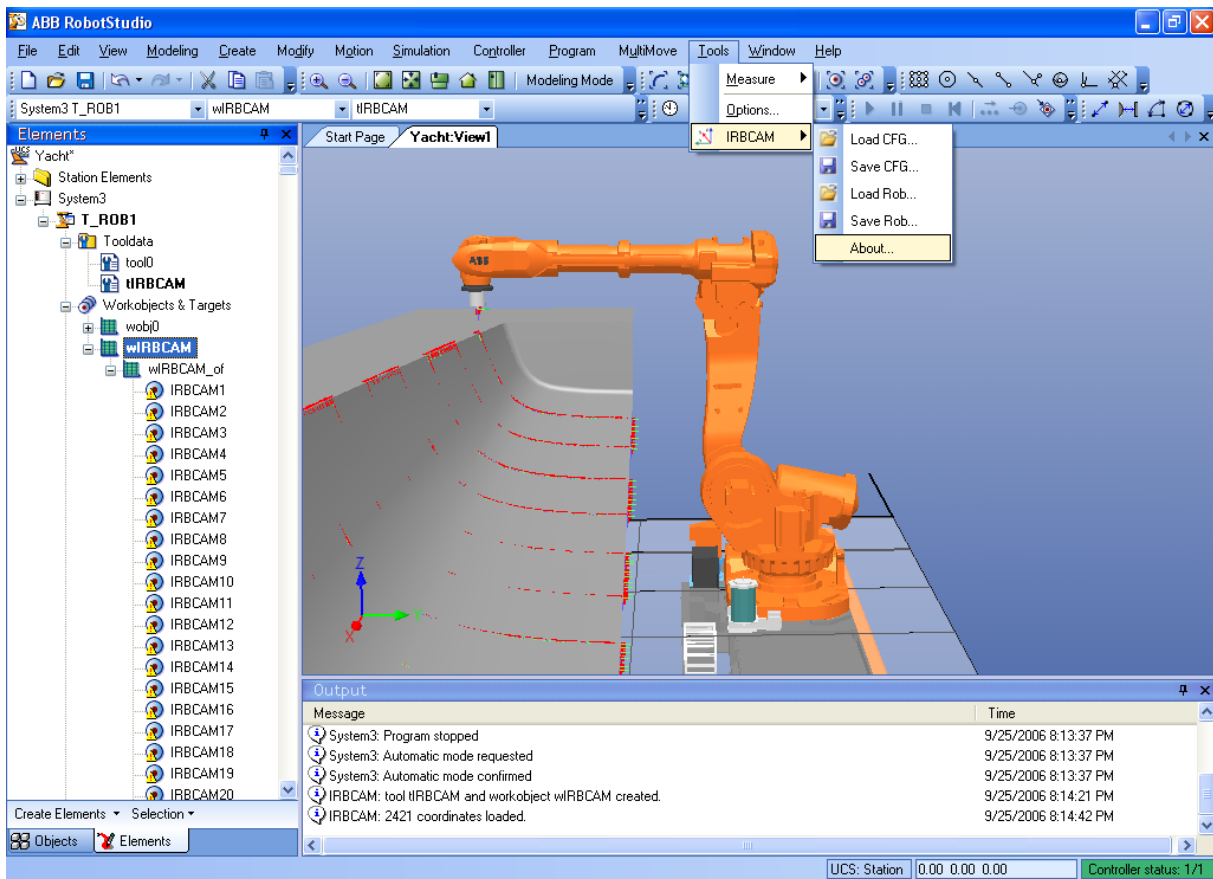


# IRBCAM Add-In v1.3 for RobotStudio

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## Abstract

This document briefly describes the IRBCAM Add-In for RobotStudio v5.07 or newer. The Add-In imports the toolpath outputs from the main IRBCAM software into the Elements Browser of RobotStudio. By having the toolpath as RobTargets inside RobotStudio, all the powerful features of RobotStudio become available to modify and optimise the toolpaths, for example reachability testing, collision detection and path configuration. The user has the option of exporting the optimised toolpath back to IRBCAM or configured RAPID code for uploading to the S4C+/IRC5 controller or continuing within the RobotStudio environment.

## 1 Introduction

The IRBCAM Add-In for RobotStudio is a software package that appears in the 'Tool' menu of RobotStudio version 5.07 or newer. (The Add-In has been tested with the following versions: 5.07, 5.08, 5.09, 5.10 and RobotStudio 2008). To install the Add-In, copy 'IRBCAMAddIn.dll' from the IRBCAM installation path (the default is 'C:\Program Files\IRBCAM') to the RobotStudio Add-In directory (the default is 'C:\Program Files\ABB Industrial IT\Robotics IT\RobotStudio\Bin\Addins'). If you place the IRBCAM Add-In in the correct directory, then the Add-In will be loaded automatically when RobotStudio is started.

