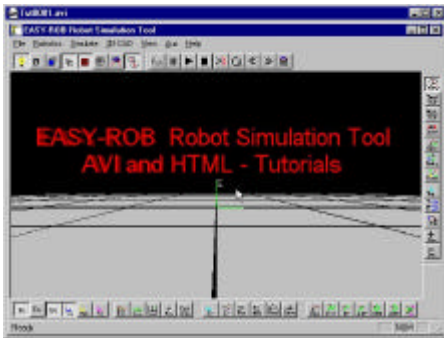


Practica de EASY-ROBOT

Primeros pasos con EASY-ROBOT Trial Versión

EASY-ROB 3D Robot Simulation Tool Copyright © 1996-1999 by Stefan Anton



Contents: Basic functions to use EASY-ROB V2.3

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- Configuration file *config.dat*
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- Toolbars

Load a body file *er-tut.bod*

- ♦ Select *File->Load->Bodyfile*,
- ♦ Open file *er-tut.bod*, a 3D text "*EASY-ROB Robot Simulation Tool AVI and HTML Tutorial*" in red color appears

How to use the mouse with 2 or 3 buttons

- ♦ EASY-ROB runs with a 2 and 3 button mouse
- ♦ Select *Aux->Mouse Mode->2 Mouse Buttons* if your mouse has only 2 buttons
- ♦ 3 Buttons mouse:
In principle the left mouse button - LMB represents the X direction or rotation about X, the middle mouse button - MMB represents the Y direction or rotation about Y and the right mouse button - RMB represents the Z direction or rotation about Z and
- ♦ 2 Buttons mouse:
In principle the left mouse button - LMB represents the X direction or rotation about X, the right mouse button - RMB represents the Z direction or rotation about Z and the left and the right mouse button - LRMB together, represents the Y direction or rotation about Y

Rotate and translate the word view (viewpoint)

- ♦ Go with the mouse into the image,
 - Pressing the LMB and moving from **left to right** and back will **rotate the scene** about the Z-axis of the green colored word coordinate system.
Moving up and down will rotate the scene about the horizontal axis of your 'monitor'
 - Pressing the LRMB and moving through the image will **translate the scene**
 - Pressing the MMB (or RMB when 2 mouse buttons) will **zoom in and zoom out**.

Reset viewpoint, set predefined view, load user views

- ♦ Select *View->Set 3D Views->Reset View* or click the *Reset View* Icon
- ♦ Select *View->Set 3D Views->Top View* will view the scene from the top

- ♦ Select *View->Set 3D Views->Right View* will view the scene from the right, etc.
- ♦ Select *File->Load->Viewfile* , open a view file *.vie, the scene interpolates to this **user view**

Rendering: Bbox, wire frame and full shaded mode

- ♦ Select *View->Render->Bounded Boxes* will show all 3D geometries as bounded boxes
- ♦ Select *View->Render->Wire Frame* will show all 3D geometries in wire frame
- ♦ *Note: Each 3D geometry has his own rendering attribute*

Floor manipulation

- ♦ Select *Aux->Mouse Mode->Floor Color*, will change the **floor color** with the mouse
 - *Note: Each color has an red, green and blue part. Values between [0..1]*
 - Pressing the LMB and moving from **left to right** and back will in- or decrease the **red** part of the color
 - Pressing the MMB (or LRMB when 2 mouse buttons) and moving from **left to right** and back will in- or decrease the **green** part of the color
 - Pressing the RMB and moving from **left to right** and back will in- or decrease the **blue** part of the color
 - *Note: EASY-ROB allows to save these environment setting, see below*
- ♦ To change the size (length) of the floor and the number of squares (dlength)
 - Select *View->Grafic View Data*
 - Enter the values for the floor length and the floor delta length in [m]

Background color manipulation

- ♦ Select *Aux->Mouse Mode->Background Color*, will change the **background color** with the mouse
 - This works similar to the floor color modification, see above
 - *Note: EASY-ROB allows to save these environment setting, see below*

Save & edit the environment file *easy-rob.env*

- ♦ The environment file *easy-rob.env* contains environment setting like floor color, floor size, background color

hither and yonder values for the clipping planes, 2 or 3 button mouse,

- File *easy-rob.env* and is loaded during start up of EASY-ROB.

This file is ASCII and can be edit also manually by the user

- Example:

```
! -----
! EASY-ROB Environment File easy-rob.env
!
! Important:
!   Please do not change the order
!   off following statements
! -----
FLOOR_ON 1
FLOOR_WIRE_ON 0
FLOOR_LENGTH 5.000000
FLOOR_DLENGTH 1.000000
FLOOR_COLOR 0.750000 0.750000 0.750000
BACKGROUND_COLOR 0.000000 0.000000 0.000000
HITHER 0.200000
YONDER 10.000000
VIEW_STEPS 5
2_MOUSE_BUTTONS 1
```

- ♦ To **save** the current setting in EASY-ROB
 - Select *File->Save->Environment file*
- ♦ To **load** the environment file
 - Select *File->Load->Environment file*
- ♦ To **edit** the environment file
 - Select *File->Edit->EASY_ROB System files->Environment file*
 - *Note: You can define your preferred editor in the configuration file *config.dat*, see below*

