeatedly without error.

10. Save this macro into a script file by pressing the save button. Name it "BlockCup-Name" where "Name" is replaced by your name or your group's name. In this activity, we are creating a script with only one macro inside of it. It is important to note that a script can contain multiple macros if need-be.



Script Builder - Exercise 4: "Calling Macros"

Introduction

In this lab you will learn how to create macros that can call other macros. This is a very useful feature when multiple actions can share subtasks. This limits the amount of scripting that you have to do because you do not have to rewrite the same subtask repeatedly.

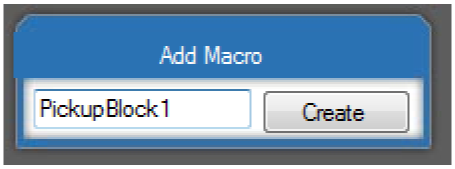
Setup

Launch the Script Builder. Select to create a script for "Pod 2". Remember, when you launch the Script Builder the robotic arm that is plugged into the computer should move to its default position. If it does not, see your instructor. You will need 2 blocks and a cup for this activity.

Activity

1. Put each block and the cup on top of a piece of paper so that they are within reach of the robotic arm. Mark the location of each block on the piece of paper.

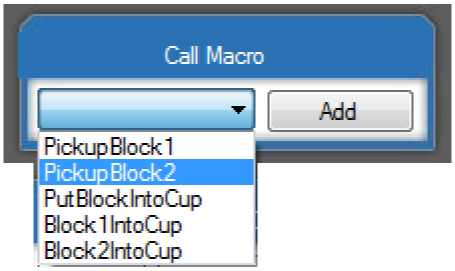
2. Create a Macro called PickupBlock1. In this macro add the “Servo Move” commands so that the arm picks up the first block. Once the block has been grabbed by the gripper, this macro is completed. You will later be writing another macro that will drop the block into the cup.



3. Create a Macro called PickupBlock2. In this macro add the “Servo Move” commands so that the arm picks up the second block.

4. Create a Macro called PutBlockIntoCup. In this macro add the “Servo Move” commands so that the arm drops the current block that it has picked up into the cup. In order to write this macro, the robot should be holding a block in its gripper.

5. Create a Macro called Block1IntoCup. This macro will call the PickupBlock1 macro and then call the PutBlockIntoCup macro so that it picks up the first block and drops it in the cup. You can call macros by selecting the macro in the drop down menu in the “Call Macro” subpanel and clicking the “Add” button. Add the commands to call the appropriate macros.



6. Create a Macro called Block2IntoCup. Follow the procedure from step 5 except for picking up the second block to put into the cup. Notice how you did not have to rewrite the code to put the second block into the cup. It uses the same command to put each block in the cup individually.