The Add-In has its own popup menu with 9 items. The menu items are shown in Figure 1. The first item in the menu allows the user to load in the configuration file from IRBCAM. The

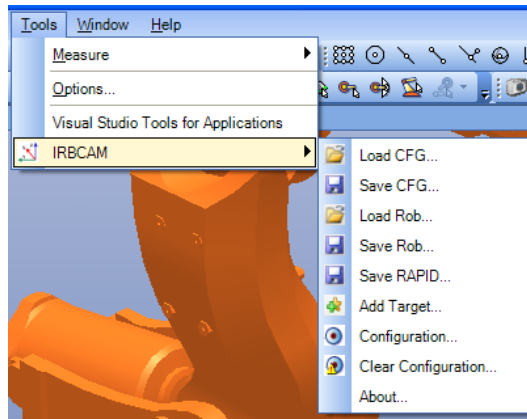


Fig. 1. IRBCAM Add-In Menu items.

default configuration file is located at 'C:\Program Files\IRBCAM\CFGFiles\default.cfg'. After the configuration file has been loaded, the tool definition **tIRBCAM** and the work object definition **wIRBCAM** will appear in the Elements Browser in RobotStudio. The user can modify these definitions in RobotStudio if required, and save them back to the IRBCAM configuration file with the second menu item.

The third menu item allows the user to load a coordinate file from IRBCAM. These files typically have a '\*.rob' extension and are the converted toolpaths from the CAD/CAM software. If any external axis values are defined in the '\*.rob' file, these will also be loaded into the RobotStudio Elements Browser. The CAD/CAM toolpath will appear as RobTargets named IRBCAM1, IRBCAM2, etc. under the wIRBCAM work object.

One benefit of RobotStudio is the 3D graphics view of the entire cell, which is a feature missing in the IRBCAM software itself. In addition, all the powerful features in RobotStudio, such as reachability testing, complex collision detection and path configuration can be used to modify the IRBCAM toolpath.

When the path has been verified in RobotStudio and found to be free of any errors, the RobTargets can then be exported back to the '\*.rob' format by using the fourth menu item of the AddIn. The '\*.rob' file can then be loaded into the IRC5 controller together with the IRBCAM.MOD and IRBCAM.SYS files and executed as described in the main IRBCAM manual. By exporting the coordinates back to the '\*.rob' format, information such as MoveL versus MoveC and contact speeds versus no-contact speeds is preserved.

If the user prefers, the RobTargets that are created by the Add-In in RobotStudio can be modified and converted into a RAPID program by using the functionality available in RobotStudio. In this case, there is no need to export back to the '\*.rob' format. The main advantage of saving the toolpath as a RAPID program compared to MOD+ROB, is the configuration of all the targets in the path. Whereas the MOD+ROB option turns off configuration checking (ConfL\Off), the RAPID program exported from the Add-In contains a complete configured path. It is normally safer to run the configured RAPID path than the MOD+ROB path. The advantage of the MOD+ROB format is the possibility to run very large toolpaths, whereas the RAPID format is limited by the controller memory (typically max 24,000 targets).

## 2 Save RAPID program

The fifth menu items allows the user to save the modified RobTargets in RobotStudio to a RAPID program file. In order to save to the RAPID \*.PRG format, all the coordinates must first be configured, see section 3. When the RobTargets have been configured and the user selects the 'Save RAPID...' menu item, the dialog box in Figure 2 will appear. The user can

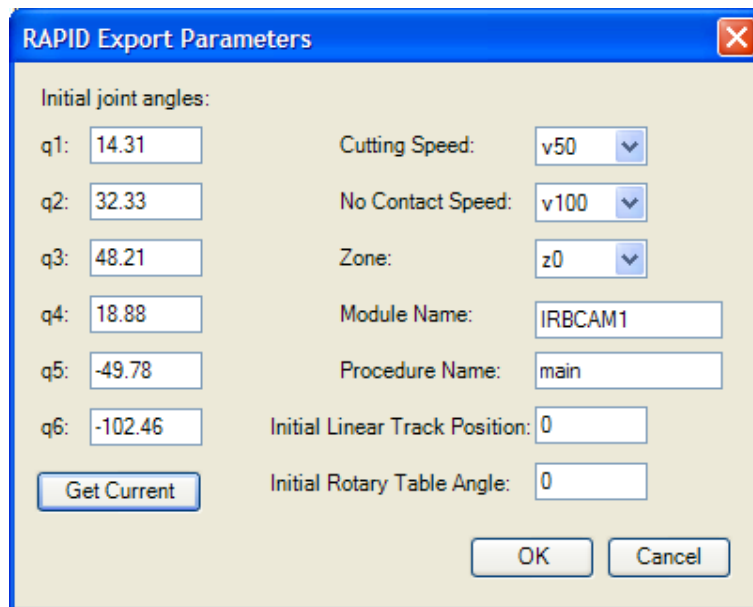


Fig. 2. Dialog box when saving RobTargets to RAPID program format.

