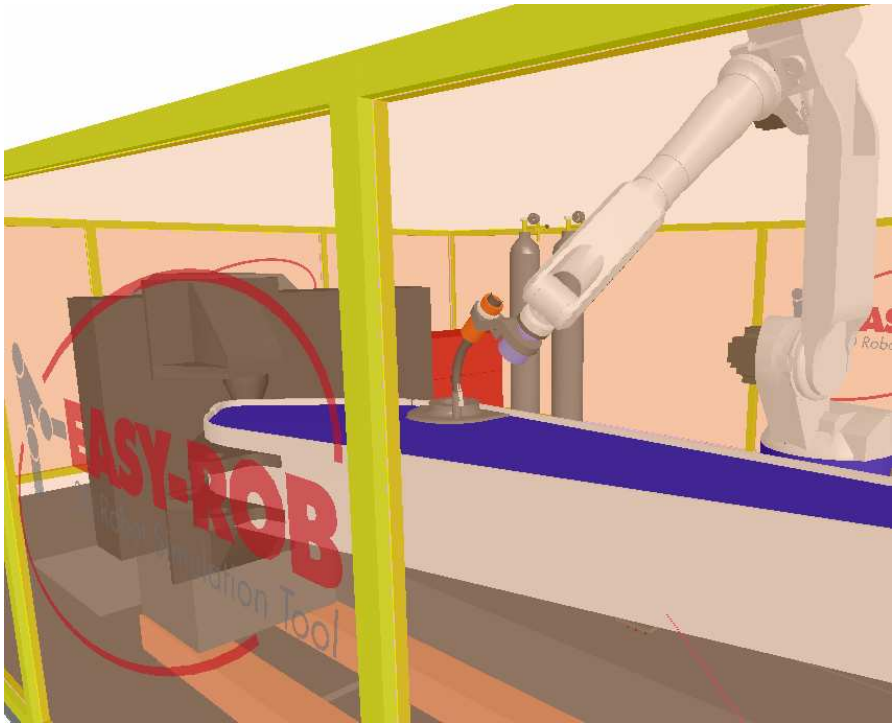
The new Version

EASY-ROB™ V5.6



APRIL 2011

Version 1.05

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EASY-ROB™

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EASY-ROB™ V5.6

Highlights in EASY-ROB™ V5.6

- **EASY-ROB™ available as 64-Bit version**
  The whole EASY-ROB™ Product Suite containing the **Single-Robot** and **Multi-Program** Version, the **DLL Version** and the **Simulations Kernel** is now available as 64-Bit version.
  This allows you to use the completely available main memory using Window® 7 64-Bit.

- **Navigation und operation**
  The Center of Interest “COI” relieves navigation through the 3D scene. In the Auto-mode the COI is always attached to the current object and forms the cruise center point.
  Additionally you can zoom the current object or the whole world using F8.

- **Space Mouse connectivity**
  EASY-ROB™ supports the 3D Mouse (Space Mouse) from 3DConnexion. This makes the navigation through the three-dimensional robot cell very intuitively and precisely.

- **CAD2ER**
  The conversion of STEP- and VRML II data into the own IGP-format has been exported as an own independent application. It is now available als 32-bit application.

- **CAD data export**
  Single robots, devices or even the whole work cell can be exported into the binary STL format. STL binary is a neutral format and can be imported into all CAD systems. This allows the designer for example to process further the results of the planer.

- **IGP also as binary Format**
  IGP can be saved and read as binary format. The file size will be reduced about 50%. Reading this kind of file will save about 20% of time.

- **New robots**
  New robot models from ABB, Kuka, Stäubli, Fanuc, Motoman and OTC has been added to the robot library.

- **Paths and tag points**
  Paths can now be assigned to robots (“Path Owner”), which improves the clarity especially using large work cells. If you choose a tag, the assigned robot will be selected automatically.
  Tag points of a path will be automatically connected with the according motion type. A visualization allows you to recognize immediately how the trace of CP motions (LIN and CIRC) looks like. PTP motion for example is visualized as a dashed line.
  Paths can also be exported and imported into different ASCII formats. For ABB Rapid S4 and KUKA KRC is a generic export available. This allows you to take over Robtargets from EASY-ROB™ into an ABB/KUKA program. We are planning to expand this feature for other languages, e.g COMAU in the future.

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- **Motion planning and interpolation**
  It is now possible to move to the exact orientation of the given Via-point, as it is known by the Stäubli- and Fanuc control. The final configuration (config) of the motion type Synchro-PTP can be kept variable.
  The target-angle respectively the axis position with the smallest changes is taken as solution (nearest solution). The resulting motion not only looks more elegant, it also can be reached much faster.

- **Simulation, ERPL**
  It is again possible, to interpolate the perspective while the simulation is running.
  Useful ERPL and ERCL commands has been added.

- **Reference kinematics**
  Redundant kinematics and kinematics without analytical solution could previously only be moved with a numerical solution method in Cartesian space. But this is also very disadvantageous because the robot is only able to move within one actual configuration. A reconfiguration is very awkward. With the new solution, called “Reference-kinematics” you are now able to move to each configuration.

- **NC simulation**
  The NC Interpreter supports the G-Codes G17, G18 and G19, which sets the plane for circular interpolation.

- **API Application Program Interface, the class CAPI**
  Many new API functions for individual product customization and special solutions has been added. These new functions allow to control EASY-ROB™ out of an own application or to exchange data in a bidirectional way.

The new version is available free of charge for all customers with a valid license key for EASY-ROB™ V5.6. For customers using older versions, it will be possible to purchase an update. We would like to thank you for your suggestions and ideas in advance.

Thank you

Stefan Anton

EASY-ROB
3D Robot Simulation Tool

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64-Bit Version

The whole EASY-ROB™ Product Suite containing the **Single-Robot** and **Multi-Program** Version, the **DLL Version** and the **Simulations Kernel** is now available as 64-Bit Version.

This allows you to use the completely available main memory using Window® 7 64-Bit. Especially for large data models this advantage becomes apparent. The 2.2 – 3 GB memory-limit of the 32-Bit version is reached very fast. First tests are very promising. Now it is worth again to update your computer with better graphics cards or more memory. Although a comparison of the simulation speed between the 32-Bit and 64-Bit-version shows no significant difference.

Operation

The operation has not been changed. The user will recognize no difference between the 32- and 64-Bit version. Work cells, robot files and program files can be run in both versions. But we recommend to copy your files first. IGP, STL and 3DS files will only be read when the robot or work cell is loaded, so there is no need to copy these files.

API

The programming interface remains also unchanged in the 64-Bit version. Some projects have to be converted to 64-Bit and compiled once again. Don't forget the preprocessor definition „_WIN64“, see also "/er_dvlp/ ER_CAPI_TYPES.H“. At the end the EASY-ROB™ Library „easyrobwx64.lib" has to be linked. We have decided to provide each 64-Bit Dlls with the Postfix x64. So „easyrobw.exe" becomes „easyrobwx64.exe" and „er_tbox.dll" becomes „er_tboxx64.dll“.

