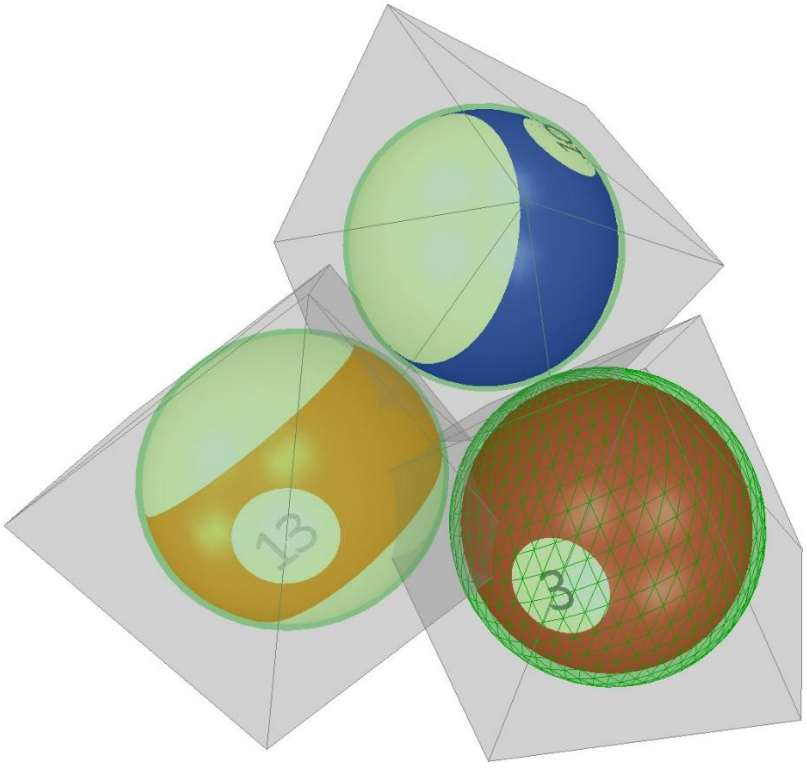
The New Version

EASY-ROB™ V7.3



October 2017

Version 1.5

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EASY-ROB™

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EASY-ROB™ V7.3 Update

Dear EASY-ROB™ Community!

We are happy to introduce the new EASY-ROB™ version 7.3 and, as always, you will find the highlights here in the quick overview:

- **Individual paths for EASY-ROB™ system files**
  The paths for system files can now be set according to Windows users.
- **EASY-ROB™ VISU**
  3D visualization for the industry
  The powerful EASY-ROB ™ VISU is designed for integration into technology-based software applications. This allows you to visualize processes, point out problems, or simply let customers and colleagues see the new project.
- **EASY-ROB™ Collision**
  More than 1000 times tested-
  Now available separately. Thanks to the intelligent software architecture EROSA, EASY ROB ™ Collision is now available, a high-performance software module for collision detection of 3D objects.
- **EASY-ROB™ 3D-PDF SDK**
  The robust 3D-PDF Export for your own software application now available as a SDK with many features i.e. animation.
- **Linkage replaces Synchronized**
  But more than that, on the one hand, a master-slave change can be programmed and on the other hand even the axes of devices can be mapped.
- **Re-Design**
  Resized buttons in adjusted dialogs
- **Ignore Limits**
  This allows you to quickly leverage an existing value limit to simulate even more freely.
- **CheckBoxes for input dialogs**
  Comfortable multiple selection by using CheckBoxes
- **Dual-arm robots**
  EASY-ROB™ supports dual-arm robots. These are stored as RAS files.

From now on, the new EASY-ROB ™ version 7.3 is available free of charge to all customers with a valid v7.3 license or a software maintenance contract.

For customers of older versions it is possible to purchase an update. Please contact our sales department at +49 6192 921 70 79 or sales@easy-rob.com.

We would like to thank you by now for your suggestions and improvement proposals.

Thank you very much!

Your EASY-ROB Team

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Configure individual paths for temporary and user files

Finally, you can configure individual paths for EASY-ROB™ system files.
This allows multiple users to work safely and efficiently on one computer and to be managed accordingly. EASY-ROB™ accesses the Windows user administration. The different folders are freely selectable, but must have write rights.

The folder paths are configured in the "config.dat" configuration file and in the new easy-rob.pth file. The configuration file is always located in the EASY-ROB™ installation directory and is configured by the administrator.

Temporary files

When working with EASY-ROB™, temporary files are created and these may not be deleted after termination. The paths for the temporary files are set in the "config.dat" with "**TMPDIR =**". This directory must have write permissions.

Temporary files include, for example:

- moni_msg.txt
- HardwareNumber.dat

Example: TMPDIR=%USERPROFILE%\EASY-ROB\tmp

User files

User files include files that the EASY-ROB™ operator can customize to suit his needs. The paths for the user files are defined in the config.dat with "**USRDIR =**". This directory must have write permissions.

User files include, for example:

- easy-rob.pth (totally new file!)
- easy-rob.env
- easy-rob-localization.ini
- er_LoadFromLibPb.ini
- er_LoadFromLibPb_prefered.ini

Example: USRDIR=%USERPROFILE%\EASY-ROB

Missing entries in the config.dat

If no paths for "TMPDIR =" and "USRDIR =" are defined in config.dat, the EASY-ROB™ installation directory is set by default. This corresponds to the old state up to version 7.0.

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easy-rob.pth - New file to manage working and geometry files

In order for users to define their own work and geometry folders, which may differ from the user folders, the paths for these folders have been separated from the config.dat and will be managed in the future by the "**easy-rob.pth**" file.

Paths for the work and geometry directories can also be set here by

- WORKDIR=
- IGPDIR=

easy-rob.pth edit directly

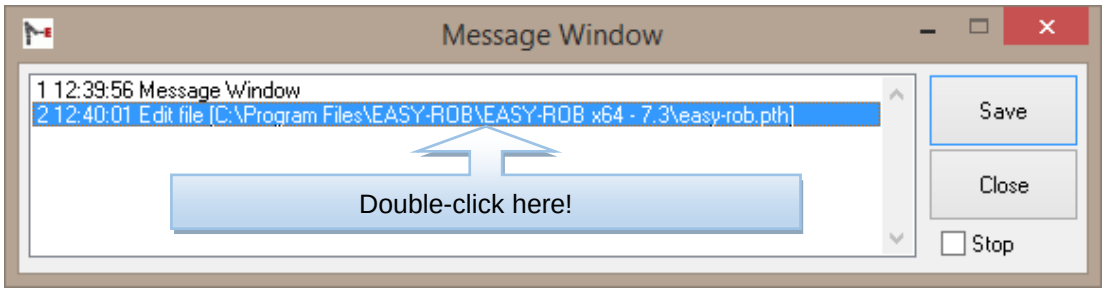
From the EASY-ROB™ user interface you can directly edit the file easy-rob.pth:

- Menu File → Edit → EASY-ROB System Files → Working pathes file

Full path can be viewed in the message window

I If the message window is open (CTRL + M), the location of the file is displayed.

The easy-rob.pth file can also be opened by double-clicking in the message window.



Full path in the Message Window

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easy-rob.pth-file overview for file paths

Example file for 'easy-rob.pth':

```
!-------------------------------------------------------
! Working pathes file
!
! File name:      "easy-rob.pth"
! Location:       User folder
!
!-------------------------------------------------------
!
WORKDIR= ..\Projects\Proj
IGPDIR= ..\Projects\Proj\igp
!
WORKDIR= ..\Projects_2\Proj
IGPDIR= ..\Projects_2\igp
!
```

config.dat-file overview

Example file for 'config.dat':

```
!-------------------------------------------------------
! Configuration file
!
! File name:      "config.dat"
! Location:       Working directory
!
!-------------------------------------------------------
! Files located in 'TMPDIR' Folder are
! - moni_msg.txt
! - HardwareNumber.dat
!
TMPDIR= .\
!TMPDIR=%USERPROFILE%\EASY-ROB\tmp
!TMPDIR= C:\Users\MyUser Name\AppData\Local\Temp
!
!-------------------------------------------------------
!
! Files located in 'USRDIR' Folder are
! - easy-rob.pth
! - easy-rob.env
! - easy-rob-localization.ini
! - er_LoadFromLibPb.ini
! - er_LoadFromLibPb_prefered.ini
!
```


