Tutorial 1 Overview of Robot Studio

1. Overview

RobotStudio is a simulation and offline programming software from ABB. The software allows robot programming to be done on a PC in the office without shutting down production. It also enables robot programs to be prepared in advance, increasing overall productivity.

RobotStudio is built on the ABB VirtualController, an exact copy of the real software that runs the robots in production. It thus allows very realistic simulations to be performed, using real robot programs and configuration files identical to those used on the shop floor. The VirtualController contains a virtual Teach Pendant Unit, which allows the operator to handle the simulated robot exactly the same way as a real robot.

1.1 Four basic steps of using Robot Studio:

- **BUILDING A STATION** – Create a new station → Import a robot → Import a tool → Attach an object → Save the station → Close the station
- **VIRTUAL CONTROLLER** – Create your own controller → The Virtual Robot Browser → Start the controller
- **MAKING THE ROBOT MOVE** – Create targets → Create path(s) → Move along a path
- **ROBOT PROGRAMMING** – Insert a model → Insert amain procedure → Include a path in a program → Add a procedure call → Play the simulation → Export the program

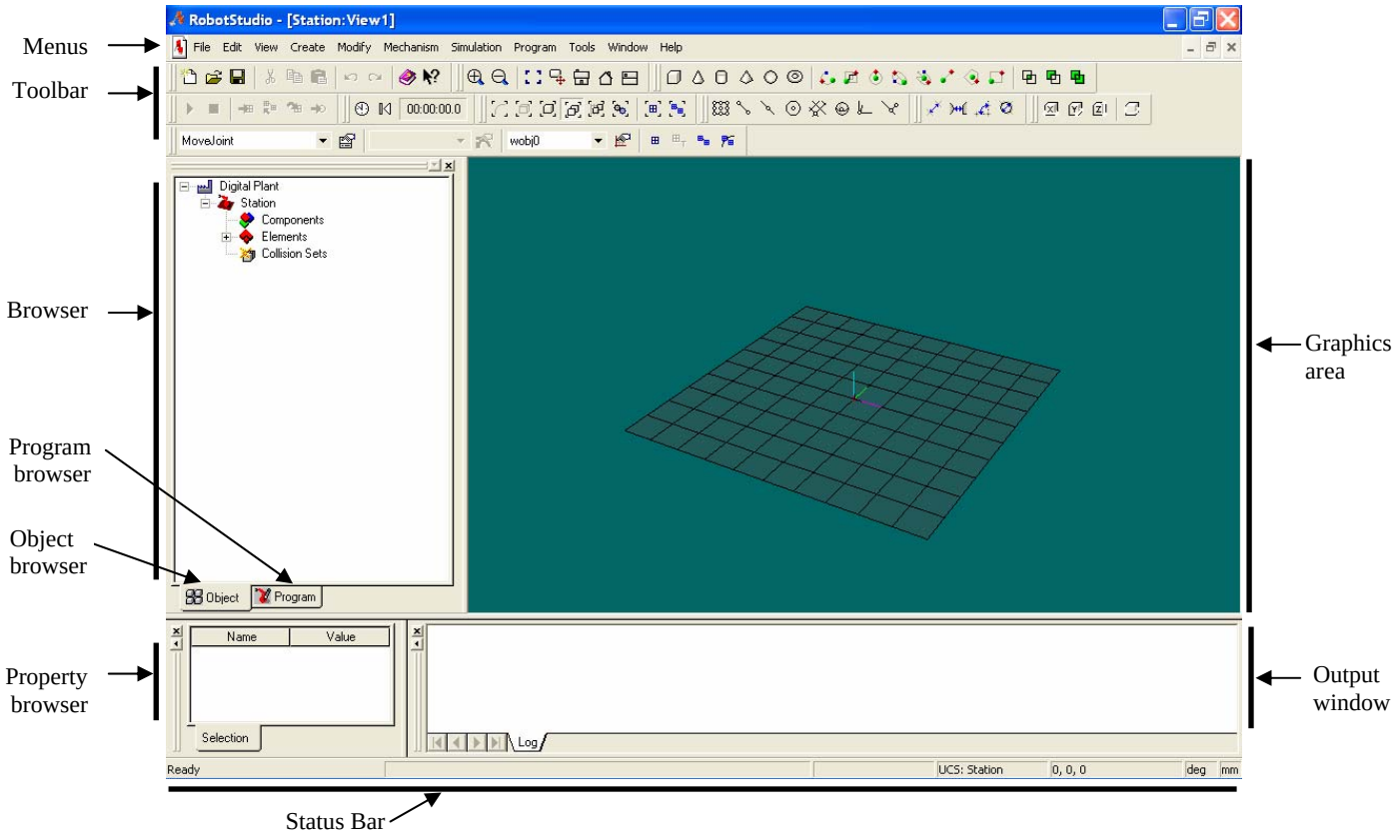
1.2 User interface

(1) Start Robot Studio

Windows **Start** menu → **Program** → **ABB Automation** → **RobotStudio** → **RobotStudio**

(2) The user interface

Eight areas – Menus, Toolbars, Browser, Property Browser, Status Bar, Output Window, and Graphics Area.



