Full tutorial for creating a 3d machine simulation with Virtual Universe Pro: Unstacker

Courtesy of School VAUVENARGUES (Aix en Provence, France)

Thanks

IRAI thanks Vauvenargues School for the use of Solidworks files used for this tutorial.

Prerequisites

Virtual Universe Pro 2.013 is required for this tutorial. Next versions are also compatible.

The last Virtual Universe Pro release can be downloaded at www.irai.com/vup

Symbols

The following symbols are used in the screenshots:

Left mouse click : ⇦

Double click : ⇦^{2}

Left mouse click: ⇨

Drag and drop: ✥

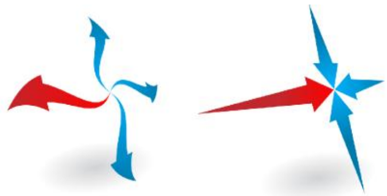
Entering text: ⇔

Select from a list: ⇩

Introduction

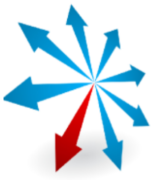
The realization of this simulation illustrates the resolution of certain difficulties, including the use of free concave parts (pallets), hybrid mechanical system cylinder (translation) / fingers (rotation). We deliberately kept some non-optimized in CAD tool elements (not aligned with the axes elements incomplete structure) to show that this can be treated in Virtual Universe Pro.

Reminder on navigation in the 3D world



Mouse wheel = zoom

Mouse wheel pressed + moving mouse or rotating wheel = translation



Left mouse button click = actions

Right mouse button pressed + moving mouse = rotation

Left mouse button click and drag = grab object

Files

The files used in this tutorial are available from our web site.

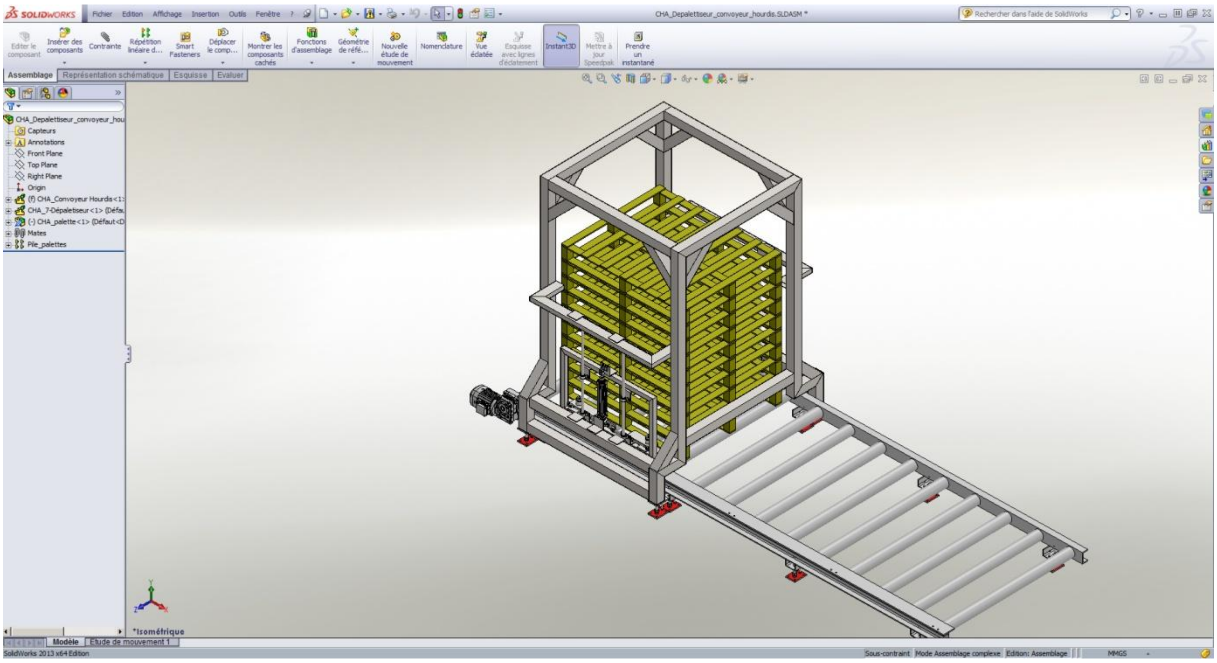
Les fichiers utilisés dans ce tutorial sont disponibles au téléchargement sur notre site Internet. The project being created has been saved in different stages identified by an index number in the file.