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```
USRDIR= .\
!USRDIR= %USERPROFILE%\EASY-ROB
!USRDIR= C:\Users\MyUser Name
!
!-------------------------------------------
! License file
!-------------------------------------------
!
WIBUKEY_USE = 1
CODEMETER_USE= 1
MATRIXLOCK_USE= 1
LMNGR_USE= 1
!
LICENSE= ..\
!
!------------------------
! API UserDll
!------------------------
!
USER_DLL= api_user_01x64.dll 1 api_user_01 (x64)
!
!-------------------------------------------
! Preferred Editor
!-------------------------------------------
!EDIT= my_editor -> your preferred editor
EDIT= notepad
!
```


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Where are the adjusted paths displayed?

From EASY-ROB™, you can view the currently set system paths.

Aux Menu in EASY-ROB™

Within EASY-ROB™ you can edit the system paths and files and display them:

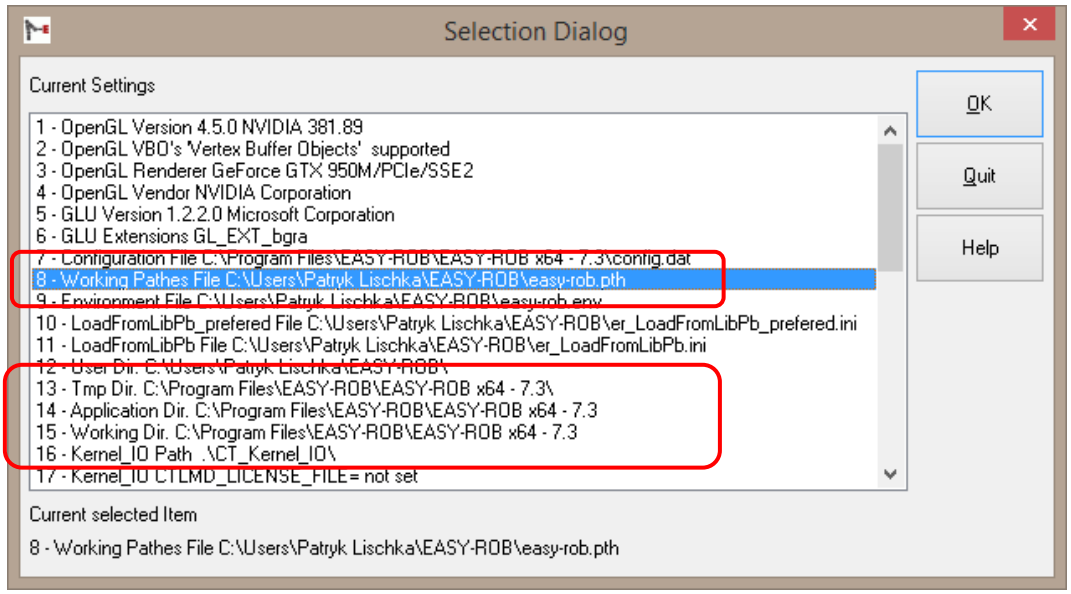
- Menu Aux → Settings → Show current settings

When selecting the individual files by double-clicking these can also be edited directly. In the menu, the relevant files have the following numbers at the front:

- 7 - Configuration File
- 8 - Working Pathes File

Further the currently configured paths or user and work directories are also listed:

- 12 - User Dir.
- 13 - Tmp Dir.
- 14 - Application Dir.
- 15 - Working Dir.



Example of a Selection Dialog with marked entries

Note: The paths are also stored in the file moni_msg.txt.

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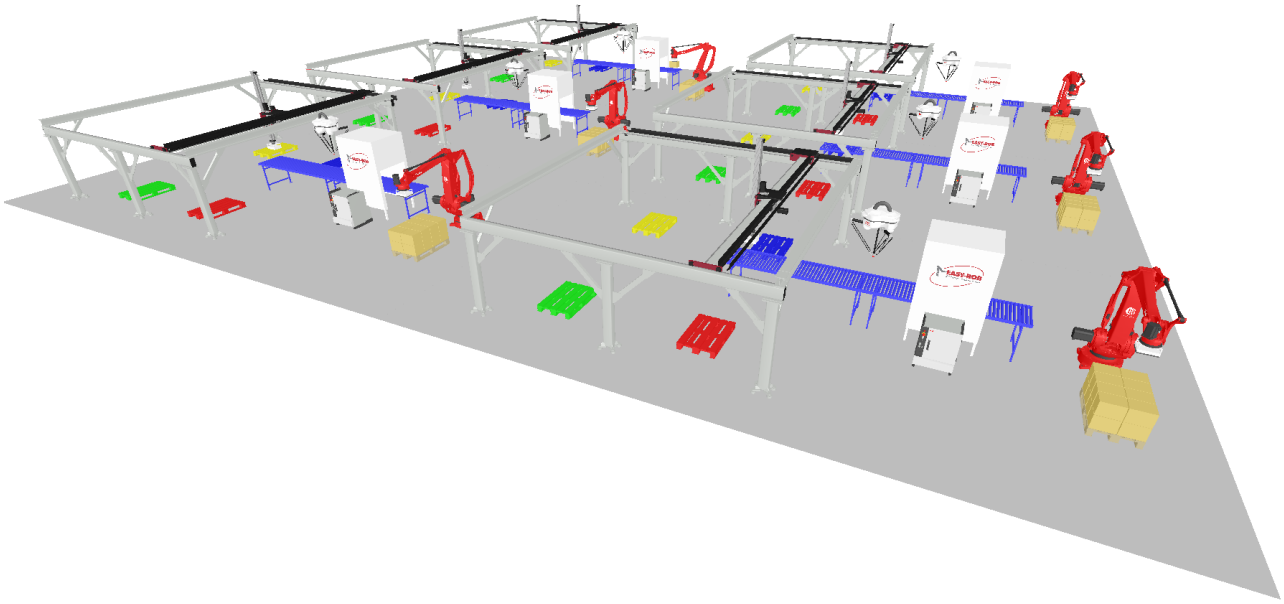
EASY-ROB™ VISU

Due to the strong demand for an increasingly finer division of the application areas for software modules, EASY-ROB from version 7.3 now offers a pure visualization module as a DLL / API.
The new member of the product family: EASY ROB™ VISU.

This standalone module is designed as a 3D visualization for the industry. We address all companies that develop technology-based software applications, but do not have their own visualization or are confronted with very limited hardware requirements.

This also makes it easy to visualize processes, identify problems, or present new projects to customers and colleagues.



Complex simulation of several work cells

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Overview of advantages and possible applications

Advantages

- Price performance advantage by self-development
- High performance with low hardware requirements
- Technology-based software solutions
- No dedicated memory required
- Free placement of the OpenGL™ window
- Available for Windows® 32- and 64-Bit

Applications

- Animation and simulation
- Advertising and sales
- Displaying of sensor data
- Real-time connection
- Positioning of geometries
- Industry-independent

Feature overview

OpenGL™ Engine

- Robust graphics engine based on the OpenGL™ graphics library

AVI Recorder

- Integrated creation of video files in many resolutions

Integration

- Detailed doxygen documentation
- Programming example for MS Visual Studio® C/C++ und C#

Mathematics

- Method class for math. calculations, e.g. of homogeneous matrices
- Conversion of angles, triangle calculation and formula parser etc.

Measuring tools

- Position, distance, diameter etc.

Camera function

- Static / movable and freely positionable as often as required

API

- C/C++ und C# Method class ERVisu_CAPI

CAD Import

- CAD files – import and export
- Modeling of simple parameterizable 3D geometries

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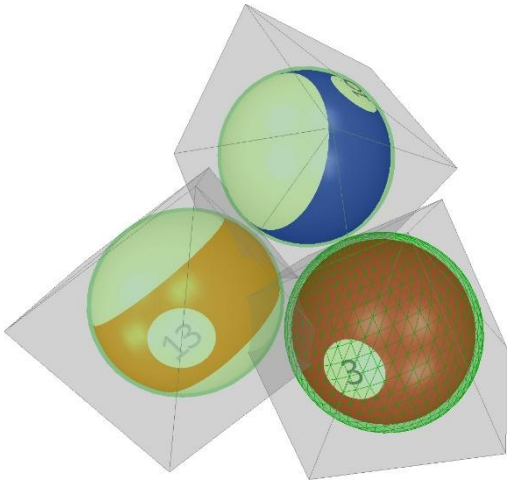
EASY-ROB™ Collision

This development also focused on the diversification needs of the market. From version 7.3, EASY-ROB offers a separate software module for collision detection as DLL/API: EASY-ROB™ Collision.

The target group are companies that are looking for a software module for high-performance collision testing and who have spared the cost-intensive self-development.

EASY-ROB™ Collision has proven itself a thousand times through the use in the EASY-ROB™ products and is absolutely precise and reliable. Especially with large and complex 3D models, EASY-ROB™ Collision plays its impressive performance-
You can always rely on EASY-ROB™ Collision!



Collision logo symbolized by billiard balls.

Overview of advantages and possible applications

Advantages

- Including various calculation methods
- High performance with low hardware requirements
- Threadsafe
- Easy integration into technology driven software solutions
- Available for

  Windows® 32- and 64-Bit

Applications

- Animation and simulation
- Motion planning
- Assembly tests
- Offline programming
- Measurement protocols
- Virtual Prototyping
- Surgical simulation
- Haptic rendering
- Molecular design
- Industry-independent

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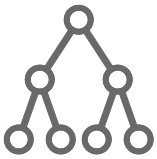
Feature overview

Various Calculation methods

- Collision Detection
- Clearance
- Distance

Hierarchical representation



- Intelligent and fast with OBBTree-Tight-Fitting

Collision Detection

- Method of whether two triangulated models collide
- Collision detection according to the first colliding triangle pair
- Calculation of all colliding triangle pairs

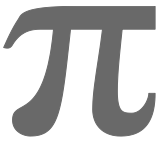
Threadsafe

- Parallel collision test safe on multi-core CPU

Clearance

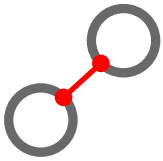
- Checks if two models are closer or further than a defined tolerance distance

Mathematics



- Method class for math. calculations, e.g. of homogeneous matrices

Distance



- Calculates the smallest Euclidean distance between two non-colliding models and
- The 2 closest points on the models

Integration

- Detailed doxygen documentation
- Programming example for MS Visual Studio® C/C++ und C#

API

- C/C++ and C# Method class ERColl_CAPI

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EASY-ROB™ 3D-PDF SDK

Locate a robust 3D PDF export for your software with Animation and have so far not found?

Then we have exactly the right solution for you:
Expand your product by our successful 3D PDF export!

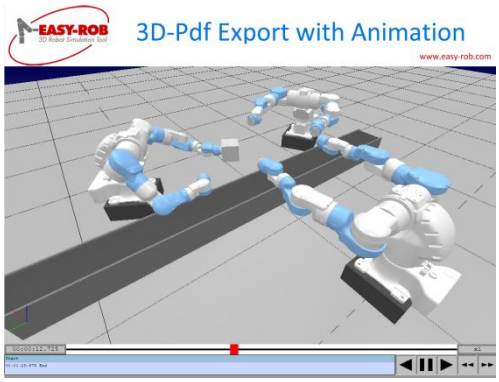
Applications of 3D-PDF Export

- Quick and easy presentation to third parties
- Disclosure of interactive simulation concepts
- Installation and maintenance instructions
- Documentation of difficult information
- Universal education and training material
- Interactive sales documentation for an improved understanding at customers

The EASY-ROB™ 3D-PDF SDK allows you easily to implement the functions required for the above-mentioned applications in your software.

Save motion sequences with animation in 3D-PDF

In the Adobe® Reader, you can use the navigation bar to start, pause, stop, fast-forward, rewind, and change the speed (x1 / 64x to x64x). The time specifies the real process time.



Navigationsleiste im Adobe® Reader

Programming interface

- A C/C++ and C# method class will be provided for the 3D-PDF SDK: ER3DPDF_CAPI

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Feature overview

Animation