(3) Operate the Graphics view with the mouse:

Shift + Ctrl + Mouse Right Button = **Rotate**

Ctrl + Mouse Left Button = **Pan**

Ctrl + Mouse Right Button = **Zoom**

1.3 Tutorial description

This tutorial will follow the basic main steps to build a robot station and make the robot move. The Robot programming will be introduced in next tutorial.

Some Notes:

(1) Use the same computer when you come next time so remember the number of your current computer.

(2) Save all the files created in the tutorial in your personal folder:

C:\Documents and Settings\(your student ID, el.g. *waldy001*)***My Documents***\ or

Desktop\My Documents\

(3) For Tutorial Section 2.2 Virtual Controller:

DO NOT make any change to the original Virtual Controller. You **MUST** '**Create copy'** from the original Virtual Controller and **'Rename'** the copy, then do the rest following the instructions.

(4) Give a special name to the Virtual Controller you created so that you can recognize it when you access next time. **DO NOT** make changes to the Virtual Controller named by other students.

Examples of specified name to the Virtual Controller *IRB2400L_M2000*:

IRB2400L_J-Thomas (your name), or

IRB2400L_waldy001 (you ID)

2. Tutorial

2.1 Building a Robot Station

In this section you will learn how to *Import a Robot and a Tool* from Libraries and A*ttach objects* to *Build a Robot Station*. Follow the step-by-step procedures shown below.

2.1.1 Create a new station

1. **File** menu → **New Station**

2.1.2 Import a robot

1. **File** menu → **Import** → **Library…**
2. Browse to the **\Library\Robots** folder
3. Select ***IRB2400L_M98A-M2000.rlb*** robot file
4. Click **Open**

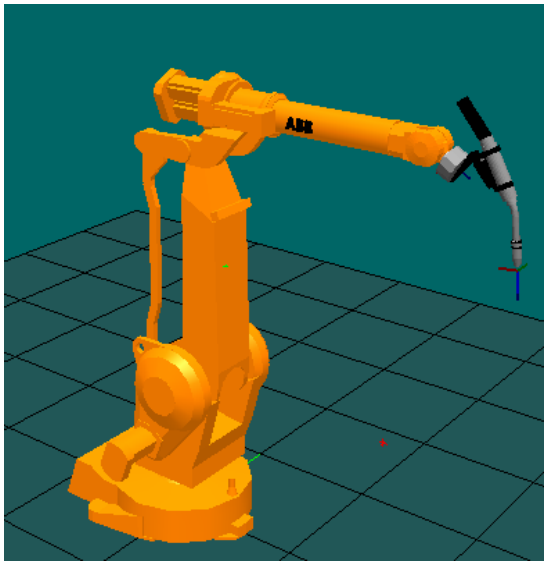
2.1.3 Import a tool

1. **File** menu → **Import** → **Library…**
2. Browse to the **\Library\Tools** folder
3. Select ***AW_Gun_PKI_500_22.rlb***
4. Click **Open**

2.1.4 Attach an object

1. Drag the tool, with the left mouse button, to the robot, and drop

2. Click **Yes** to the dialog window.



2.1.5 Save the station

1. **File** menu → **Save As…**
2. Browse to **\My Documents\Robotics\RS Station**
3. In the **File** name field, enter ***Basic***
4. Click **Save**

**** If you want to continue with the tutorial, go directly to Step 2.2.2. Otherwise, go to Step 2.1.6 to quit the station.***

2.1.6 Close the station

1. **File** menu → **Close**

2.2 Virtual Controller

For each robot in the library there is a default controller. Once a Robot Studio has been built, its controller has also been installed automatically. In this section you will learn how to *Create your own Virtual Controller*, *Link it to the robot*, and *Start the Virtual Controller*.

Now you will use the Robot Station (***Basic***) built in the previous section.