Exceptions

1. AVI movies cannot be created in the actual 64-Bit version. This feature will be added in the upcoming updates.

2. The "older" collision-algorithm OpCode could not be added to the 64-Bit-version. The "newer" and also more powerful collision-algorithm, which is available since version 5.3 has been added instead.

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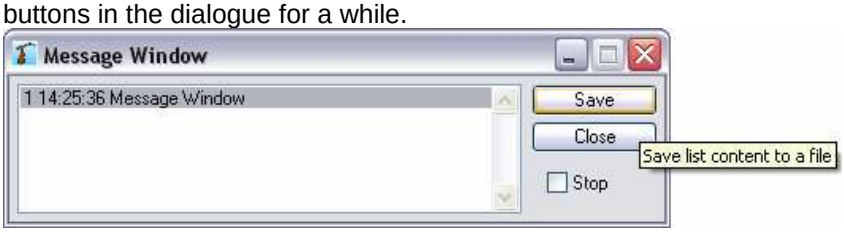
Navigation and operation

Operation and navigation has been improved in the new version.

- All dialogues have been provided with Tool Tips: a short description appears if you remain on the buttons in the dialogue for a while.



- The entire Menu bar can be hidden
  Menu: View > Menu F10
  Pressing F10 will show the Menu bar again

- Users, working with different 3D Software Tools (CAD systems, etc.), can now change the assignment of keys for the Cruise Mode  using the environment file (Alt+Shift+E) „easy-rob.env“.

  Applies for EASY-ROB™:

CRUISE_ROT_FLAGS		LMB	press LMB to rotate the world
CRUISE_ZOOM_FLAGS		MMB	press MMB to zoom in or out
CRUISE_ZOOM2MB_FLAG		RMB	zoom setting if '2 Mouse Buttons' is enabled
CRUISE_PAN_FLAG	LMB	RMB	press LMB+RMB to pan the world

  The basic settings can be restored in the Menu: View > Set 3D View > Reset Cruise Flags

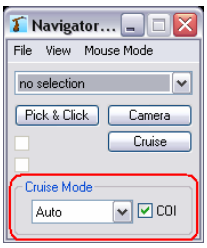
  Hint:
  Sample-settings will be created after saving the environment file.

Center of Interest COI

The COI of the 3D scene will be set automatically using the Cruise Mode Auto (Standard setting). This happens if you pick a geometry, a robot, tag, polygon or e.g. a vertex. Pressing the F8 will zoom the COI to the center of the screen.

The COI is visualized as a small and transparent red ball. It also can be switched off in the Navigator Window.


COI in the world origin



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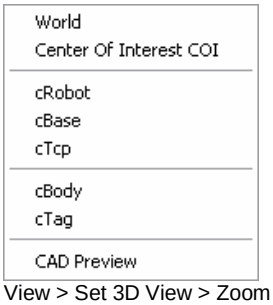
Zoom

The new Zoom function simplifies the moving of selected objects into the visible area of your screen. The rotation of the 3D scene around the center of these objects has been improved, too.

The whole 3D scene, the cRobot, cTag etc. can be zoomed into the center of your screen by using the Menu View > Set 3D View > Zoom



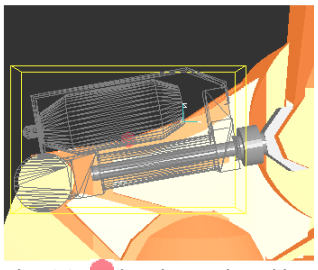
View > Set 3D View > Zoom

1. Example:

Load a robot and open the 3D CAD Window by clicking twice on 

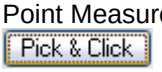
Choose a geometry by clicking on 

Press the F8 button or use the Menu: Zoom cBody.
The selected geometry will be zoomed into the center of the screen and is now the Center of Interest (COI).


The COI has been placed in the center of the selected geometry

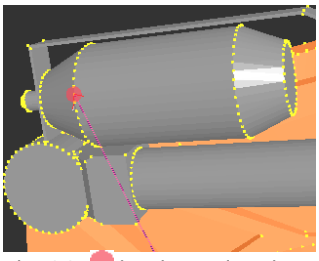
Hint:
Pressing the space-bar changes between the “Pick“- and “Cruise“ modes.

2. Example:
Pick a vertex of a geometry, so that the chosen vertex becomes the COI. For that open the Navigator Window (Ctrl + N)

Select:
Point Measure and Vertices and


and „pick“ a vertex of the geometry.

Press now F8, and the selected vertex, which now is the Center Of Interest (COI), will be zoomed to the center of the screen.


The COI has been placed on the selected vertex of the geometry

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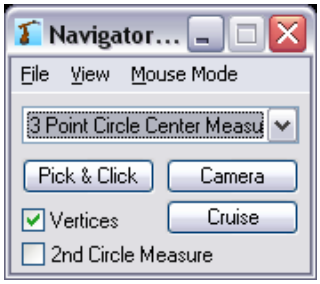
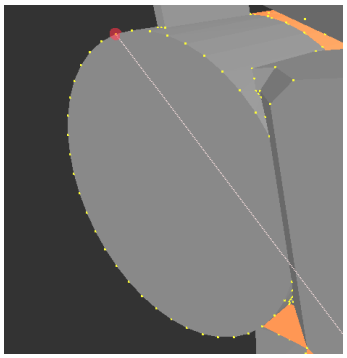
Measuring of the center-circle

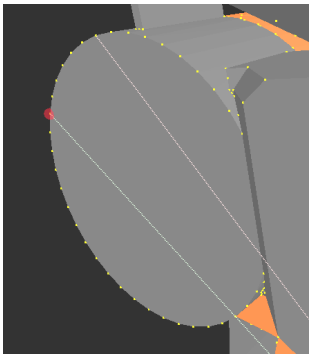
Since version 5.3 the circle center can be determined by measuring three points of the circle. In the new version measured values, as radius, arc length and angle will be displayed additionally.

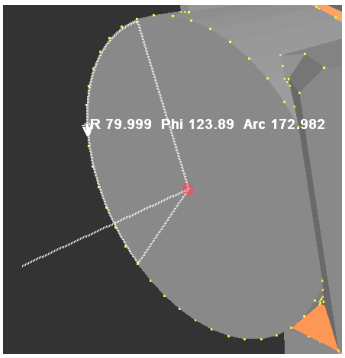
Select 3 Point Circle Measure and Vertices and Pick & Click in the Navigator Window. Pick three points of your geometry.

The order of the measuring points determines the normal vector and the direction of the arc.