- Export the 3D scene as an interactive 3D-PDF
- Simulation run can be fast-forward and rewinded, and even played backwards!
- Control panel freely placeable
- With animation

Static

- Export the 3D scene as a static 3D-PDF
- without animation

Layout function

- Parameterizable appearance
- Use several pictures as logos for your CI

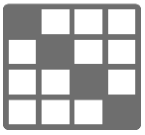
Label

- Complements your 3D PDF with any labels
- With these, you can jump specific to simulation sections

GeoRending

- Displays geometries different for example for visualization during collision detection
- Color
- Rendertyp e.g. wire frame
- Visibility (visible/invisible)

Floordesign



- Parameterizable floor
- Length and width
- Color

Background

- Background color adjustable

Integration

- Detailed doxygen documentation
- Programming example for MS Visual Studio® C/C++ und C#

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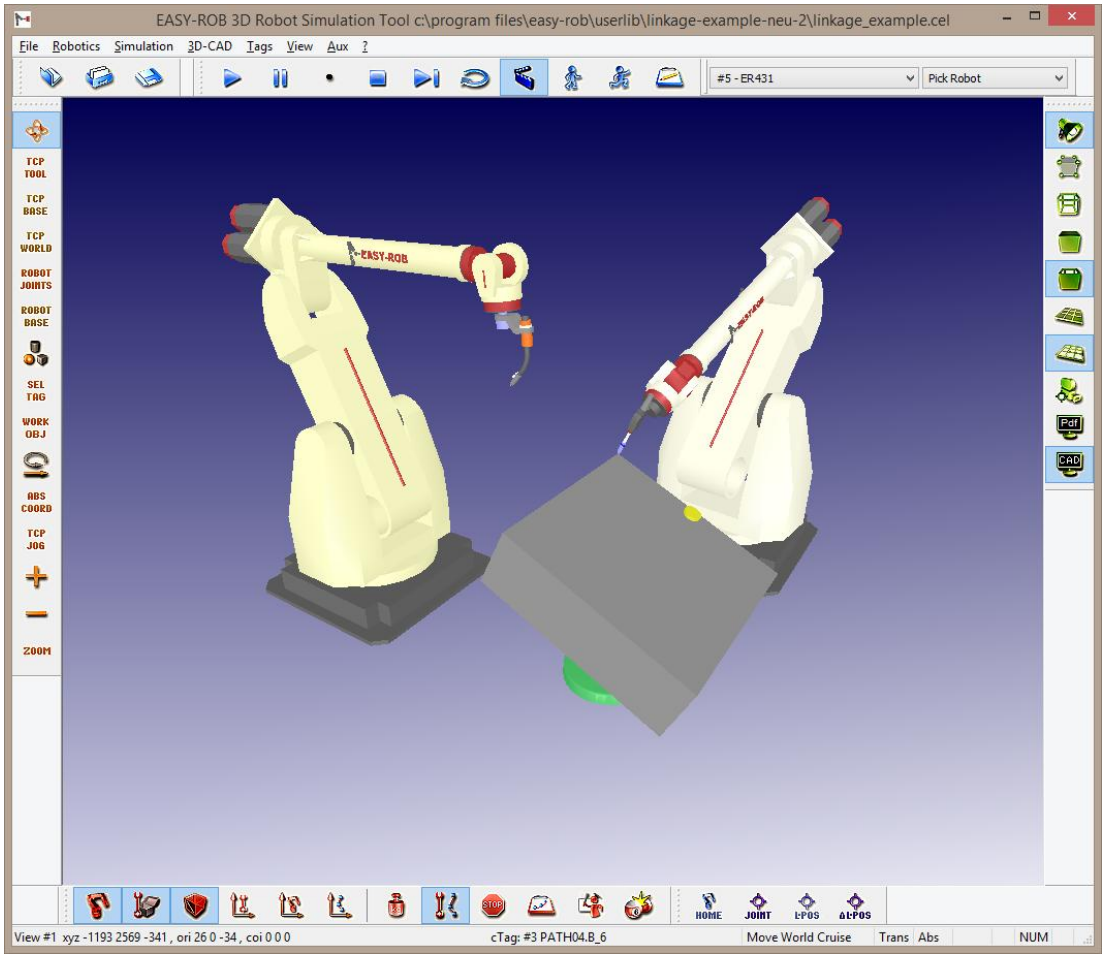
Linkage replaces Synchronized

EASY-ROB™ offers the possibility that devices can couple their axes to axes from other devices e.g. a positioner can be integrated as the 7th axis of a robot.

The term "synchronized with" was used in the respective dialogs, but this partly led to misunderstandings.

This is why EASY-ROB decided to change this function from "Synchronized with" to "Linked with". The topic is treated as Linkage i.a. this is also reflected in new ERCL commands.



Alternating coupling between devices

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ERC LINKAGE commands

Along with this conversion, new ERCL instructions have been implemented which include e.g. from the simulation run allow a change for such couplings. Thus, e.g. a change of master and slave can be elegantly implemented, i.e. first, the first master robot controls the positioner, and later in the simulation the second robot (slave) then takes control of it.

- ERC LINKAGE DEVICE SET 'DeviceName' AxIdx(1) .. AxIdx(n)
  Connects devices during the simulation run
- ERC LINKAGE DEVICE UNSET ['DeviceName']
  Reverses linkage
  (Editor's note.: If another DEVICE SET command is used, UNSET is not necessary)

The following are two examples of ERCL commands:

- ERC LINKAGE DEVICE SET TurnTable 0 7

  Here, the current device (robot) is coupled to the device "TurnTable" (positioner as the external axis of the robot).
  Since this robot has only an additional 7^{th} axis, but the "TurnTable" positioner has two axes, a mapping must take place. This is done with the postpositive indices behind the device name "TurnTable". Here, the 2^{nd} axis of the "TurnTables" is coupled to the 7^{th} axis of the robot (current device).
  With the 0, the first axis of the "TurnTables" is ignored by the robot and is not coupled.

- ERC LINKAGE DEVICE SET TurnTable 7 8

  As with the previous ERCL command example, the current device (robot) is coupled to a device "TurnTable". The difference is the number of additional axes that the robot has. Like the "TurnTable", it also has two axes and the mapping can be made via index 7, for the first axis, and index 8, for the second axis of the "TurnTables".

On the next page, the above example of mapped axes is represented as follows:

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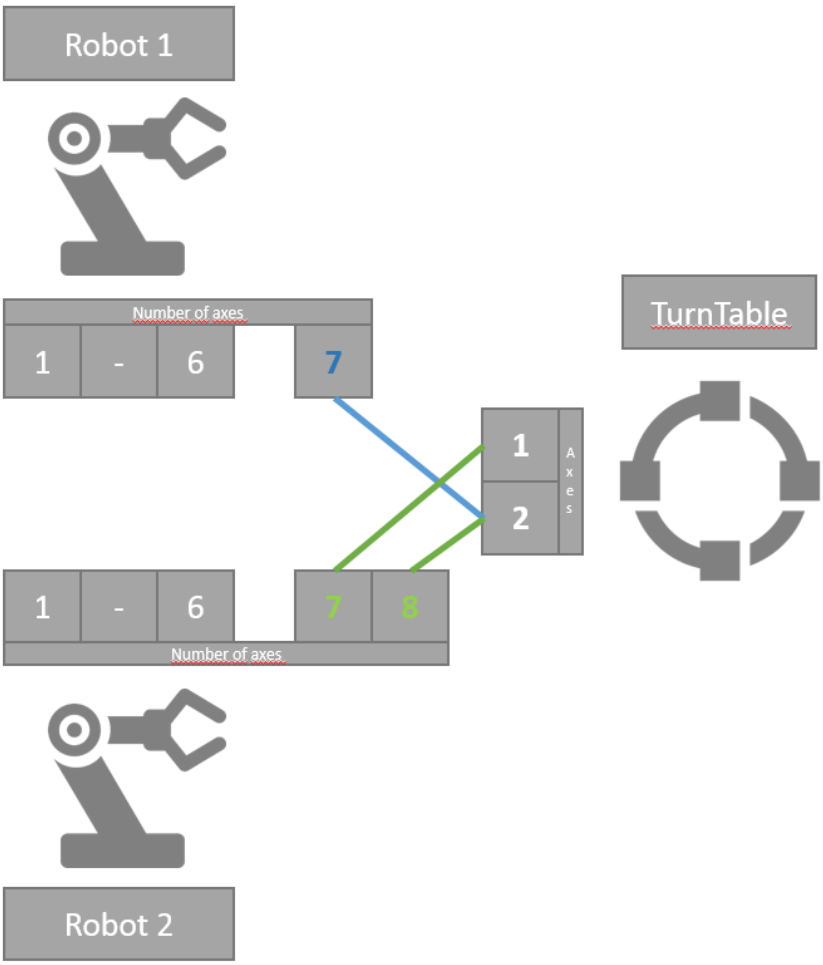
Schematic representation of the axis mappings



Schematic representation of the axis mappings

blue = ERC LINKAGE DEVICE SET TurnTable 0 7
green = ERC LINKAGE DEVICE SET TurnTable 7 8

See "New ERCL Commands" on page 30, later in this document, for more linkage commands.

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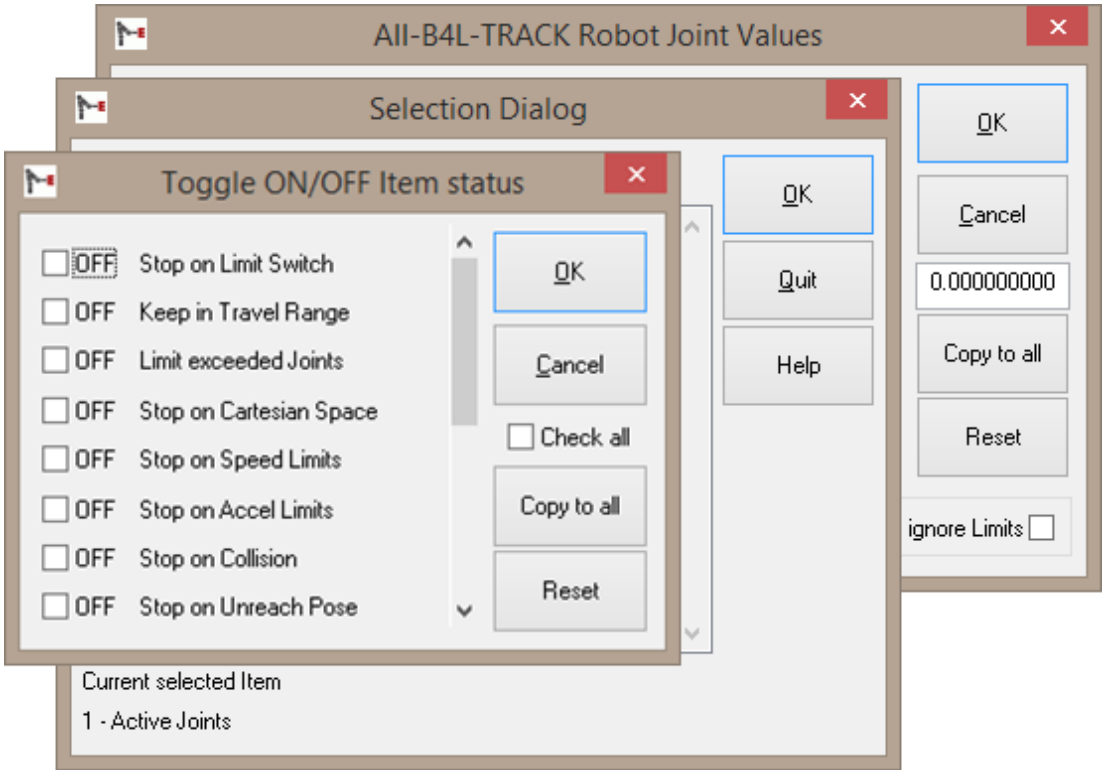
Re-design of dialogs

Many dialogues were revised as part of the re-design. The focus was on an even better simulation experience. On the following pages the novelties will be presented.

New Style

Large buttons in the chic style are practical and promote the user friendliness.



Selection of revised dialogs

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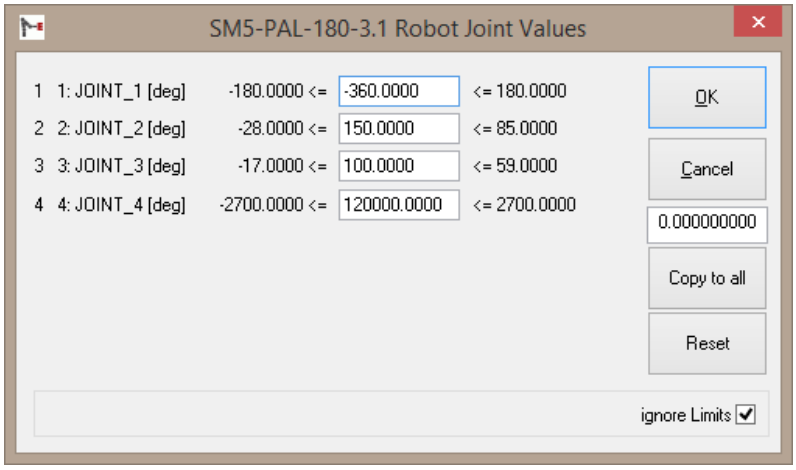
Ignore Limits

From version 7.3 onwards, numeric values, in dialogs with values, can be entered without verifying limits (valid numbers). This promotes an even better simulation experience. You can try out values completely free and you are no longer restricted in your own approach. This may include i.a. if a robot is to be tested outside its travel range limits.



Values outside the valid value range in the Robot Joint dialog

The practical checkbox "ignore Limits" allows ad hoc monitoring of limits without a large configuration.

The setting of the "ignore limits" checkbox is applied to the entire value input in the dialog. If the dialog is closed, the monitoring of the limits is automatically activated again. The purpose of this mechanism is to ensure the user is consciously switched off.

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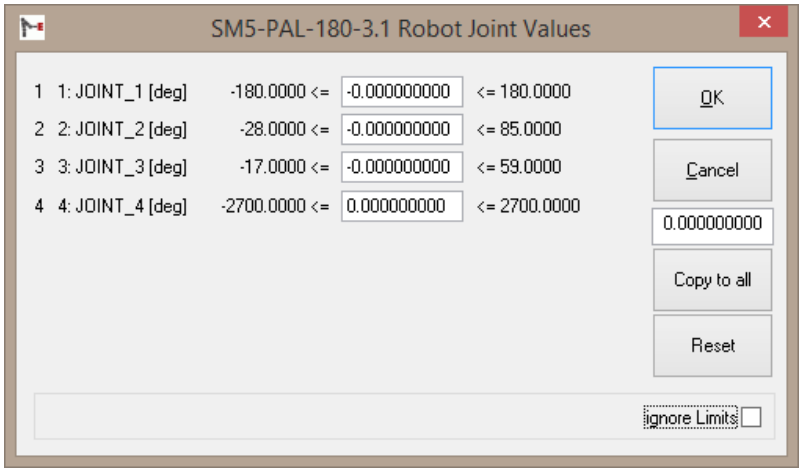
Refined value input

The values have been refined for an improved simulation result.

By increasing the value input to standard 8 digits behind the comma or even 9 digits, if the value is less than 0.001 a more precise simulation is to be enabled.

Of course, values can be more realistic in the simulation



New value entry with 9 decimal places

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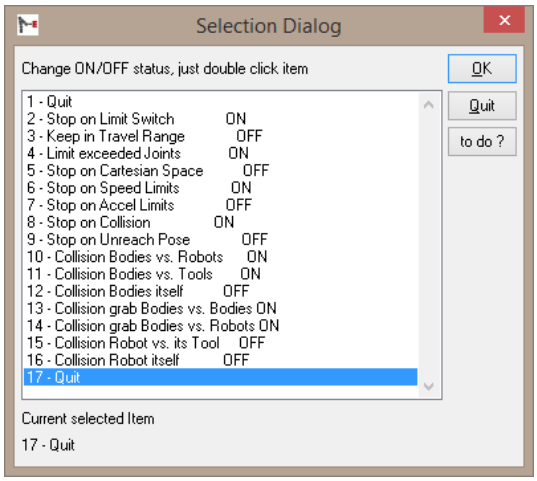
Checkboxes for input dialogs

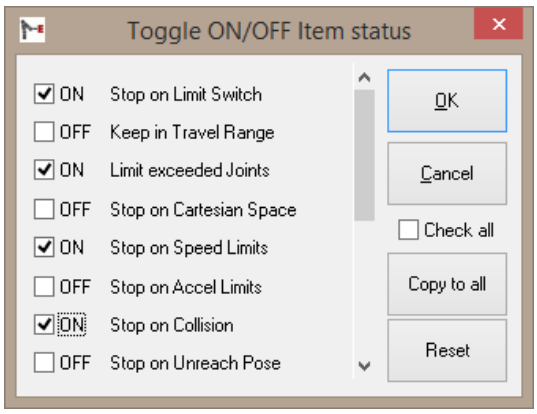
Here as well, the focus was on an improved simulation experience during development.

For dialogs that allow multiple selection, e.g. the STOP On/Off dialog, the user had to activate an option by double-clicking or by pressing the "OK" button. If one had made his selection the dialog then still should be closed. All in all, this was quite cumbersome.



Old STOP On/Off dialog

The use of checkboxes makes it possible to select a multi-selection conveniently and quickly and to implement it directly with the "OK" button. At the same time, the dialog is closed after confirmation with "OK", which was also expected at this point. In addition, the status of the selection is displayed and gives users immediate feedback on your settings.



New optimized STOP On/Off dialog

„Check All“ selects or deselects all options

The "Check all" button with "Copy to all" proves to be absolutely practical.
All options can be set or neutralized here.

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Robotics Simulation Kernel Class ERK_CAPI

Look Ahead Method "erSET_NEXT_TARGET_ADVANCE()"

A Look Ahead can be achieved by calling the method " erSET_NEXT_TARGET _ADVANCE()". It is important to call this method before calling "erSET_NEXT_TARGET()".

Using this Look Ahead functionality results in an early deceleration on the current motion segment, in case the next motion segment was programmed with a lower speed. As an important effect the cycle time will increase a bit, which comes closer to the real robot behavior.

◆ erSET_NEXT_TARGET_ADVANCE()