In this manual, the various save points are identified by a tracking # with <n> <n> = index, eg #3 refers to file unstacker#3.vu

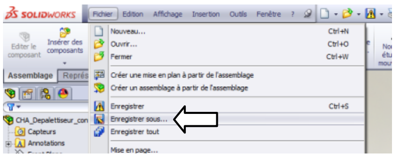
Tutorial

1- Conversion of the Solidworks assembly to 3dxml format

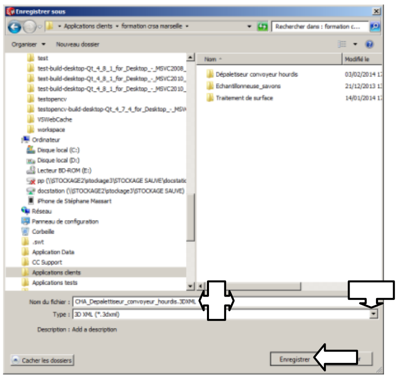
1.1 - Opening of the complete assembly of the machine from SolidWorks


SOLIDWORKS
Fichier
Edition
Affichage
Insertion
Outils
Fenêtre
CHA_Depalettiseur_convoyeur_hourdis.SLDASM *
Assemblage
Représentation schématique
Esquisse
Evaluer
CHA_Depalettiseur_convoyeur_hou
Capteurs
Annotations
Front Plane
Top Plane
Right Plane
Origin
(f) CHA_Convoyeur Hourdis<1>
CHA_7-Dépaletiseur<1> (Défa
(-) CHA_palette<1> (Défaut<D
Mates
File_palettes
*Isométrique
Modèle
Etude de mouvement 1
SolidWorks 2013 x64 Edition

1.2- Export



1.3- Selecting the destination file



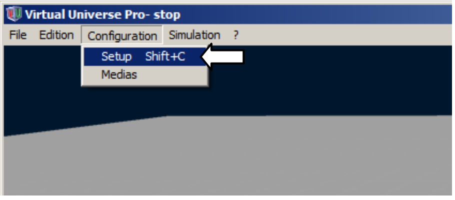
Nom du fichier : CHA_Depalettiseur_convoyeur_hourdis.3DXML

Type : 3D XML (*.3dxml)

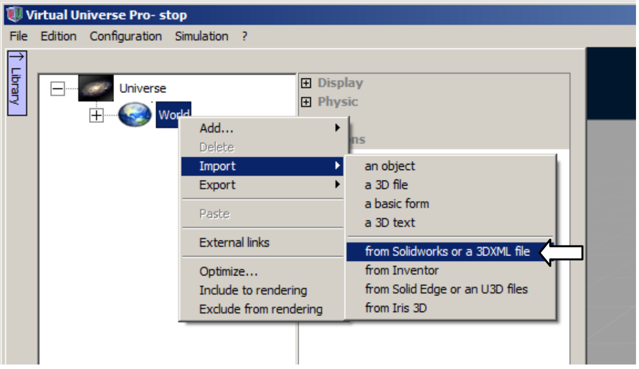
Description : Add a description

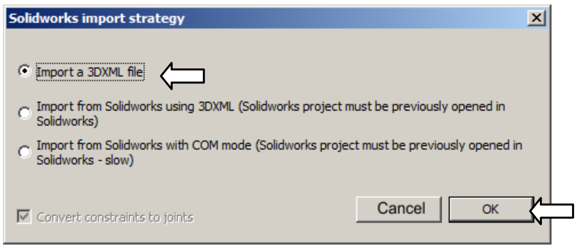
2- Import into Virtual Universe Pro

2.1- Opening the setup window



2.2 - Selecting the type of import




Solidworks import strategy

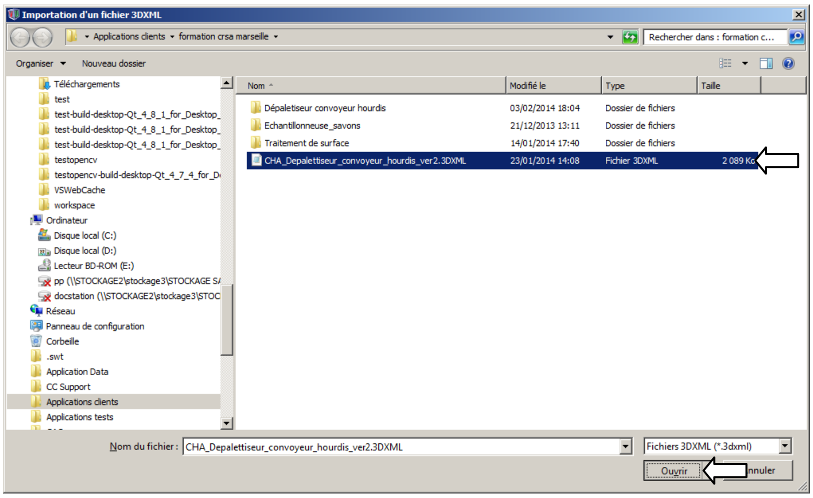
● Import a 3DXML file

○ Import from Solidworks using 3DXML (Solidworks project must be previously opened in Solidworks)