1. Measuring point


2. Measuring point



3. Measuring point
Result: R= 80, Phi= 124°, Arc= 173

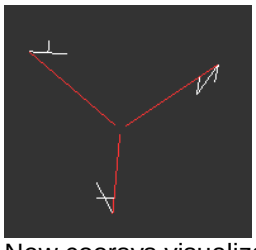
Hint:
Press the Esc button, if you have selected a wrong vertex. It will be deleted. To create a new tag point in the center circle press the MMB once and after that the RMB.

Visualization of coordinate systems

Coordinate systems, such as used for tags will be visualized in a new way, to prevent them from covering e.g. geometry-points.

The origin of the coordinate system is cut free, which allows you to select points/vertices more clearly.

Furthermore the size of the tags will be regulated while zooming.


New coorsys visualization

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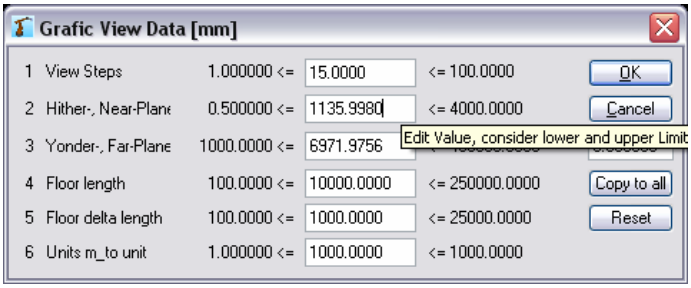
Near- and Farplane

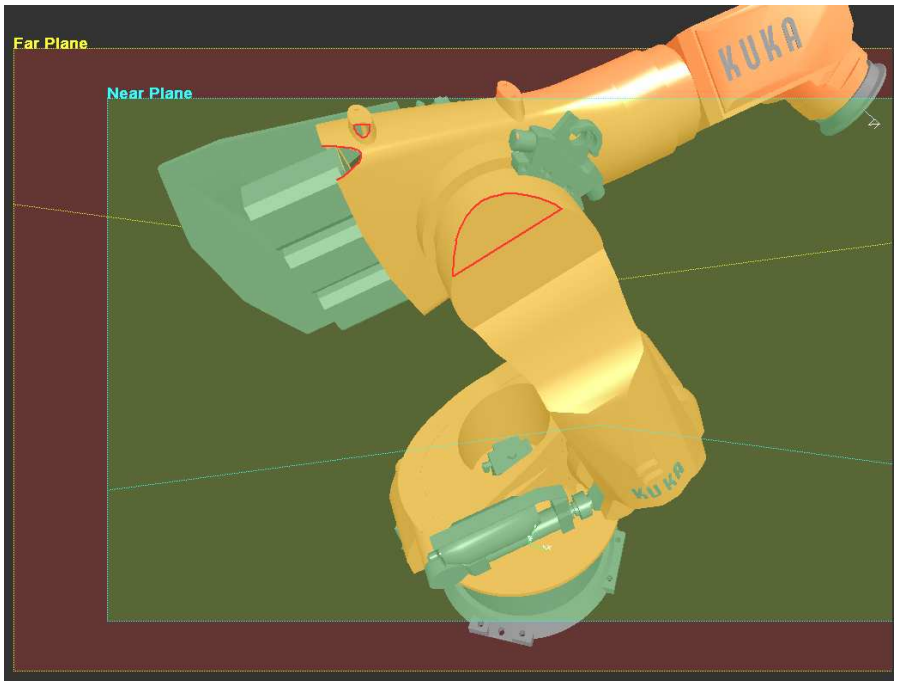
The setting of Near- and Far Plane (Clipping Planes) can be done interactively by dragging the mouse.

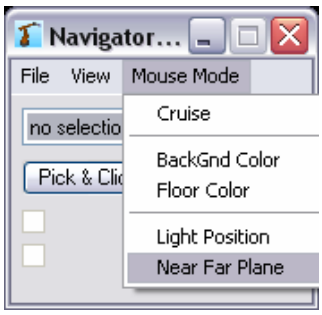
Select *Menu Mouse Mode > Near Far Plane* in the Navigator Window.

Drag the mouse holding the
LMB to move the Near Plane or
RMB to move the Far Plane.

Alternative: Insert the values using the Menu:
View > Graphic View Data







Floor and Background Color

Floor and Background color can be set directly in the Color-Dialogue.

```
Menu View >Floor  > Floor Color
Menu View >Render > Background Color
```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Space Mouse connectivity

Navigate through the 3D scene using the Space Mouse from 3DConexion.
This makes the navigation through the three-dimensional robot cell very intuitively and precisely.

Picture: 3DConnexion

Key assignment of the Space Explorer (see also display of Status Bar)

1 Toggles -> PanZoom
-> Rotate
-> Pan+Rotate

2 Toggles -> Cruise World
-> Jog cTcp
-> Jog cRobot Joints

Shift as Keyboard
Esc as Keyboard
Ctrl as Keyboard
Alt as Keyboard

Panel Open Menu
Fit Zoom World, cRobot, cTag, ..

- Reduces sensitivity

+ Increases sensitivity

T Top View
L Left View
2D without function
R Right View
F Front View

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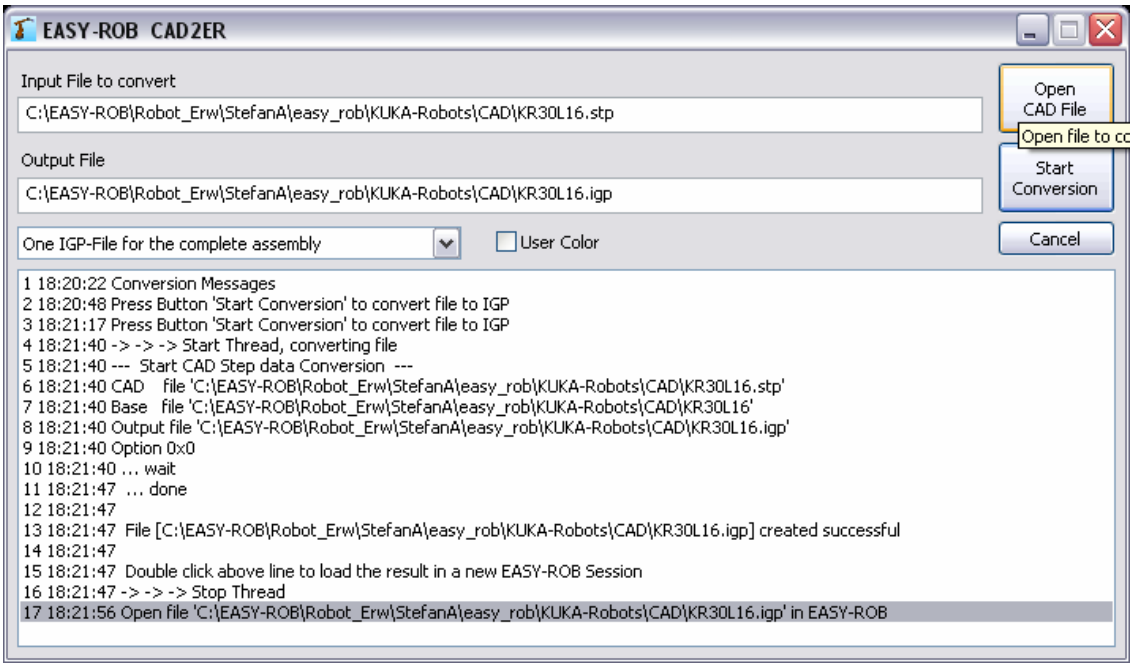
CAD2ER