```
static DLLAPI int ER_STDCALL
ERK_CAPI_MOP_PREP::erSET_NEXT_TARGET_ADVANCE ( ER_HND                    er_hnd,
                                               NEXT_TARGET_DATA_ADVANCE * p_next_target_data_advance
                                             )                                                        static
```

Sends about next target data
The function gives information about the about next target, stored in **NEXT_TARGET_DATA_ADVANCE**

Remarks

This function should be called once, just before calling **erSET_NEXT_TARGET()**
Parameter `reset` sets all data in **NEXT_TARGET_DATA_ADVANCE** to default values.

Parameters

`[in]`	**er_hnd**	unique kinematics handle **ER_HND**
`[in]`	**p_next_target_data_advance**	about next target data **NEXT_TARGET_DATA_ADVANCE**

Return values

0 - OK, valid about next target data
1 - Error, in validabout next target data

Furthermore the Look Ahead must be activated calling method "erSET_ADVANCE_MOTION()".

◆ erSET_ADVANCE_MOTION()

```
DLLAPI long ER_STDCALL erSET_ADVANCE_MOTION ( ER_HND  er_hnd,
                                              long    Number_of_motion
                                            )
```

Defines the number of motions, the motion planner may run in advance of the interpolator (look_ahead).
Opcode 127, Chapter 3.4.4, Page 3-67.

Parameters

`[in]`	**er_hnd**	unique kinematics handle **ER_HND**
`[in]`	**Number_of_motion**	

Return values

0 - OK
1 - Error

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Look Ahead Structure "NEXT_TARGET_DATA_ADVANCE"

The data in the NEXT_TARGET_DATA_ADVANCE structure must be set in a proper way.

Contains target data for about next move "advance move" This structure contains all required data for the about next target "advance target" Usage with **erSET_NEXT_TARGET()** More...