License file *license.dat*

- ♦ The license file *license.dat* contains the license key for EASY-ROB
 - Example: EASY-ROB V2.3 GER980929 StefanAnton ID-4460100043 hw_no:29268100 exp.date:0000-00-00 0
 - (the above license will only work on the computer with the hardware number 29268100)
- ♦ **VERY IMPORTANT: EASY-ROB will not start if the license file 'license.dat' does not exist.**
- ♦ Does the license file contains an invalid key, EASY-ROB will start as a demo version. With the demo version the full functionality is available, but does not allow to save anything
- ♦ To **edit** the license file
 - Select *File->Edit->EASY_ROB System files->License file*
 - Note: You can define the path where your license file resides on your computer in the configuration file *config.dat*, see below
- ♦ **Get a license key for EASY-ROB**
 - If you have ordered EASY-ROB, I need your
 - 1) Name, for example StefanAnton, see above
 - 2) The **hardware number**: for example 29268100 in my case
 - Get your hardware number:
 - Select *File->Edit->EASY_ROB System files->Get License Info* , read you hardware number
 - 3) I will send you your license key per email

Configuration file *config.dat*

- ♦ The configuration file *config.dat* contains pathes of you working and grafics directories, your preferred editor, ...
 - Example:

```
....  
WORKDIR= .\proj  
WORKDIR= .\proj2  
IGPDIR= .\igp_usr  
IGPDIR= .\igp_rob  
IGPDIR= .\igp_tut  
LICENSE= .\  
!  
!EDIT= my_editor -> your preferred editor  
!  
EDIT= notepad  
....
```

- ♦ **VERY IMPORTANT: EASY-ROB will not start if the configuration file 'config.dat' does not exist.**
- ♦ To **edit** the configuration file
 - Select *File->Edit->EASY_ROB System files->Config file*

Monitoring file *moni_msg.txt*

- ♦ The monitoring file *moni_msg.txt* protocols most importants thing what happens in EASY-ROB.
 - Example:
 - If a 3D geometry is not load quite well (e.g. wrong polygons), take a look in this file.
 - If EASY-ROB is doing s.th strange, take a look in this file.
 - If an error occurs, email me the monitoring file
- ♦ To **edit** the monitoring file
 - Select *File->Edit->EASY_ROB System files->Monitoring file*

Toolbars

- ♦ The Toolbars in EASY-ROB gives an fast access to the most needed functions



Fig. Tut02 (Tollbars)

- **Render Toolbar:**

- to enable or disable the **light**
- to enable or disable the render mode **wire frame** for the complete scene
- to enable or disable the render mode **bbox mode** for the complete scene
- to enable or disable the render mode **backface culling** for the complete scene
- to enable or disable the floor visualization
- to enable or disable the floor render mode to wire frame
- to reset the view
- to toggle between Cell view and Igp-CAD View

- **Run-Animation Toolbar:**

- to run, pause, continue, stop,
- to enable or disable 'pause program execution after each motion command',
- to enable or disable 'repeat program automatically',
- to decrease or increase the simulation step size
- to open output windows for miscell. values like joint and cartesian coordinates, current motion data, ...

- **On-Off Toolbar:**

- to enable or disable the visualization of the robot,
- to enable or disable the visualization of the robots tool,
- to enable or disable the visualization of the environment bodies,
- to enable or disable the TCP coordinate system (blue color)
- to enable or disable the joint coordinate systems from each robot joint (yellow color)
- to enable or disable all tag coordinate systems in the cell (different colors)
- to enable or disable robot dynamics
- to enable or disable the TCP trace (in green color for nominal path, red color for current path using dynamics)
- to enable or disable 'Stop on limit switch', when joint travel ranges of robots are exceeded
- to open the program window (shows current executed program command)
- to enable or disable hierarchical collision detection (bounded boxes, convex hul and concave bodies)

- **Mouse Mode Toolbar:**

- to modify the view point (cruise, zoom in/out, translate),
- to move the robot in cartesian coordinates related to the TCP frame,
- to move the robot in cartesian coordinates related to the Robot Base frame,
- to move the robot in joint space,
- to move the robots base position,
- to move the current selected body in cartesian space related to its base frame,
- to move all bodies in a selected group in cartesian space related to a reference frame (tbd),
- to move the current selected Tag point in cartesian space related to its own frame,
- to enable or disable Translation (X,Y and Z-direction) or Rotation (RotX, RotY and RotZ-direction),
- to enable or disable TCP jog mode. (If this mode is on, the TCP location is kept its position when during modifying
 - the robots base position),
 - increments the mouse sensitivity
 - decrements the mouse sensitivity

- **Move to Target Toolbar:**

- moves the robot to his homeposition in PTP mode,
- moves the robot to a givin joint location in PTP mode,
- moves the robot to a givin cartesian location in LIN mode,
- moves the robot to a givin delta cartesian location in LIN mode,
- moves the robot to a givin cartesian via point and cartesian target location in CIRC mode,
- moves the robot to a givin delta cartesian via point and delta cartesian target location in CIRC mode,
- moves the robot to one ore more tag points in a givin motion planner mode