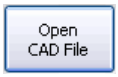
STEP- and VRML II, 97 data can be converted into IGP using EASY-ROB™ - CAD2ER. The application has been exported as an independent application which can be found in the folder ./cad2er/ der EASY-ROB™ Applikation. Opened Rob- and IGP-files will be loaded in a new EASY-ROB™ session.

Start CAD2ER with the keyboard shortcut “Ctrl+Shift+C” or using the Menu: Load > Start CAD2ER Converter

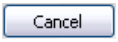


CAD2ER was created in collaboration with *machineering* GmbH & Co. KG (www.machineering.de).
machineering develops software solutions for the 3D-Simulation and virtual start-up in machinery and equipment.

Operation

- Select the file you want to convert by clicking on 

.
- Change the name of the output file „Output File“ if necessary
- Check the „User Color” to set the color afterwards in EASY-ROB™.
- Press 

to start conversion
- Double click on the created filename in the „[]“ brackets to open it in a new EASY-ROB™ session.
- Quit CAD2ER with 

Hint: Native CAD files, as CATIA V4/V5 or Pro/Engineer, can be converted to STEP using the software „3D-Tool“.

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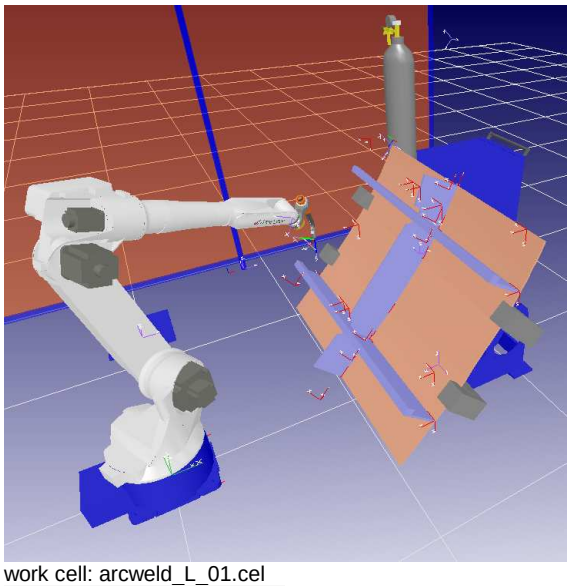
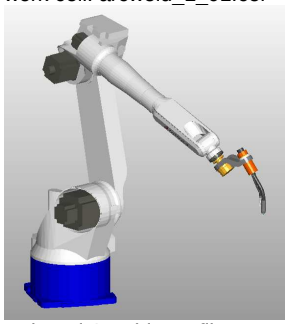
CAD data export

Single robots or devices or even the whole work cell can be exported into the binary STL format. STL binary is a neutral format and can be imported into all CAD systems. So the results of the planer can be further processed by the designer.

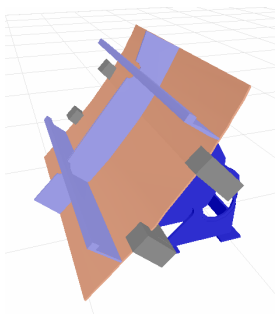
Optionally, the exported STL format can include also color attributes, which is unfortunately not supported by every CAD system.



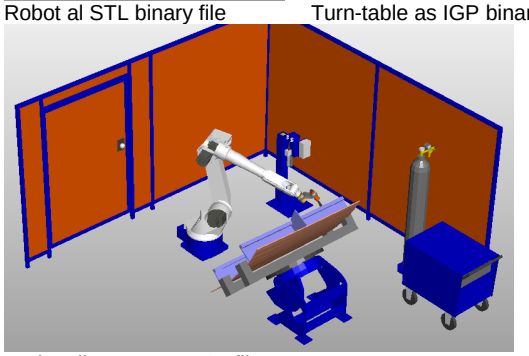
work cell: arcweld_L_01.cel



Robot al STL binary file

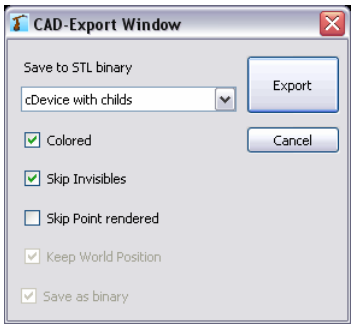


Turn-table as IGP binary file



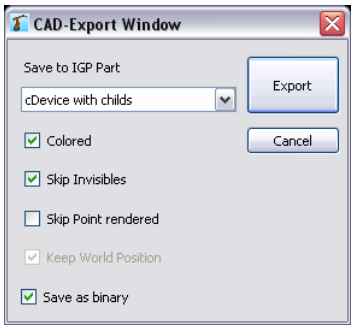
work cell as VRML II,97 file

For export choose the robot and open the **CAD Export Window** by clicking on Menu: File > Save > Export > STL binary.



Choosing „cDevice with childs“ will export the robot including the torch as colored STL-file, e.g. DeviceChilds_stl“.

To export e.g. the turn-table „POSITIONER_01“ including its component „WORKPIECE_02 „ as **IGP binary** file, select only the turn-table.



IGP can be saved and read as binary format. The file size will be reduced about 50%. Reading this kind of file will save about 20% of time. Each geometry will be saved in world coordinates.

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IGP also as binary format

IGP can be saved and read as binary format. The file size will be reduced about 50%. Reading this kind of file will save about 20% of time.

IGP binary b11 consists only of triangulated data.