```
#include <erk_capi_types.h>
```

Public Attributes

long	**AdvanceParam** 1 valid data specified, 0 no data specified, 2 initializes and set default data More...
TErTargetID	**TargetID** Identifier of the target, 0 no identifier givin, >0 identifier of this target. More...
long	**MotionType** Motion Type **ER_JOINT** = **ER_PTP** = 1, **ER_LIN** = 2, **ER_SLEW** = 3, **ER_CIRC** = 4. More...
long	**target_type** Target Type **ER_TARGET_TYPE_ABS** or **ER_TARGET_TYPE_ABSJOINT**. More...
double	**speed_value** Speed for cartesian motion [m/sec]. More...
double	**speed_ori_value** Speed for the orientation during cartesian motion [rad/sec]. More...
double	**joint_speed_percent** Joint speed percentage [1%..200%] for joint motion. More...
double	**segment_length** Segment length to Target location [m]. More...
long	**flyby_type** Flyby Type **ER_FLYBY_TYPE_UNDEF** = 0, **ER_FLYBY_TYPE_SPEED** = 1, **ER_FLYBY_TYPE_DISTANCE** = 2. More...
double	**flyby_value** Flyby or zone value, depending on flyby type as percentage value [0%..100%], or distance [mm]. More...
double	**bending_angle_value** Bending angle [rad]. More...
long	**TargetPosSet** 0x0 - not set, 0x1 - CartPos, 0x2 - CartPosVia, 0x4 - JointPos More...
DFRAME	**CartPos** Target cartesian position for cartesian motion or joint motion with target type **ER_TARGET_TYPE_ABS**. More...
DFRAME	**CartPosVia** Target cartesian via position for cartesian motion **ER_CIRC**. More...
double	**JointPos [ER_KIN_DOFS]** Target joint position for joint motion and target type **ER_TARGET_TYPE_ABSJOINT**. More...

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Class ER_CAPI EASY-ROB™ DLL- and Multi-Robot Version

New methods have been added to class **ER_CAPI**,
see header files: er_CAPI.h and er_CAPI_Types.h

New constants in er_CAPI_Types.h