○ Import from Solidworks with COM mode (Solidworks project must be previously opened in Solidworks - slow)

☑ Convert constraints to joints

2.3- Select file to import

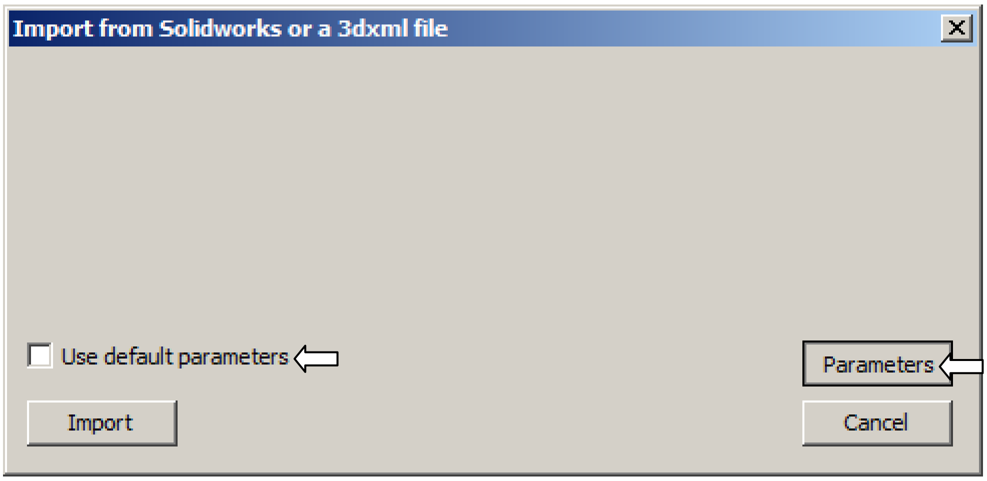

Importation d'un fichier 3DXML
Applications clients ▸ formation crsa marseille
Rechercher dans : formation c...
Organiser
Nouveau dossier
Téléchargements
test
test-build-desktop-Qt_4_8_1_for_Desktop_
test-build-desktop-Qt_4_8_1_for_Desktop_
test-build-desktop-Qt_4_8_1_for_Desktop_
testopencv
testopencv-build-desktop-Qt_4_7_4_for_D
VSWebCache
workspace
Ordinateur
Disque local (C:)
Disque local (D:)
Lecteur BD-ROM (E:)
pp (\\STOCKAGE2\stockage3\STOCKAGE S
docstation (\\STOCKAGE2\stockage3\STOC
Réseau
Panneau de configuration
Corbeille
.swt
Application Data
CC Support
Applications clients
Applications tests
Ouvrir
nnuler

Nom	Modifié le	Type	Taille
Dépaletiseur convoyeur hourdis	03/02/2014 18:04	Dossier de fichiers	
Echantillonneuse_savons	21/12/2013 13:11	Dossier de fichiers	
Traitement de surface	14/01/2014 17:40	Dossier de fichiers	
CHA_Depalettiseur_convoyeur_hourdis_ver2.3DXML	23/01/2014 14:08	Fichier 3DXML	2 089 Ko

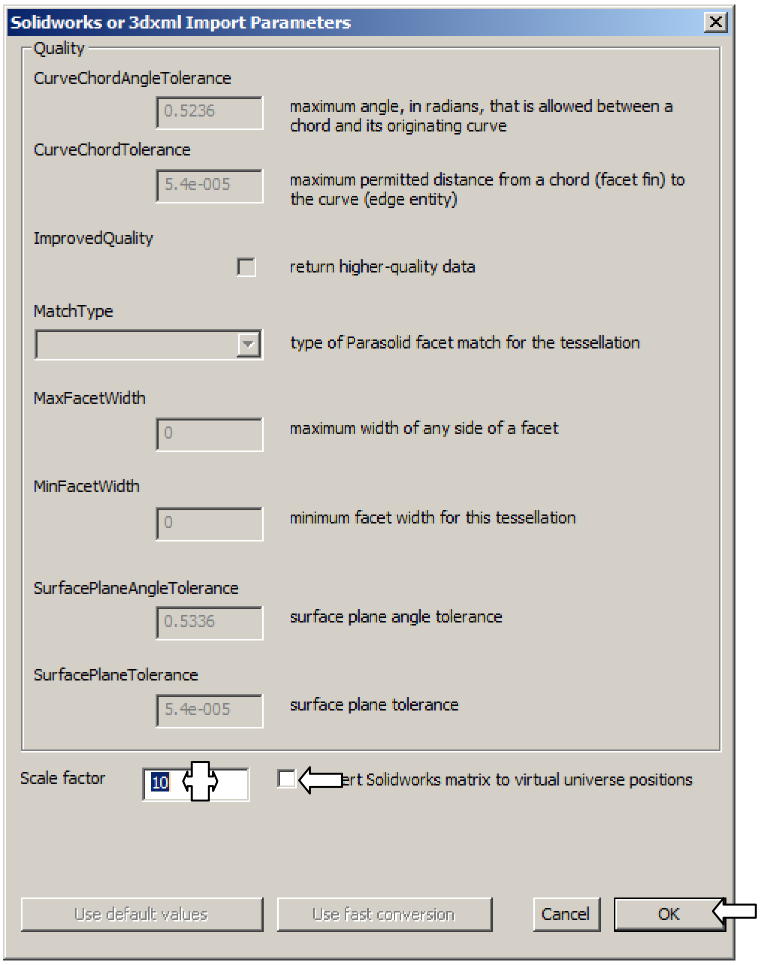
Nom du fichier : CHA_Depalettiseur_convoyeur_hourdis_ver2.3DXML