Structure of the format

```
IGPHeader       80 bytes     "b11 EASY-ROB IGP binary Exporter v1.0 ...";
                             --> detection key 'b11' -> binary and version 11

OBJHeader       16 Bytes     int n_coorsys int n-obj 0 0

if (n_coorsys)
  OBJ_COORSYS   48 Bytes     float n[3],o[3],a[3],p[3]

if (n_obj)
  OBJHeader     16 Bytes     int color_idx n_points n_lines n_poly

read complete object content, with
                n_obj_size = n_point*sizeof(VERTEX)+ n_line*sizeof(LINESEG)+
                             n_poly*sizeof(TRIPOLY);
 --> obj_content
if (n_points>0) get vertices from obj_content
if (n_lines>0)  get lines from obj_content
if (n_poly>0)   get triangulated polygons from obj_content

go for next object
```

with the data types:

```
typedef struct { char id[80]; } IGPHeader;                          // 80 Bytes
typedef struct { int iv[4]; // n_coorsys n-obj 0 0 ;
                            or color_idx n_points n_lines n_poly
               } OBJHeader;                                         // 16 Bytes
typedef struct { float n[3],o[3],a[3],p[3]; } OBJ_COORSYS;          // 48 Bytes
typedef struct { float x[DIM]; } VERTEX;                            // 12 Bytes
typedef struct { int l[2]; } LINESEG;                               // 8 Bytes
typedef struct { int i[3]; } TRIPOLY;                               // 12 Bytes
```


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New robots

The robot library has grown. New models form ABB, Kuka, Stäubli, Fanuc, Motoman and OTC have been added.

Some examples

ABB robots

```
IRB-120-3-0,6.rob
IRB-260--30-M2004.rob
IRB-540-12-10.rob
IRB-540-1620-M96.rob
IRB-6660_205_190.rob
```

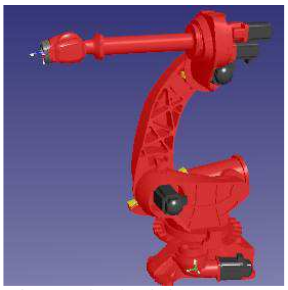
IRB-260--30-M2004

IRB-6660_205_190

COMAU robots

```
SM-NH3-165-3,0.rob
SM-NH3-220-2,7.rob
SM-NM-16-3,1.rob
```

SM-NM-16-3,1



SM-NH3-165-3,0

KUKA robots

```
KR180L100_2k.rob
KR180L100K_2K.rob
KR360-2
KR360-L280
KR360-L240
KR500-2
KR500-L420
KR500-L340
KR90-R2700-pro
KR90-R3100-extra
```

KR-500-L420--

KUKA-LBR.jpg

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New robots

OTC-Daihen robots

```
AII-B4.rob
AII-B4L.rob
AII-PF-XXX.rob
AII-PH-501.rob
```

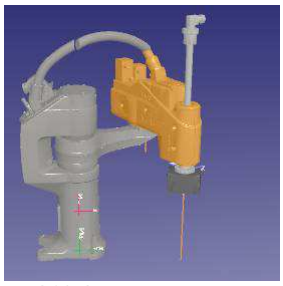
AII-B4

AII-PH-501

Staubli robots

```
CS8-Controller.rob
CS8-PENDANT.rob
CS8-STOP.rob
TS40-STD-FL.rob
TS60-STD-FL.rob
TS80-STD-FL.rob
TX200--100-.rob
TX200-L-60-.rob
```

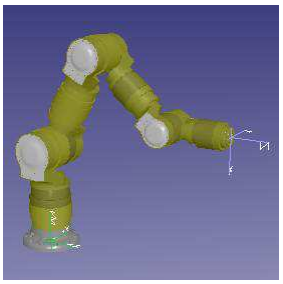
TX200-L-60-



TS60-STD-FL

Schunk robots

```
LWA3 - Ultra Light Weight
          Arm Version 3
```



LWA3.jpg

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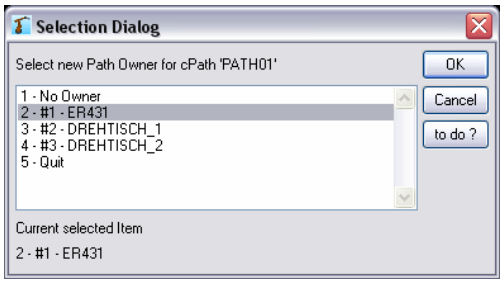
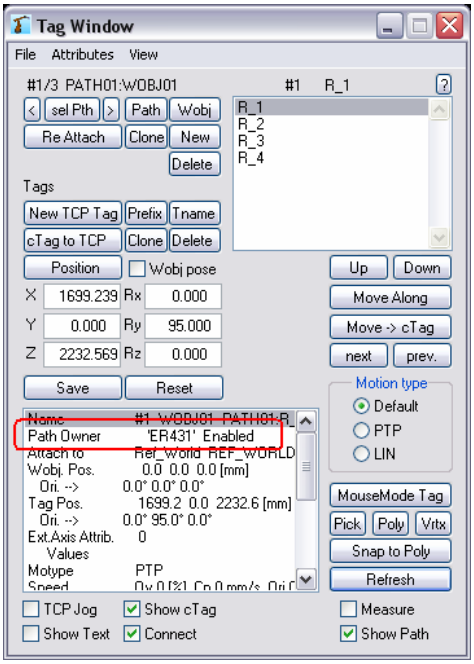
Paths and tag points

Path Owner

Paths can now be assigned to robots (“Path Owner”), which improves the clarity especially using large work cells. If you choose a tag, the assigned robot will be selected automatically.

By double-clicking on “Path Owner” in the Tag Window you can choose the robot, which refers to the path. Here it is the “ER431”.

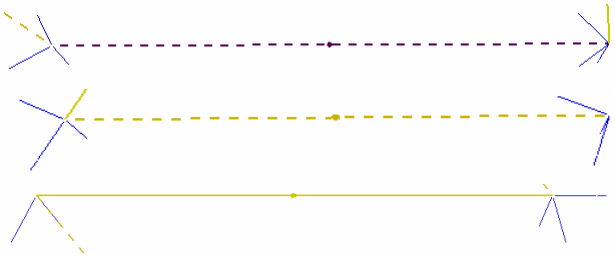




The connection can also be dissolved again.

Motion Type Visualization

If a tag point is assigned to a “motion type” as PTP, LIN, VIA or CIRC this state is represented graphically.