```
// Constants
const long DS_MAXSTR          = 2048;     ///< Maximum length of a double huge
        message

const int DOF12               = 12;       ///< 12 Degrees-of-Freedom

// class ER_CAPI_SYS_STATUS;
const int SYS_SYSTEM_FOLDER_DIRECTORY_UNDEF    = 0; ///< Request Idx
        undefined
const int SYS_SYSTEM_FOLDER_DIRECTORY_LIST     = 1; ///< List all system
        folder and directories in a message window
const int SYS_SYSTEM_FOLDER_DIRECTORY_CONIFG_FILE = 10; ///< configuration
        file 'config.dat', resides in Application directory
const int SYS_SYSTEM_FOLDER_DIRECTORY_LICENSE_FILE = 11; ///< license file
        'license.dat', resides in 'LICENSE=' definition in config.dat
const int SYS_SYSTEM_FOLDER_DIRECTORY_MONITORING_FILE = 12; ///< monitoring
        file 'moni_msg.txt', resides in TMPDIR
const int SYS_SYSTEM_FOLDER_DIRECTORY_ENVIRONMENT_FILE= 13; ///< environment
        file 'easy-rob.env', resides in USRDIR
const int SYS_SYSTEM_FOLDER_DIRECTORY_WORKING_PATHES_FILE= 14; ///< working
        pathes file 'easy-rob.pth', resides in USRDIR
const int SYS_SYSTEM_FOLDER_DIRECTORY_LOADFROMLIB_FILE= 15; ///< Device
        Manager: Load from Library file 'er_LoadFromLibPb.ini', resides in
        USRDIR
const int SYS_SYSTEM_FOLDER_DIRECTORY_LOADFROMLIB_PREFERRED_FILE= 16; ///<
        Device Manager: Load from Library Preferred file
        'er_LoadFromLibPb_prefered.ini', resides in USRDIR
const int SYS_SYSTEM_FOLDER_DIRECTORY_APPLICATION_DIR= 101; ///< Application
        directory
const int SYS_SYSTEM_FOLDER_DIRECTORY_WORKING_DIR    = 102; ///< current
        working directory
const int SYS_SYSTEM_FOLDER_DIRECTORY_USR_DIR        = 103; ///< User
        directory, defined in config.dat, individual or depending on
        environment variable %USERPROFILE%
const int SYS_SYSTEM_FOLDER_DIRECTORY_TMP_DIR        = 104; ///< Temp
        directory, defined in config.dat, individual or depending on
        environment variable %TMP%
const int SYS_SYSTEM_FOLDER_DIRECTORY_KERNEL_IO_DIR  = 105; ///< Kernel IO,
        defined in config.dat
const int SYS_SYSTEM_FOLDER_DIRECTORY_EDIT_PRG       = 201; ///< Editor
        program, defined in config.dat
```


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```
// System Routines
// API-UserDLL
const int USER_DLL_CALLBACK_AUXUPDATE_MAX      = 12;  ///< Max number of
        callback fct for AuxUpdate, see set_callback_AuxUpdate
const int USER_DLL_CALLBACK_PROGLINEUPDATE_MAX = 12; ///< Max number of
        callback fct for ProglineUpdate, see set_callback_ProglineUpdate
```

New and extended methods in er_CAPI.h

SYS_STATUS : System files

```
char * ER_CAPI_SYS_STATUS::get_system_folder_file ()
```

◆ get_system_folder_file()

static ER_DllExport char*
ER_CAPI_SYS_STATUS::get_system_folder_file (int request_idx = SYS_SYSTEM_FOLDER_DIRECTORY_UNDEF) static

Supplies requested system path or file. Parameter `request_idx` is one of **SYS_SYSTEM_FOLDER_DIRECTORY_UNDEF**, **SYS_SYSTEM_FOLDER_DIRECTORY_LIST**, **SYS_SYSTEM_FOLDER_DIRECTORY_CONIFG_FILE**, **SYS_SYSTEM_FOLDER_DIRECTORY_LICENSE_FILE**, **SYS_SYSTEM_FOLDER_DIRECTORY_MONITORING_FILE**, **SYS_SYSTEM_FOLDER_DIRECTORY_ENVIRONMENT_FILE**, **SYS_SYSTEM_FOLDER_DIRECTORY_WORKING_PATHES_FILE**, **SYS_SYSTEM_FOLDER_DIRECTORY_LOADFROMLIB_FILE**, **SYS_SYSTEM_FOLDER_DIRECTORY_LOADFROMLIB_PREFERRED_FILE**, **SYS_SYSTEM_FOLDER_DIRECTORY_APPLICATION_DIR**, **SYS_SYSTEM_FOLDER_DIRECTORY_WORKING_DIR**, **SYS_SYSTEM_FOLDER_DIRECTORY_USR_DIR**, **SYS_SYSTEM_FOLDER_DIRECTORY_TMP_DIR**, **SYS_SYSTEM_FOLDER_DIRECTORY_KERNEL_IO_DIR**, **SYS_SYSTEM_FOLDER_DIRECTORY_EDIT_PRG**

.

Parameters

`[in]` **request_idx**

Return values

NULL - in valid request

else - pointer to requested string of path or file name

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USER_IO_DIALOG: Checkbox Dialog and StringSingle Dialog

`int ER_CAPI_USER_IO_DIALOG::dialog_checkbox ()`

◆ dialog_checkbox()

```
static ER_DllExport int ER_CAPI_USER_IO_DIALOG::dialog_checkbox ( char *   title,
                                                                  int      n,
                                                                  char **  ww,
                                                                  int *    iv,
                                                                  char **  ww_on = NULL,
                                                                  char **  ww_off = NULL
                                                                )
```

static

Opens CheckBox dialog

This Dialog allows to check or uncheck the status `for` several items in the string array `ww`.

```
// Example:
char title_txt[MAXSTR] = {"Change Item status"};
char *ww[] = {"ItemTxt"};
int n = sizeof(ww)/sizeof(ww[0]);              // get number of Items
int iv = 1;      // check
char *ww_on[]  = {"On"};
char *ww_off[] = {"Off"};
int ret=er_user_io_dialog.dialog_checkbox(title_txt,n,ww,&iv,ww_on,ww_off);
if (ret==1)
{
        er_user_io_dialog._info_line_msg(0,"Item status is %s",iv?"ON:"OFF");
}
...
```

Parameters

[in]	**title**	dialog title
[in]	**n**	number of items
[in]	**ww**	array of `strings`, size `n`
[in]	**iv**	array of item status to check or uncheck, size `n`
[in]	**ww_on**	array of `strings` when item checked, size `n`
[in]	**ww_off**	array of `strings` when item unchecked, size `n`

Return values

1 - OK

-1 - **ER_CANCEL**, dialog cancelled

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int ER_CAPI_USER_IO_DIALOG::dialog_string_single ()

◆ dialog_string_single()

```
static ER_DllExport int ER_CAPI_USER_IO_DIALOG::dialog_string_single ( char *  title,
                                                                       char *  header,
                                                                       char *  footer,
                                                                       char *  v,
                                                                       int     len,
                                                                       int     pw = 0
                                                                      )                  static
```

Opens dialog to enter a single string
This Dialog allows to enter a string `v`.

Parameters

`[in]`	**title**	dialog title
`[in]`	**header**	dialog header information
`[in]`	**footer**	dialog footer information
`[in,out]`	**v**	string value to modify
`[in]`	**len**	maximum length for each `v`
`[in]`	**pw**	password, hide text if true

Return values

1 - OK

-1 - **ER_CANCEL**, dialog cancelled

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SIM_MONITORING: Collision Methods

New methods allow a more efficient collision test between two devices (=robots).
It is now possible to test the collision of two devices or one single devices vs. all other devices in a work cell.