Fichiers 3DXML (*.3dxml)

2.4- Defining the parameters of the import



□ Use default parameters



Solidworks or 3dxml Import Parameters ☒

Quality

CurveChordAngleTolerance: 0.5236 — maximum angle, in radians, that is allowed between a chord and its originating curve

CurveChordTolerance: 5.4e-005 — maximum permitted distance from a chord (facet fin) to the curve (edge entity)

ImprovedQuality: □ return higher-quality data

MatchType: — type of Parasolid facet match for the tessellation

MaxFacetWidth: 0 — maximum width of any side of a facet

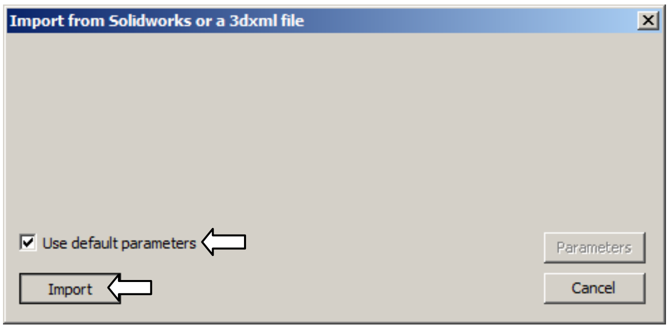
MinFacetWidth: 0 — minimum facet width for this tessellation

SurfacePlaneAngleTolerance: 0.5336 — surface plane angle tolerance

SurfacePlaneTolerance: 5.4e-005 — surface plane tolerance

Scale factor: 10

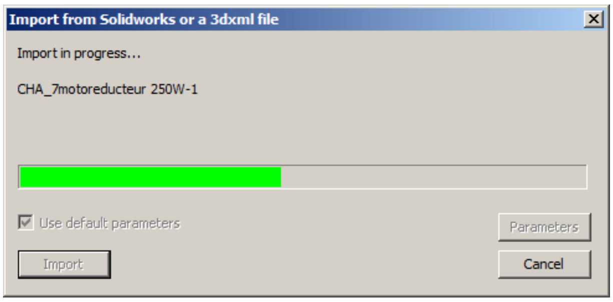
□ ert Solidworks matrix to virtual universe positions



Import from Solidworks or a 3dxml file ☒

☑ Use default parameters

2.5- Automatic processing import



Import from Solidworks or a 3dxml file ☒

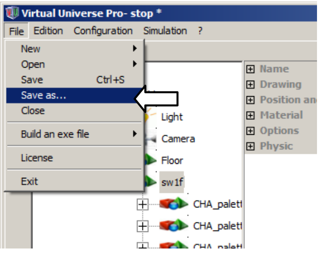
Import in progress...