Motion Type **not defined**, dark dashed line

Motion Type **PTP**, yellow dashed line

Motion Type **CP LIN**, yellow solid line

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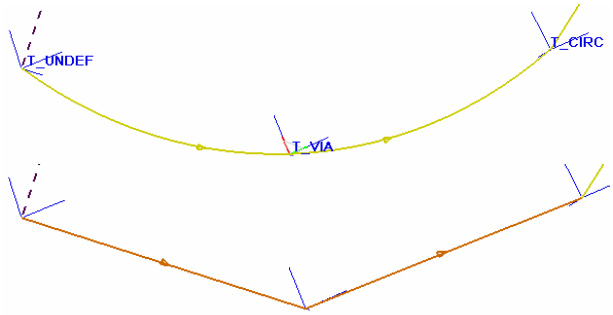
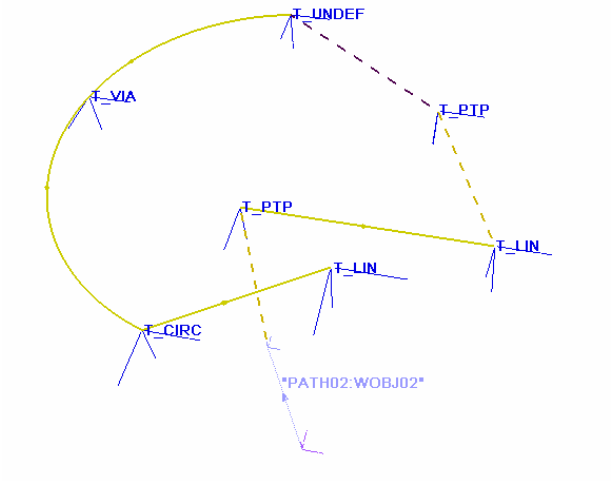


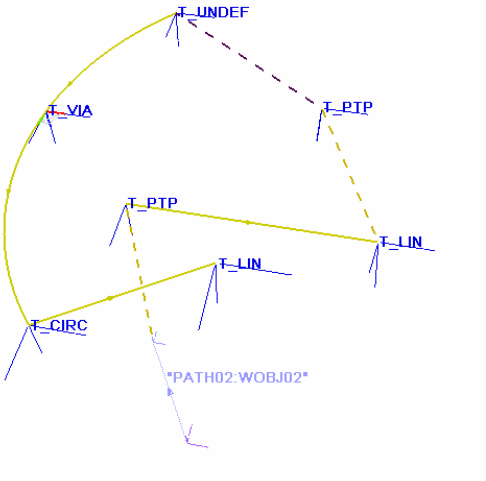
Motion Type **CP VIA -> CIRC**, yellow solid line

Motion Type **invalid**, red solid line

e.g. two tags with the motion type CIRC follow each other.



Path with different motion types



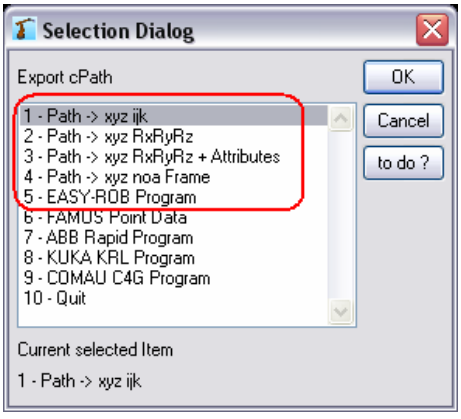
Path with changed T_Via position, the circular segment will immediately be updated.

Path Export

Paths can now be exported into different ASCII formats. They can also be imported again.
Tag-Menu > File > Save > Export cPath

The first four variations save all tag positions of the current path “cPath” as

1. **xyz ijk**
   0.00 0.00 700.00 0 0 -1 T_PTP
   600.00 0.00 700.00 0 0 -1 T_LIN
2. **xyz RxRyRz**
   0.00 0.00 700.00 180 0 0 T_PTP
   600.00 0.00 700.00 180 0 0 T_LIN
3. **xyz RxRyRz + Tag-Attributes**
   [motype, render, speed_ptp_ov, speed_cp, speed_ori, configuration]
   0.00 0.00 700.00 180 0 0 T_PTP
   0 0.0000 0.0000 0.0000 0
   600.00 0.00 700.00 180 0 0 T_LIN
   2 0 0.0000 0.0000 0.0000 0



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4. **xyz noa Frame**

```
0.00 0.00 700.00  1 0 0  0 -1 0  0 0 -1  T_PTP
600.00 0.00 700.00  1 0 0  0 -1 0  0 0 -1  T_LIN
```

Such ASCII files can also be created by external applications, so that end positions as measuring points, etc can be imported as paths in EASY-ROB™.

The variation „**5 – EASY-ROB Program**" writes out an ERPL program for the cPath. Here the target positions are written out as numbers with respect to the robot base.

```
ProgramFile
!
SPEED_PTP_OV   80.0000
SPEED_CP_OV    80.0000
SPEED_ORI_OV   80.0000
OV_PRO   100.0000
ERC NO_DECEL OFF
ZONE   0.0000
!
ERC TRACK ON
!
BASE 1.3228 0.2826 0.0500 0.00000 0.00000 0.00000
!
TOOL 0.0000 0.0000 0.0000 0.00000 0.00000 0.00000
!
PTP   0.00000 0.00000 0.70000 180.000 0.000 0.000
LIN   0.60000 0.00000 0.70000 180.000 0.000 0.000
!
EndProgramFile
```

Variation „**6 - FAMOS Point Data**" exports a Point Data file for the OLP Software FAMOS robotic®. These Point Data files (*.pis) can also be generated by FAMOS and imported into EASY-ROB™.

```
Syntax einer .pis Datei: n o a p
1 1 1 0 1 0 0 0 1 0 0 0
-0.0871558 0.0000000 -0.9961947 0.0000000 1.0000000 0.0000000 0.9961947 0.0000000 -0.0871558
      1699.239 0.000 2232.569
-0.0718273 -0.0493656 -0.9961947 -0.5664063 0.8241262 -0.0000001 0.8209901 0.5642509 -
      0.0871557 949.923 652.864 2280.380
-0.0571793 0.0657772 -0.9961947 0.7547101 0.6560584 -0.0000001 0.6535619 -0.7518381 -0.0871557
      756.201 -869.911 2280.380
-0.7824137 0.1950773 -0.5914166 0.2419214 0.9702958 0.0000000 0.5738491 -0.1430763 -0.8063661
      1849.237 -461.066 1865.039
```

The variations „**7 - ABB Rapid Program**" and „**8 - KUKA KRL Program**" allow to create a generic exports for ABB Rapid S4 and KUKA KRC. This allows you to take over "robtargets" from EASY-ROB™ into an ABB/KUKA program. We are planning to expand this feature for other languages, e.g COMAU in the future.

```
Example ABB Rapid Export
%%%
  VERSION:1
  LANGUAGE:ENGLISH
%%%
MODULE MY_PROG
! ------------------------------------------------
! Path Export
! EASY-ROB 3D Robot Simulation Tool
! Copyright (c) 1996-2011
! ------------------------------------------------
! ------------------------------------------------
! Declaration of common variables
! ------------------------------------------------
```