`int ER_CAPI_SIM_MONITORING::chk_collision_workcell ()`
=> identical with method call: chk_limits (AUX_UPDATE_IDX_COLLISION)

◆ chk_collision_workcell()

static ER_DllExport int ER_CAPI_SIM_MONITORING::chk_collision_workcell ( ) static

Check Workcell Collision
Test all devices versus all other devices, including environemnt geometries
Current settings, such as device visibility, "reference collision" or geometry collision tolerance, etc. are considered
Use **get_collision_workcell_msg()** to retrieve information about colliding devices and objects, in case of collision.

Return values

0 - no collssion
1 - collision detected

`int ER_CAPI_SIM_MONITORING::chk_collision_devices_idx ()`

◆ chk_collision_devices_idx()

static ER_DllExport int ER_CAPI_SIM_MONITORING::chk_collision_devices_idx (int dev_idx_1,
int dev_idx_2
) static

Check for collision between two devices
The device index `dev_idx_1` , `dev_idx_2` must be in [1..n_dev] and not equal
If dev_idx_1 or dev_idx_2 are not valid, -1 is returned
In case `dev_idx_1` and/or `dev_idx_2` are 0, the specified device will be tested versus all other devices
See also **chk_collision_workcell()**, **chk_collision_devices_uid()**, **chk_collision_devices_name()**

Parameters

`[in]` **dev_idx_1** idx 1st device [1..n_devices]
`[in]` **dev_idx_2** idx 2nd device [1..n_devices]

Return values

1 - collision occured
0 - no collision
-1 - error

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int ER_CAPI_SIM_MONITORING::chk_collision_devices_uid ()

◆ chk_collision_devices_uid()

static ER_DllExport int ER_CAPI_SIM_MONITORING::chk_collision_devices_uid (ER_UID dev_uid_1,
ER_UID dev_uid_2
) static

Check for collision between two devices
If dev_uid_1 or dev_uid_2 are not valid, -1 is returned
In case `dev_uid_1` and/or `dev_uid_2` are 0, the specified device will be tested versus all other devices
See also **chk_collision_workcell()**, **chk_collision_devices_idx()**, **chk_collision_devices_name()**

Parameters

`[in]` **dev_uid_1** unique id 1st device
`[in]` **dev_uid_2** unique id 2nd device

Return values

1 - collision occured
0 - no collision
-1 - error

int ER_CAPI_SIM_MONITORING::chk_collision_devices_name ()

◆ chk_collision_devices_name()

static ER_DllExport int ER_CAPI_SIM_MONITORING::chk_collision_devices_name (char * dev_name_1,
char * dev_name_2
) static

Check for collision between two devices
If dev_name_1 or dev_name_1 are not valid, -1 is returned
In case `dev_name_1` and/or `dev_name_2` are NULL, the specified device will be tested versus all other devices
See also **chk_collision_workcell()**, **chk_collision_devices_uid()**, **chk_collision_devices_idx()**

Parameters

`[in]` **dev_name_1** device name 1st device
`[in]` **dev_name_2** device name 2nd device

Return values

1 - collision occured
0 - no collision
-1 - error

int ER_CAPI_SIM_MONITORING::get_collision_workcell_msg ()

=> identical with method call: get_warning_msg (AUX_UPDATE_IDX_COLLISION, msg)

◆ get_collision_workcell_msg()

static ER_DllExport int ER_CAPI_SIM_MONITORING::get_collision_workcell_msg (char * msg) static

Collision message in case of detected collision
Call **chk_collision_workcell()** first to detect workcell collision.

Parameters

`[out]` **msg** collision message, size **DMAXSTR**

Return values

0 - valid message
1 - invalid

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SYS_USERDLL: Callback Funktionen für AuxUpdate(...) und ProgLineUpdate(...)

An export of AuxUpdate(int idx, int sub_idx) or ProgLineUpdate(char *cmd) from an API-UserDLL is not necessary any more. The callback functions can be established or disabled during run time.

Up to USER_DLL_CALLBACK_AUXUPDATE_MAX = 12 and
USER_DLL_CALLBACK_PROGLINEUPDATE_MAX = 12 callback functions can be defined.

`int ER_CAPI_SYS_USERDLL::set_callback_AuxUpdate ()`

◆ set_callback_AuxUpdate()

```
static ER_DllExport int ER_CAPI_SYS_USERDLL::set_callback_AuxUpdate ( int                        callback_fct_id,
                                                                      int(*)(int idx, int sub_idx) callback_AuxUpdate
                                                                    )                                                  static
```

Defines callback fct pointer array for AuxUpdate
Parameter `callback_fct_id` is zero based in [0..**USER_DLL_CALLBACK_AUXUPDATE_MAX**-1]
Parameter `callback_AuxUpdate` points to callback function.
Prototype: int MyAuxUpdate_fct (int idx, int sub_idx)
To unset the callback fct, set callback_AuxUpdate = NULL.

Parameters

`[in]` **callback_fct_id** in [0..**USER_DLL_CALLBACK_AUXUPDATE_MAX**-1]

`[in]` **callback_AuxUpdate** (int, int) callback function pointer

Return values

0 - Ok

1 - Error

`int ER_CAPI_SYS_USERDLL::set_callback_ProgLineUpdate ()`

◆ set_callback_ProglineUpdate()

```
static ER_DllExport int ER_CAPI_SYS_USERDLL::set_callback_ProglineUpdate ( int                      callback_fct_id,
                                                                           int(*)(char *progline) callback_ProglineUpdate
                                                                         )                                             static
```

Defines callback fct pointer array for ProglineUpdate
Parameter `callback_fct_id` is zero based in [0..**USER_DLL_CALLBACK_PROGLINEUPDATE_MAX**-1]
Parameter `callback_ProglineUpdate` points to callback function.
Prototype: int MyProglineUpdate_fct (char *progline)
To unset the callback fct, set callback_ProglineUpdate = NULL.

Parameters

`[in]` **callback_fct_id** in [0..**USER_DLL_CALLBACK_PROGLINEUPDATE_MAX**-1]

`[in]` **callback_ProglineUpdate** (char *) callback function pointer

Return values

0 - Ok

1 - Error

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Renaming of API methods

The following API methods will replace obsolete API methods, see chapter"Linkage ersetzt Synchronize". We recommend to use these new methods.

```
static ER_DllExport int ER_CAPI_DEVICES::Device_Link_by_idx (
        int  new_reference_type,
        int  new_reference_device_idx = 0,
        int  *  new_reference_jnt_link_idx = NULL
        )
```

ersetzt **Device_Sync_by_idx** (.)

```
static ER_DllExport int ER_CAPI_DEVICES::Device_Link_by_name  (
        int  new_reference_type,
        char  *  new_reference_device_name = NULL,
        int  *  new_reference_jnt_link_idx = NULL
        )
```

ersetzt **Device_Sync_by_name** (.)

```
static ER_DllExport int ER_CAPI_DEVICES::Device_Link_by_uid  (
        int  new_reference_type,
        ER_UID  new_reference_device_uid = 0,
        int  *  new_reference_jnt_link_idx = NULL
        )
```

ersetzt **Device_Sync_by_uid** (.)

```
static ER_DllExport ER_UID* ER_CAPI_DEVICES::inq_device_link_ref_sys_grp_uid  ( void )
```

ersetzt **inq_device_sync_ref_sys_grp_uid** (.)

```
static ER_DllExport int* ER_CAPI_DEVICES::inq_device_link_ref_sys_jnt_link_idx  ( void )
```

ersetzt **inq_device_sync_ref_sys_jnt_link_idx** (.)

```
static ER_DllExport int* ER_CAPI_DEVICES::inq_device_link_ref_sys_type  ( void )
```

ersetzt **inq_device_sync_ref_sys_type** (.)

```
static ER_DllExport char* ER_CAPI_DEVICES::inq_device_link_ref_sys_type_name  ( void )
```

ersetzt **inq_device_sync_ref_sys_type_name** (.)

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Complete robot libraries

EASY-ROB™ provides complete libraries for the integration of all major types of robots of the market. These include ABB, b + m, Comau, Denso, Eisenmann, Fanuc, Guedel, igm, Kawasaki, KUKA, Mitsubishi, OTC-Daihen, Rice, Stäubli, Tricept, Unimation, Universal Robots and Yaskawa.

The robot libraries of ABB, KUKA, Comau, Fanuc, Stäubli and Yaskawa are almost complete and constantly maintained by us.

Currently more than 1000 robots, positioners and external tracking axes are available of various manufacturers.