select the initial joint angles of the robot as well as the initial position and angle of any linear tracks or rotary axes present in the station. The 'Get Current' command button copies the initial robot angles from the current robot angles in the RobotStudio station. The cutting speed, the no contact speed and the zone can also be defined. All the other information such as the X,Y,Z coordinates, the quaternions and the configurations of the RobTargets will be automatically generated based on the data stored inside RobotStudio.

The RAPID export option is an alternative to the RAPID export option in the stand-alone version of the IRBCAM software. The benefit of the RAPID export option available in the RobotStudio Add-In, is the possibility the user has to modify quaternions and configurations of individual RobTargets. These features are not available in the stand-alone version.

### 3 Automatic Path Configuration

The sixth menu item allows the user to configure an IRBCAM toolpath. The user must first configure the first robot target manually by right-clicking on the target IRBCAM1 and selecting 'Configurations...'. The menu shown in Figure 3 will then appear. The user should select

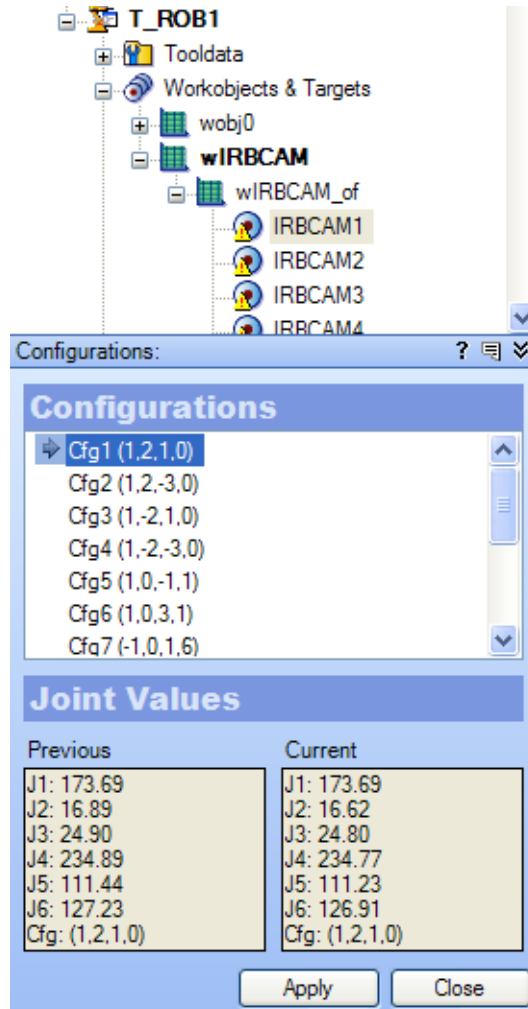


Fig. 3. Manual configuration menu in RobotStudio.

one of the configurations (in this case 1,2,1,0) and click on the 'Apply' button. The target IRBCAM1 should then be marked as configured in RobotStudio, see Figure 4. The next step is to automatically configure the path using the IRBCAM Add-In. Go to the IRBCAM menu and select 'Configuration...'. The Add-In will then go through all the IRBCAM targets and try and configure them automatically. Sometimes the automatic configuration is not possible and the dialog box in Figure 5 appears. In this case, you can try and answer 'Yes' in the dialog box to see if the rest of the path configures automatically. If the problem persists, answer 'No' in the dialog box and configure the first IRBCAM target, in this case IRBCAM870, manually as described above and repeat the automatic configuration in IRBCAM. The Add-In will not reconfigure targets that have already been configured, so the second attempt will be faster than the first attempt. When all targets have been configured correctly, a dialog box like the one in Figure 6 will appear.