CHA_7motoreducteur 250W-1

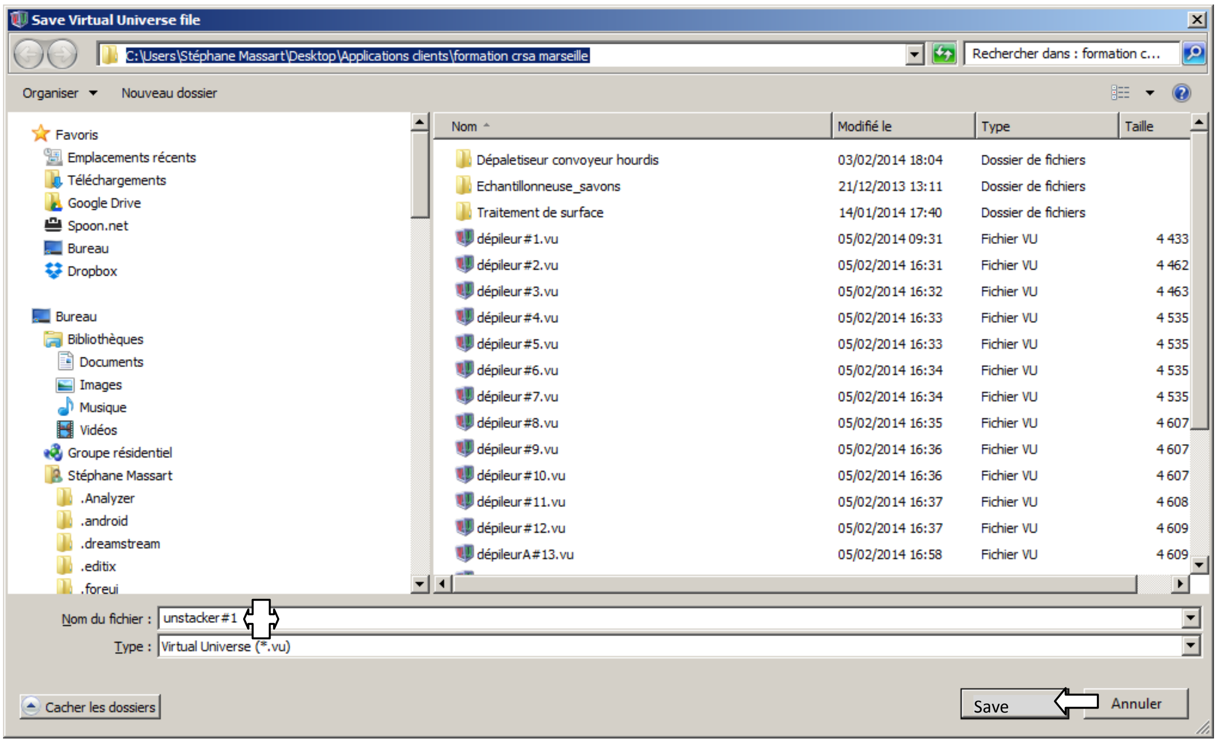
☑ Use default parameters

3- Saving the Virtual Universe Pro project

3.1- Saving



3.2- Setting of the file name



C:\Users\Stéphane Massart\Desktop\Applications clients\formation crsa marseille

Nom	Modifié le	Type	Taille
Dépaletiseur convoyeur hourdis	03/02/2014 18:04	Dossier de fichiers	
Echantillonneuse_savons	21/12/2013 13:11	Dossier de fichiers	
Traitement de surface	14/01/2014 17:40	Dossier de fichiers	
dépileur#1.vu	05/02/2014 09:31	Fichier VU	4 433
dépileur#2.vu	05/02/2014 16:31	Fichier VU	4 462
dépileur#3.vu	05/02/2014 16:32	Fichier VU	4 463
dépileur#4.vu	05/02/2014 16:33	Fichier VU	4 535
dépileur#5.vu	05/02/2014 16:33	Fichier VU	4 535
dépileur#6.vu	05/02/2014 16:34	Fichier VU	4 535
dépileur#7.vu	05/02/2014 16:34	Fichier VU	4 535
dépileur#8.vu	05/02/2014 16:35	Fichier VU	4 607
dépileur#9.vu	05/02/2014 16:36	Fichier VU	4 607
dépileur#10.vu	05/02/2014 16:36	Fichier VU	4 607
dépileur#11.vu	05/02/2014 16:37	Fichier VU	4 608
dépileur#12.vu	05/02/2014 16:37	Fichier VU	4 609
dépileurA#13.vu	05/02/2014 16:58	Fichier VU	4 609

Nom du fichier : unstacker#1

Type : Virtual Universe (*.vu)

Tip: including # 1, the index (the number behind #) is automatically incremented for each backup allowing easy back to a previous version if mishandled. Remember to save regularly in the creation phase of a project.