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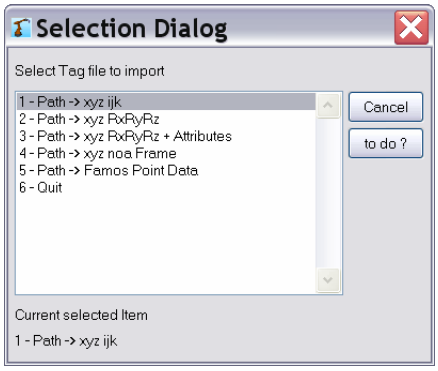
```
 PERS LoadData lDef:=[10,[0,0,0.1],[1,0,0,0],0,0,0];
 PERS ZoneData zDef:=[FALSE,0,0,0,0,0,0];
 PERS SpeedData vDef:=[0.05,500,5000,1000];

 PERS WobjData WOBJ01:=[FALSE,TRUE,"",[[-0.000000,-0.000000,-
      0.000000],[1.00000000,0.00000000,0.00000000,0.00000000]],[[0,0,0],[1,0,0,0]]];

! ------------------------------------------------
! Declaration of Tools and Workobjects
! ------------------------------------------------
 PERS ToolData
      TOOL_1:=[TRUE,[[0.000000,0.000000,0.000000],[1.00000000,0.00000000,0.00000000,0.00000000
      ]],[0.1,[0.1,0.1,0.1],[1,0,0,0],0.4,0.4,0.4]];
 PERS ZoneData z1:=[FALSE,0,0,0,0,0,0];
 PERS SpeedData vProcess:=[255,500,5000,1000];

! ------------------------------------------------
! Robtarget declaration
! ------------------------------------------------
PERS robtarget
      R_1:=[[1699.239016,0.000000,2232.568979],[0.67559,0.00000,0.73728,0.00000],[0,0,0,0],[9E
      +09,9E+09,9E+09,9E+09,9E+09,9E+09]];
PERS robtarget R_2:=[[949.922979,652.863979,2280.380011],[0.64520,-
      0.21863,0.70411,0.20034],[0,0,0,0],[9E+09,9E+09,9E+09,9E+09,9E+09,9E+09]];
PERS robtarget R_3:=[[756.201029,-869.911015,2280.380011],[0.61476,0.30574,0.67089,-
      0.28016],[0,0,0,0],[9E+09,9E+09,9E+09,9E+09,9E+09,9E+09]];
PERS robtarget R_4:=[[1849.236965,-461.066008,1865.038991],[0.30883,0.11582,0.94328,-
      0.03792],[0,0,0,0],[9E+09,9E+09,9E+09,9E+09,9E+09,9E+09]];

! ------------------------------------------------------------
! Pathnumber: PATH01
! ------------------------------------------------------------
PROC ErProg001()
 MoveJ R_1,vProcess,fine,TOOL_1\WObj:=WOBJ01;
 MoveJ R_2,vProcess,fine,TOOL_1\WObj:=WOBJ01;
 MoveJ R_3,vProcess,fine,TOOL_1\WObj:=WOBJ01;
 MoveJ R_4,vProcess,fine,TOOL_1\WObj:=WOBJ01;
ENDPROC

! ------------------------------------------------------------
!  This procedure is the basic "main" function
! ------------------------------------------------------------
 PROC RunER()
  Init_Trigger;
  Config_OFF;
  ErProg001;
! ErProg002;
  Config_ON;
 ENDPROC
ENDMODULE
```

Import of ASCII data

Tag-Menu > File > Load > Import Tags from ASCII file

Creates a new path with its associated tags out of an ASCII file.



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Motion planning and Interpolation

Interpolation of orientation in CIRC motion

The manner in which the orientation is interpolated differs from manufacturer to manufacturer.
Some manufacturer (e.g. FANUC and Stäubli) make it possible to move to the exact orientation of the given Via-point on the circle-segment.

The orientation type can be set with the new ERPL command

CIRC_ORI_QUAT_IPO START_VIAORI_END

, if CIRC_ORI = QUATERNION has been set before.

START_VIA_END	– The orientation of the x-direction of the Via-point determines the interpolation of the orientation.
START_END	– The interpolation of the orientation will be only determined by the orientation at start and end position.
START_VIAORI_END	– While CIRC-interpolation the orientation will be reached at the Via-point.
TANGENTIAL	– The x-axis will be guided tangentially on the circular arc.
FIX	– The orientation remains unchanged. The orientation at the target position will be ignored.

Variable configuration „nearest solution“

A new configuration at the target position can be set for PTP motion. However some applications require the sum of axis value changes between the start and target position to be as low as possible.

The new command

PTP_CALC_MODE VAR_CONFIG

calculates these axis values. The robot can possibly have a new configuration at the target position. The valid travel ranges will be considered here.

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Simulation, ERPL

World coordinate system

The world coordinate system can now be switched off.
You can make this setting in the environment file „easy-rob.env“:

```
! World coordinate system 1-Show , 0-Hide
WORLD_COORSYS 1
```

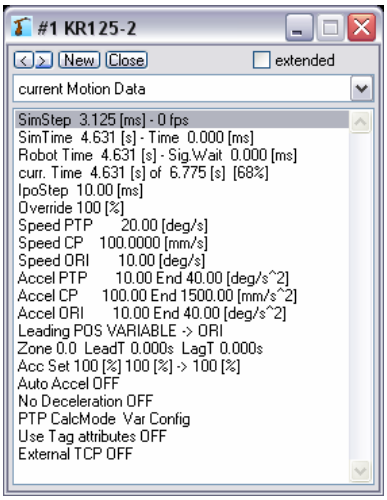
Output „cMotion Data“

The Motion Data Output shows the remaining time until the target point is reached.

curr. Time 4.631 [s] of 6.775 [s] [68%]

The current motion takes 6.775s.
Of which 4.631s [68%] are already have passed.

In addition, other states, as programmed velocities, accelerations, PTP Calculation Mode, etc, are displayed.



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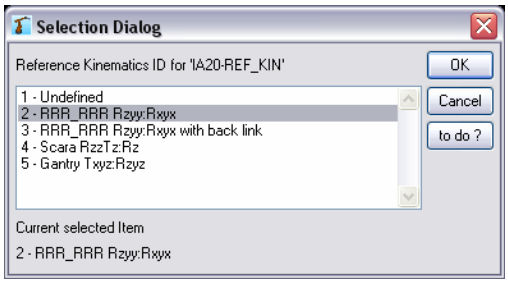
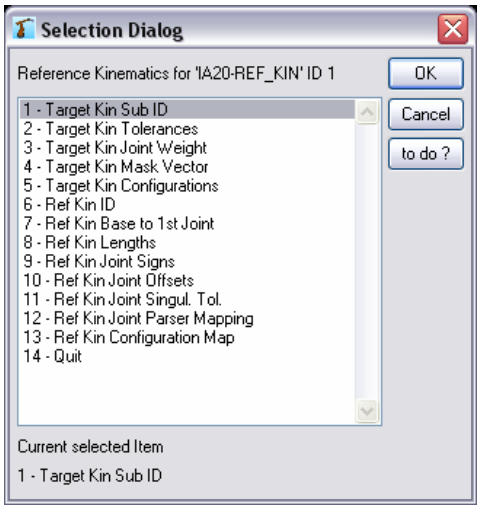
Reference kinematics