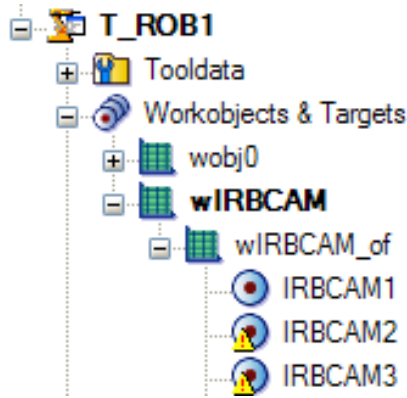


Fig. 4. Graphical symbol in RobotStudio showing that the target IRBCAM1 is configured.

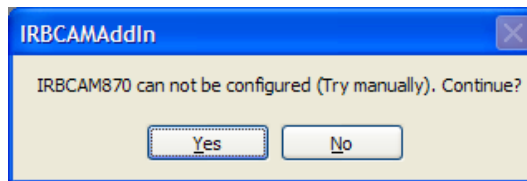


Fig. 5. Dialog box showing that automatic configuration of target IRBCAM870 is not possible.

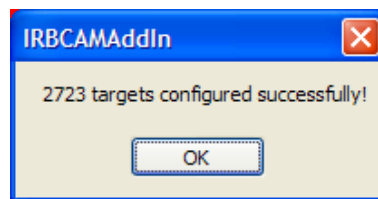


Fig. 6. Dialog box showing that all targets have been configured correctly.

Even if the entire path is configured successfully, it may not run on the robot controller. If the change of robot angles for axis 1, 4 or 6 is larger than 90 degrees between two RobTargets, the robot controller will stop the path and produce an error message. To detect such potential errors, the IRBCAM Add-In checks the entire path for this type of problems. An example of detection of large axis angle change is shown in Fig. 7. When such problems occur, the user can remove all the configuration data (menu item 8), select a new configuration for IRBCAM1 and configure the path again. If the problem persists for all initial robot configurations, then another solution may be to add a new RobTarget in the path to avoid large axis re-orientations between two existing RobTargets.

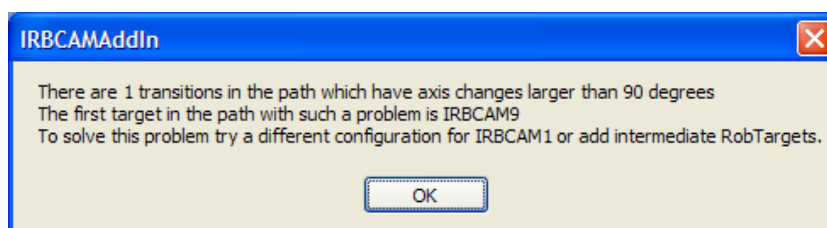


Fig. 7. Warning message for configured path when axis 1, 4 or 6 re-orientations are larger than 90 degrees.

## 4 Add New Robot Target

When using the IRBCAM Add-In, it is possible for the user to create and insert new targets into the CAM toolpath. Adding new targets is sometimes useful for creating a modified approach path before the cutting process is started, or a retraction path after the cutting is finished. It is also sometimes useful to add new targets in the middle of a CAM toolpath, for example when an external linear track changes direction. In this case, if a new target is created away from the object, then potential backlash problems in the track will not occur when the milling tool is in contact with the object.

Figures 8, 9 and 10 show the dialog boxed when adding new targets using the IRBCAM Add-In. The user can select the robot speed (slow or fast as defined in the IRBCAM stand-alone software) and the sequence number of the new target. Figure 9 allows the user to create a new

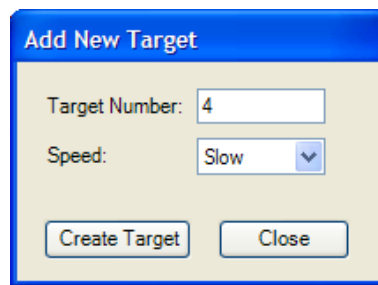


Fig. 8. Dialog box for adding new robot target.

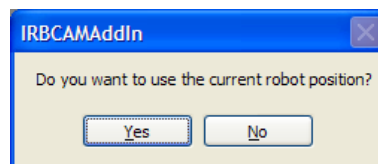


Fig. 9. Dialog box which lets the user select the current robot position or create a new target with the default values.

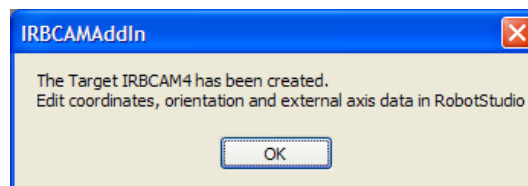


Fig. 10. Message box showing that new target has been created successfully.

target with the current position of the robot and any external axes. If the user answers No in the dialog box in Figure 8, then a new target with the default position (0,0,0) and quaternions (1,0,0,0) in the work object wIRBCAM is created.