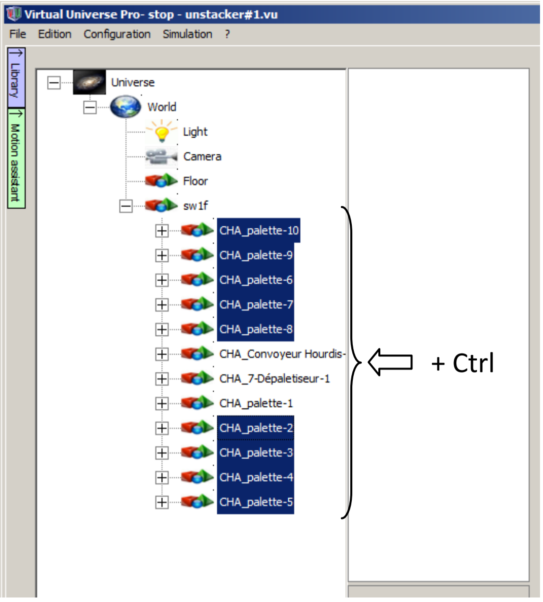
#1

4- Model creation

4.1- Setting the "free" items: pallets

4.1.1- Removing objects palettes (to keep only one)

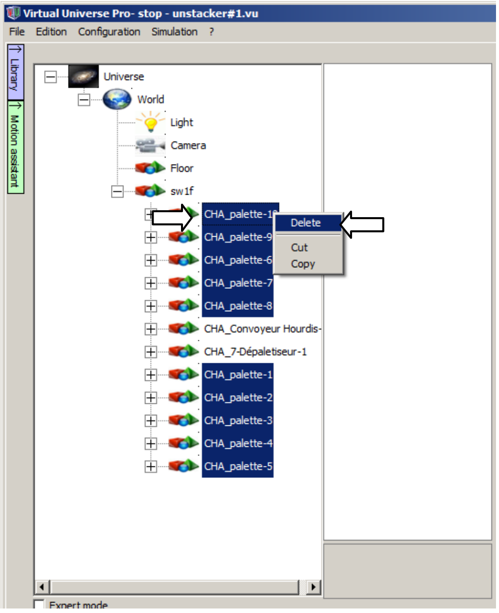
4.1.1.1- Selecting objects to be removed



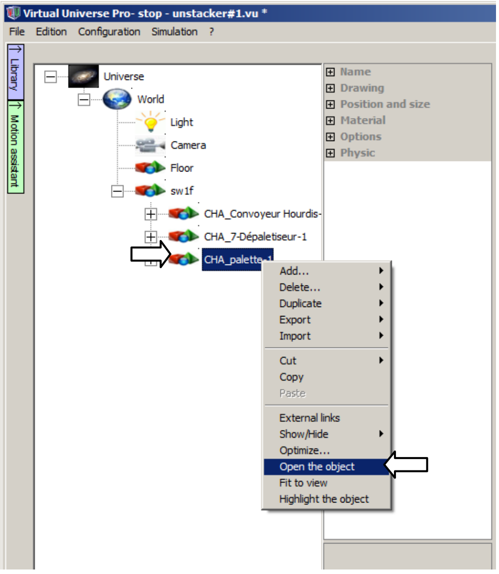
- Universe
  - World
    - Light
    - Camera
    - Floor
    - sw1f
      - CHA_palette-10
      - CHA_palette-9
      - CHA_palette-6
      - CHA_palette-7
      - CHA_palette-8
      - CHA_Convoyeur Hourdis-
      - CHA_7-Dépaletiseur-1
      - CHA_palette-1
      - CHA_palette-2
      - CHA_palette-3
      - CHA_palette-4
      - CHA_palette-5