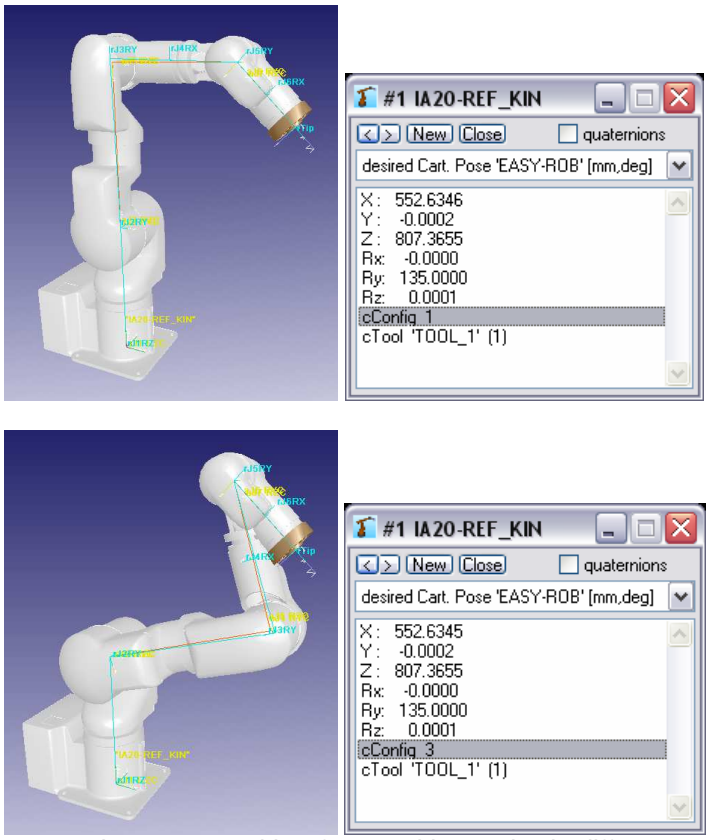
Redundant kinematics and kinematics without analytical solution could previously only be moved with a numerical solution method in Cartesian space. But this is also very disadvantageous because the robot is only able to move within one actual configuration. A reconfiguration is very awkward. With the new solution, called “Reference-kinematics” you are now able to move to each configuration.

Four kinematics structure types are actually available as reference kinematics:

- RRR_RRR Rzyy:Rxyx
- RRR_RRR Rzyy:Rxyx with back link
- Scara RzzTz:Rz
- Gantry Txyz:Rzyz







7 Ax-Roboter IA-20 with reference-kinematics in different configurations 1 and 3

The main idea is to choose an appropriate reference-kinematics, which supports us with start values for the numerical solution for each configuration.

This method was developed in collaboration with Mr. Matthias Aalto (GOM - Gesellschaft für Optische Messtechnik mbH, Braunschweig, http://www.gom.com).

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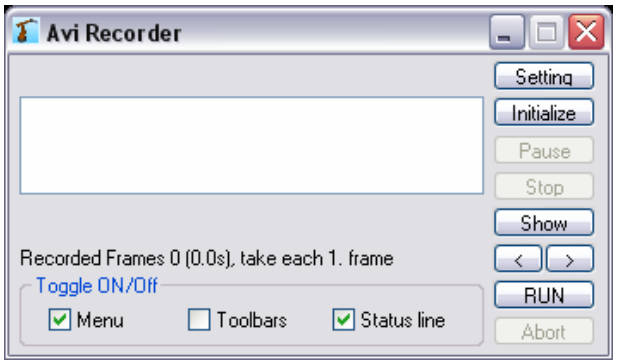
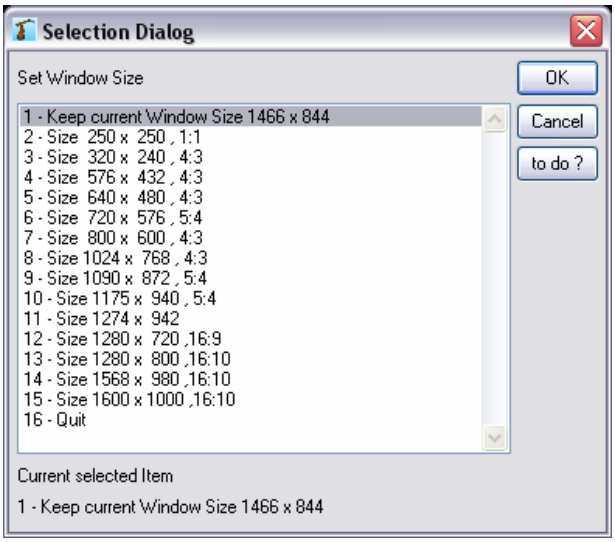
AVI

New resolutions can be set in the AVI Recorder. Furthermore the Menu, toolbars and status line can be hidden.





New resolutions:
Size 1280 x 720 ,16:9
Size 1280 x 800 ,16:10
Size 1568 x 980 ,16:10
Size 1600 x 1000 ,16:10

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ERPL commands

PTP_CALC_MODE SHORTEST_ANGLE [TURN, MATH, IN_TRAVEL_RANGE, VAR_CONFIG]

Calculation rule for PTP-motion

SHORTEST_ANGLE	– Shortest angle
TURN	– as TURN
MATH	– mathematically within [-180°,180°]
IN_TRAVEL_RANGE	– within valid travel range, when possible
VAR_CONFIG	– variable configuration. The calculation of axis values changes between the start and target position can result in a new robot configuration.

CIRC_ORI_QUAT_IPO START_VIA_END [START_END, START_VIAORI_END, TANGENTIAL, FIX]

Orientation-Interpolation for Circular CP motion, if CIRC_ORI = QUATERNION is set.

START_VIA_END	– The orientation of the x-direction of the Via-point determines the interpolation of the orientation.
START_END	– The interpolation of the orientation will be only determined by the orientation at start and end position.
START_VIAORI_END	– While CIRC-interpolation the orientation will be reached at the Via-point.
TANGENTIAL	– The x-axis is guided tangentially on the circular arc.
FIX	– The orientation remains unchanged. The orientation at the target position will be ignored.

ERCL-Befehle

ERC VIEW TOP [BOTTOM, LEFT, RIGHT, FRONT, REAR, ZOOM_WORLD]

Zooms the scene into the predefined perspective (Top, Bottom, Left, etc.).
ZOOM_WORLD zooms the scene into the visible area of the screen.

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EASY-ROB Customer area

Online available: Program Updates and Robot libraries

Web: www.easy-rob.com/special/kundenbereich

Access data:

User: customer
Password: **********

Notes

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