- 3D CAD Toolbar:

to enable or disable the coordinate system from the current selected body (cyan color)

to select the next 3D CAD body in the current selected group (this body is the current selected

one)

EASY-ROB has 3 groups for geometries:

Group 1: Robot bodies

Group 2: Tool bodies

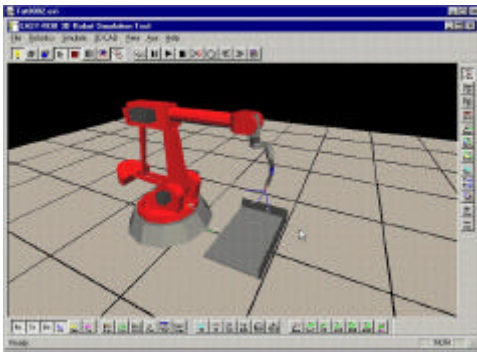
Group 3: Environment (Body) bodies

to enter or modify the absolute cartesian position of the current selected body

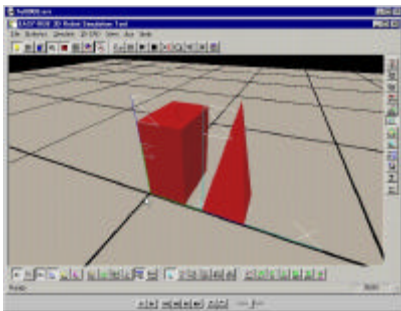
to enter or modify a relative cartesian position of the current selected body

to reset (undo) the cartesian position of the current selected body

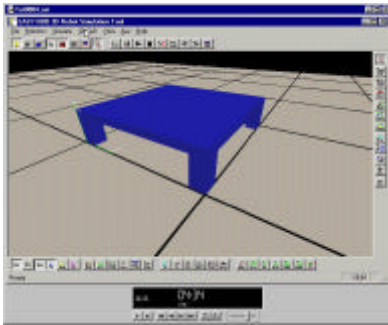
to save the cartesian position of the current selected body



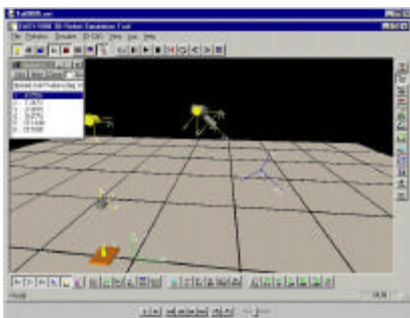
- Load a cell file *arc_abb.cel.cel*
- Run the program (loaded with the cell)
- Show the joint values during program execution
- Show the program window during program execution
- Close the joint value & program window
- Load another robot *irb24-10.rob*
- Modify the robots base position by -0.3m in -X direction
- Save all joints and positions
- Load tool file *arc_gun.tol*
- Restart the program
- Open the *Teach Window*, modify the program and restart
- Save the Cell, give a new name => *myfirstcel*
- Delete the current loaded cel, reload cell file *myfirstcel.cel*
- Run the program (loaded with the cell)



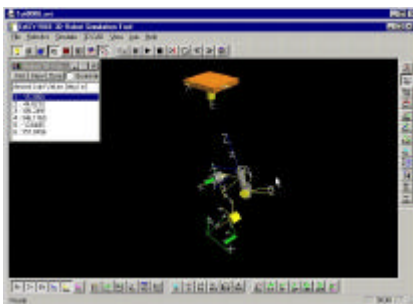
- *3D CAD* Manipulations
- Create a Block (Quader)
chose a name and color
- Modify the lengths of the block afterwards
- Translate the Body with the mouse on the floor
- Rotate the Body with the mouse
- Reset bodies position to its initial location
- Create a pyramide as second body
- Invert the polygons from the pyramide
- Set pyramide to wire frame
- Select first body (Block)
- Enter *absolut* values for location of the block
- Enter *relative* values for location of the block



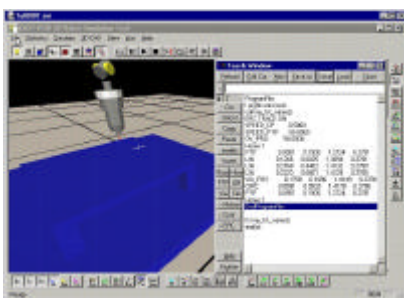
- **3D CAD:**
- Build a table
- Save the table as "IGP" Part file format
- Reload the table



- Create a robot
- move the robot with the mouse in joint space
- move the robot with the mouse in cartesian space



- Create a new robot
- Set up the robots attributes
- Set the robots base position
- Modify (play with) the robots kinematics lengths



- Load a robot created in tutorial 6
- Load the table from tutorial 4
- Load a tool
- Move the robot in cartesian space
- Open the Teach Window
- Teach a program and save it
- Run the program
- Save the Cell