+ Ctrl

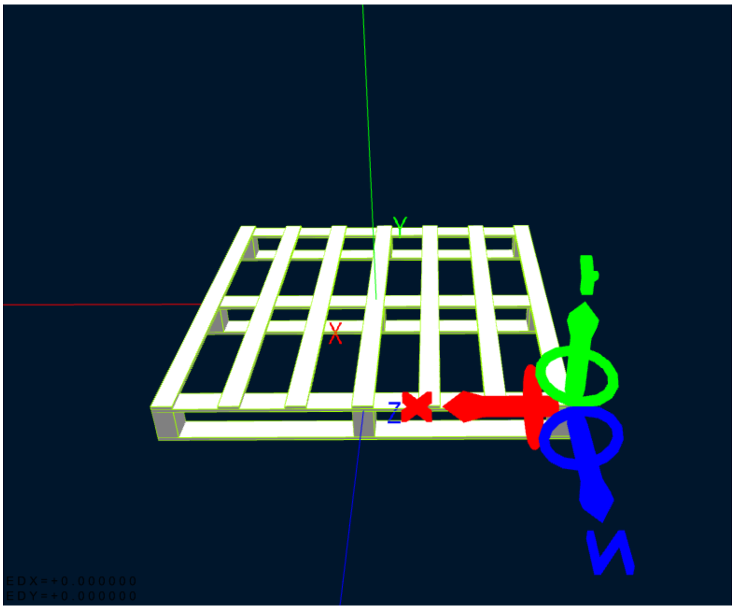
4.1.1.2- Deleting



4.1.2- Isolate the object



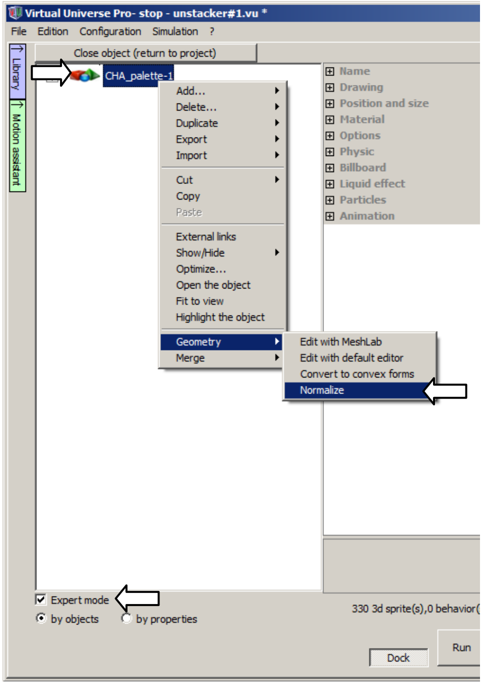
4.1.3- Center the pallet on the reference



In grabbing red, green and blue arrows, visually center the pallet on the origin of the reference (marked X / Y / Z thin lines).

4.1.4- Normalize the geometry

(required for the physics engine for compounds of several sub-items items)



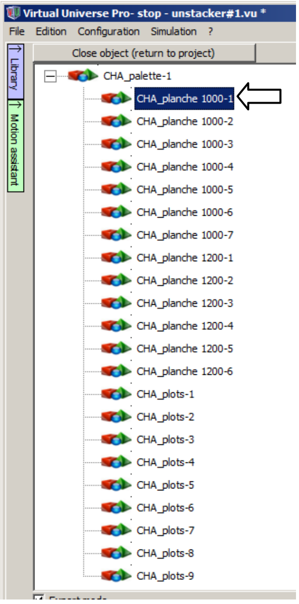
☑ Expert mode

● by objects ○ by properties

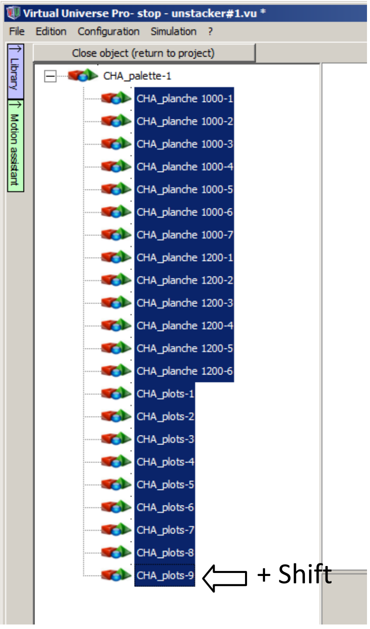
4.1.5- Merge elements of the palette

The purpose is to obtain a complex object composed of a plurality of convex forms usable by the physical engine. Pallets must in fact be crossed by fingers to be raised.

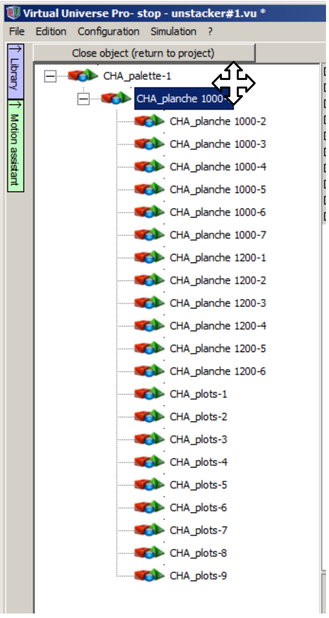
4.1.5.1- Making palette items child of the first item


Virtual Universe Pro- stop - unstacker#1.vu *
File Edition Configuration Simulation ?
Close object (return to project)
Library
Motion assistant

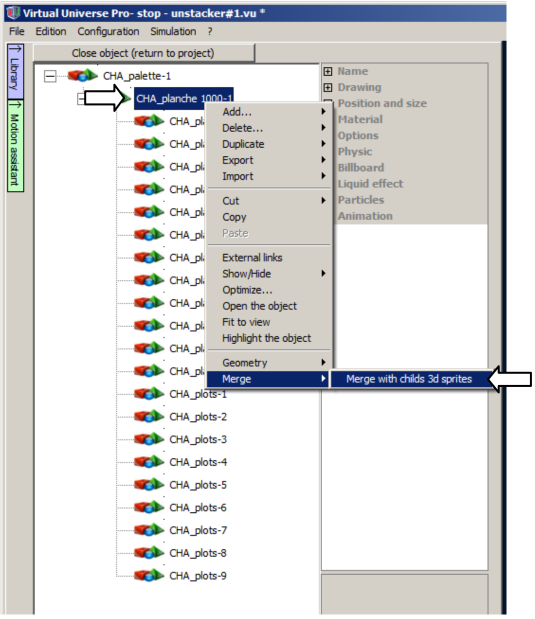
CHA_palette-1
CHA_planche 1000-1
CHA_planche 1000-2
CHA_planche 1000-3
CHA_planche 1000-4
CHA_planche 1000-5
CHA_planche 1000-6
CHA_planche 1000-7
CHA_planche 1200-1
CHA_planche 1200-2
CHA_planche 1200-3
CHA_planche 1200-4
CHA_planche 1200-5
CHA_planche 1200-6
CHA_plots-1
CHA_plots-2
CHA_plots-3
CHA_plots-4
CHA_plots-5
CHA_plots-6
CHA_plots-7
CHA_plots-8
CHA_plots-9