2.2.1 Open a saved station

1. **File** menu → **Open Station**
2. Browser to **\My Documents\Robotics\RS Station**
3. Select the ***Basic*** station
4. Click **Open**

2.2.2 Create your own controller

1. In the **Object Browser** right click the robot *IRB2400L_M2000*
2. Click **Setup Controller…**
3. Click **Change Controller**
4. In the **Virtual Robot Browser**, under **System**, select *IRB2400L_M2000*
5. Click **Create copy**
6. In the list, select *Copy of IRB2400L_M2000*
7. Click **Rename**
8. Enter the name *IRB2400L_*(your name or ID), and **OK**
9. Click **Set Current robot**
10. Click **Close**
11. In the **Setup for IRB2400L_M2000** dialog, make sure the *IRB2400L_*(your name or ID) controller is selected
12. **OK**

2.2.3 Start the controller

1. In the **Object Browser** right click the robot *IRB2400L_M2000*
2. Click **Start Controller**

The first time you start a Virtual Controller system it will perform a cold start. This takes about 20-30 seconds. For cold start the icon  is blue and for warm start it is yellow. When the icon shows a green light, the Virtual Controller is running. The Status bar will get green indicating that the Virtual Controller is in 'auto' mode. A blue bar indicates 'manual' mode and a red bar means the Virtual Controller is stopped.

2.2.4 Save the station

1. **File** menu → **Save As…**
2. Browse to **\My Documents\Robotics\RS Station**
3. In the **File** name field, enter ***BasicController***
4. **Save**

**** If you want to continue with the tutorial, go directly to Step 2.3.2. Otherwise, go to Step 2.2.5 to quit the station.***

2.2.5 Close the station

1. **File** menu → **Close**

2.3 Making the Robot Move

In this section you will learn how to *Create targets and paths, Jump to targets and move along paths*.

2.3.1 Open a saved station

1. **File** menu → **Open Station**
2. Browse to **\My Documents\Robotics\RS Station**
3. Select ***BasicController***
4. **Open**

2.3.2 Create a target

1. **Create** menu → **Target**
2. In the **Location** field, enter the value 1250, 100, 1100
3. In the **Orientation** field, enter 0, 135, 0
4. **OK**

   Target1:1 has been created under the default **wobj0_of**

5. In the **Object Browser** right click *Target1:1*
6. Click **Examine**

   In the **Graphics Area**, a target with 3 coloured coordinate axes can be seen (Red = X, Green = Y, and Blue = Z).

2.3.3 Create multiple targets

1. **Create** menu → **Target**
2. **Location** field: 1250, -100, 1100
3. **Orientation** field: 0, 135, 0
4. Click **Apply**
5. Change **Location** Z field to 1300
6. Click **Apply**
7. Change **Location** Y filed to 100
8. **OK**

2.3.4 Jump to target

1. In **Object Browser** select *Target1:1*
2. **Mechanism** menu → **Move** → **Jump to Target**

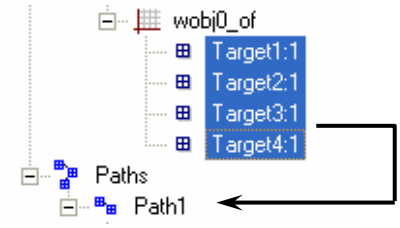
3. Repeat for all of the targets

2.3.5 Move to Home

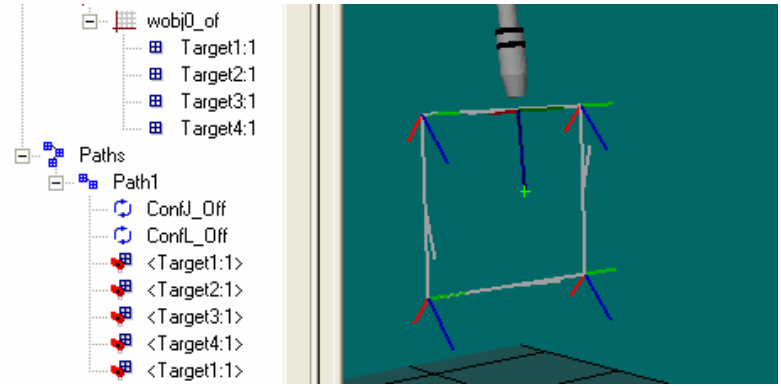
1. **Mechanism** menu → **Move** → **Move to Home**

2.3.6 Create a path

1. **Create** menu → **Path**
2. In **Object Browser**, click on *Target1:1*
3. Hold down **Shift** button on the keyboard and click on *Target4:1*
4. Drag *Target1:1-4:1* to *Path1* and drop



5. Drag only *Target1:1* to *Path 1* and drop



2.3.7 Move along a path

1. In **Object Browser** right click *Path1*
2. Click **Move Along Path**

2.3.8 End the exercise

1. **Save** the station as **\My Documents\Robotics\RS Station***BasicPath*.stn

**** If you want to continue with the tutorial, go directly to Step 2.4.2. Otherwise, close the station.***

2. **Close** the station

2.4 Robot Configuration

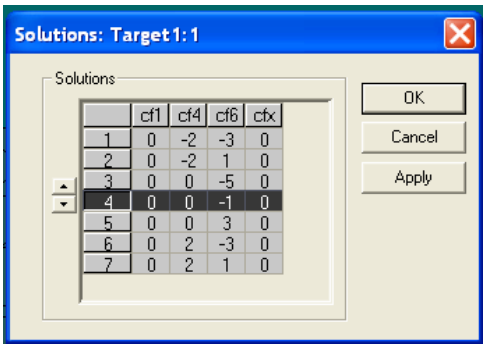
In this section, you will learn *the concept of Robot configuration* and *make Robot configuration using Solutions.*