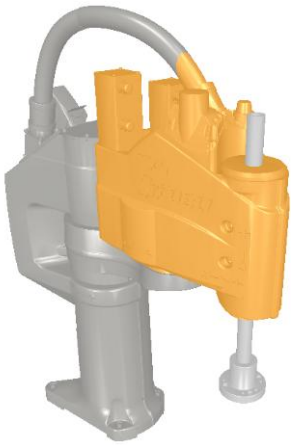
Further information:

http://www.easy-rob.com/en/product/extensions/robot-libraries.html

Here is a small selection of new models, which have been added to the many existing robots:

- Comau: Racer 3
- Stäubli: Scara TS 40 STD FL
- FANUC: CR 35 iA

Comau Racer 3



Stäubli TS 40 STD FL

FANUC CR 35 iA

Important notice:

Non-existent robots, handling systems, machines, tools or even special kinematics can be easily and quickly "reconstructed virtually" in EASY-ROB™.

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Dual-arm robots

Cobots are an integral part of human-robot collaboration (MRK) as hard-working helpers. Dual-arm robots will continue this triumphal process and as the next step among others take over complex assembly activities. That is why EASY-ROB is dedicated to this topic.

Simulate the tasks of tomorrow-
With EASY-ROB ™ in future-proof new tasks!

EASY-ROB will now continuously add dual-arms in an optional robot library. These are stored as RAS files (Robot Assembly).

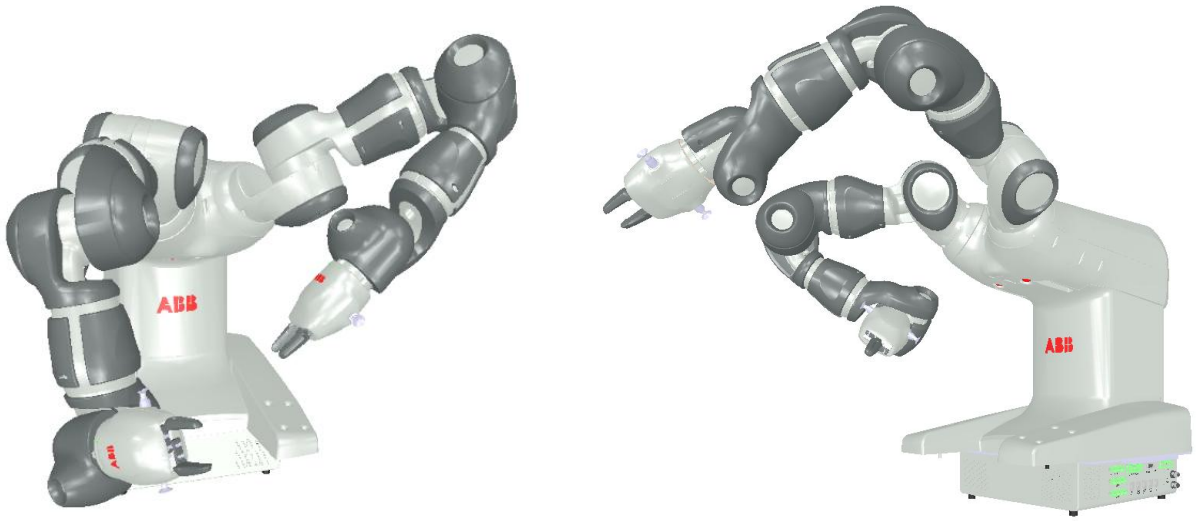

ABB Yumi

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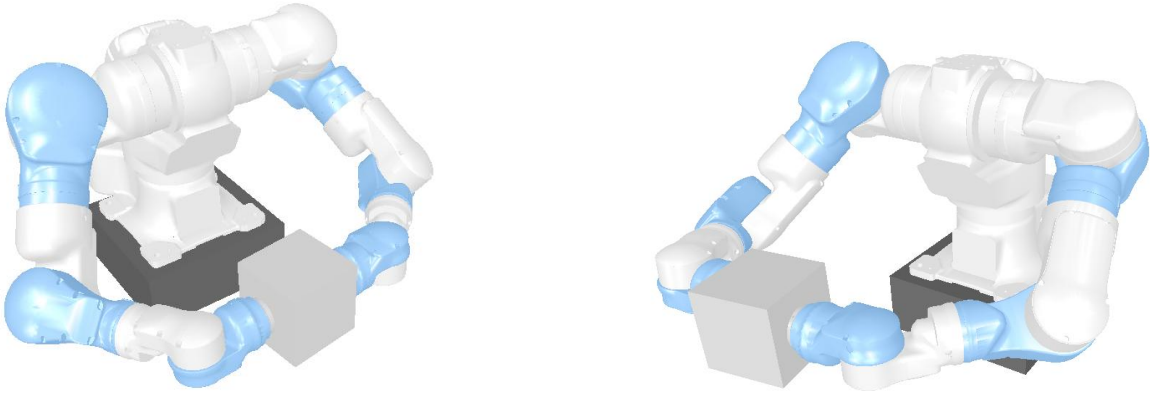
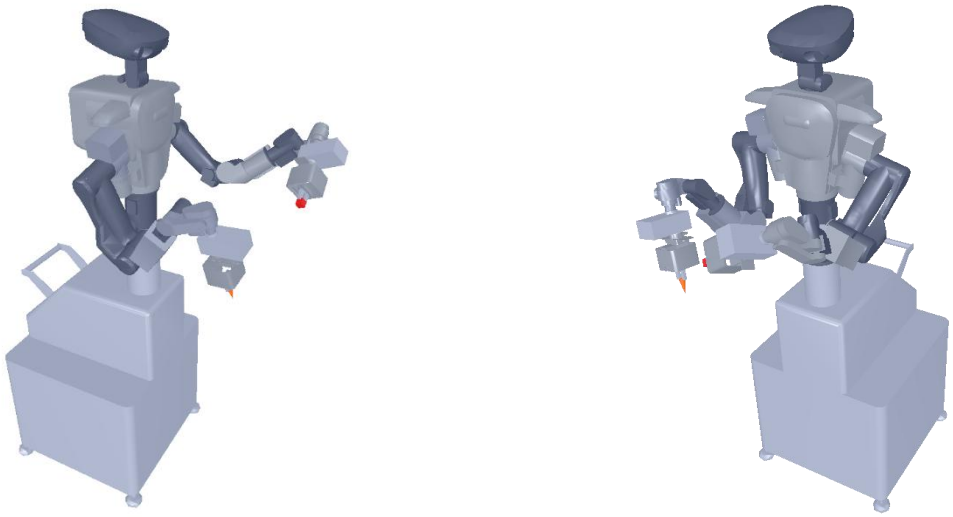


MOTOMAN SD 20

Models from the service robotics are also included:



KAWADA NEXTAGE

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New ERPL- and ERCL-Commands

Please find a detailed description about all ERPL- and ERCL Commands in document
`EASY-ROB-ERPL_ENG.pdf`

ERCL - Linkage Device

ERC LINKAGE DEVICE SET 'DeviceName' AxIdx(1) .. AxIdx(n)

This command will couple (link) the current device with another device '`DeviceName`' during simulation, whereby the parameters `AxIdx(1)..AxIdx(n)` define the respective axis index for the coupling.

ERC LINKAGE DEVICE UNSET ['DeviceName']

Deletes the existing coupling of the current device to another device '`DeviceName`', if a link exist.

ERCL - Display Device

ERC DISPLAY DEVICE 'DeviceName' ON/OFF

En-/Disable the visualization of the device '`DeviceName`'

Parser Funktionen

collision_devices_idx (dev_idx1, dev_idx2)

Checks whether the 1st device with the device idx `dev_idx1` collides with the 2nd device `dev_idx2`.
The parameters `dev_idx1` and `dev_idx2` can be set flexible, so that e.g. the 1st device is checked against all other devices `dev_idx2 = 0` in the work cell for collision.

collision_devices_name ("DeviceName1", "DeviceName2")

Checks whether the 1st device with the device name "`DeviceName1`" collides with the 2nd device "`DeviceName2`". The parameters "`DeviceName1`" and "`DeviceName2`" can be set flexible, so that e.g. the 1st device is checked against all other devices "`DeviceName2`" = "0" in the work cell for collision.

get_device_idx ("DeviceName")

Returns the device idx in the range [1 to n = number of devices] of the device named "`DeviceName`".
The parameter "`DeviceName`" can be chosen flexibly, so that e.g. "" or () returns the device idx of the current device. If an error occurs, 0 is returned.

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Own notes

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