2.4.1 Open a saved station

1. **File** menu → **Open Station**
2. Browse to **\My Documents\Robotics\RS Station**
3. Select ***BasicPath***
4. **Open**

2.4.2 Use Solutions

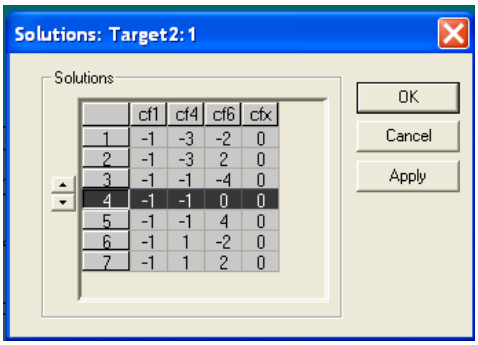
1. In **Object Browser** right click *Target1:1*
2. Click **Solutions**
3. In the dialog window click the small up and down arrows to see all the different ways the robot configuring its joints to reach the target.
4. Select the 4th solution



	cf1	cf4	cf6	cfx
1	0	-2	-3	0
2	0	-2	1	0
3	0	0	-5	0
4	0	0	-1	0
5	0	0	3	0
6	0	2	-3	0
7	0	2	1	0

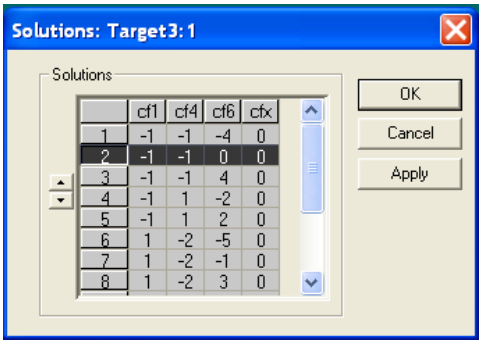
As an ABB robot has six joints, a position or target can be reached with several different kinds of joint values. The set of specific joint values is called Robot configuration. Try to make the values as close as possible to 0 as possible when assigning values.

5. Click **Apply** and don't close the window
6. Click *Target2:1*, and select the 4th solution



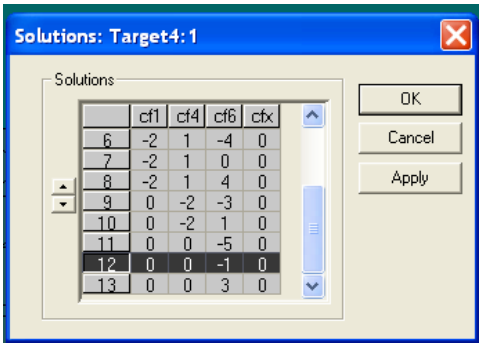
	cf1	cf4	cf6	cfx
1	-1	-3	-2	0
2	-1	-3	2	0
3	-1	-1	-4	0
4	-1	-1	0	0
5	-1	-1	4	0
6	-1	1	-2	0
7	-1	1	2	0

7. Click *Target3:1*, and select the 2nd solution



	cf1	cf4	cf6	cfx
1	-1	-1	-4	0
2	-1	-1	0	0
3	-1	-1	4	0
4	-1	1	-2	0
5	-1	1	2	0
6	1	-2	-5	0
7	1	-2	-1	0
8	1	-2	3	0

8. Click *Target4:1*, and select the 12th solution



	cf1	cf4	cf6	cfx
6	-2	1	-4	0
7	-2	1	0	0
8	-2	1	4	0
9	0	-2	-3	0
10	0	-2	1	0
11	0	0	-5	0
12	0	0	-1	0
13	0	0	3	0

9. Click **OK**.

2.4.3 Delete the ConfX_Off

When you created a Path, you got two action instructions by default, ConfJ_Off and ConfL_Off. These instructions tell the robot to ignore robot configuration for Joint and Linear moves. Now, configurations have been made for all targets, they are no longer necessary so they will be removed.

1. In **Object Browser** under the path click *ConfJ_Off*, hold down **Shift** button on keyboard, and click on *ConfL_Off*
2. Right click the selection, and **Delete**.
3. In the **Delete object** dialog, click **Yes**.

2.4.4 Move along a path

1. In **Object Browser** right click *Path1*
2. Click **Move Along Path**

2.4.5 End the exercise

1. **Save** the station as **\My Documents\Robotics\RS Station***BasicRobotConfiguration*.stn
2. **Close** the station

References:

Robot Studio Training Manual

RAPID reference manual