Virtual Universe Pro- stop - unstacker#1.vu *
File Edition Configuration Simulation ?
Close object (return to project)
Library
Motion assistant
+ Shift

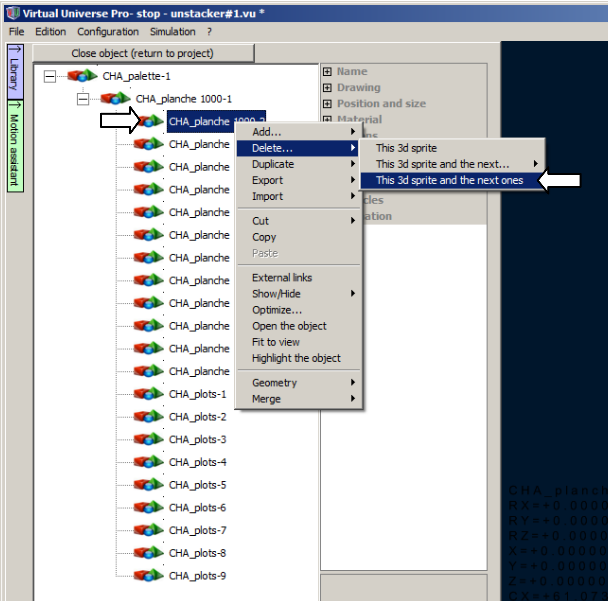
CHA_palette-1
CHA_planche 1000-1
CHA_planche 1000-2
CHA_planche 1000-3
CHA_planche 1000-4
CHA_planche 1000-5
CHA_planche 1000-6
CHA_planche 1000-7
CHA_planche 1200-1
CHA_planche 1200-2
CHA_planche 1200-3
CHA_planche 1200-4
CHA_planche 1200-5
CHA_planche 1200-6
CHA_plots-1
CHA_plots-2
CHA_plots-3
CHA_plots-4
CHA_plots-5
CHA_plots-6
CHA_plots-7
CHA_plots-8
CHA_plots-9



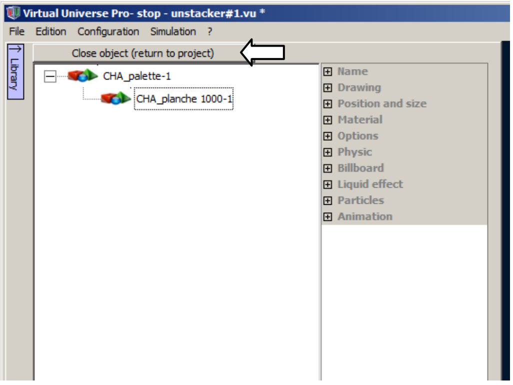
4.1.5.2- Merge objects



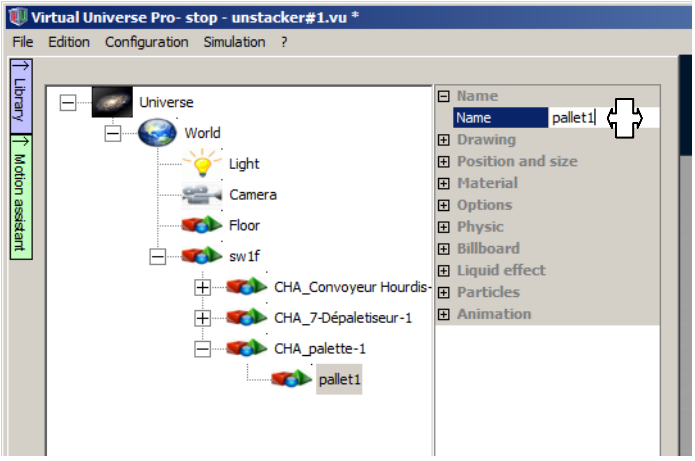
4.1.5.3- Delete child objects



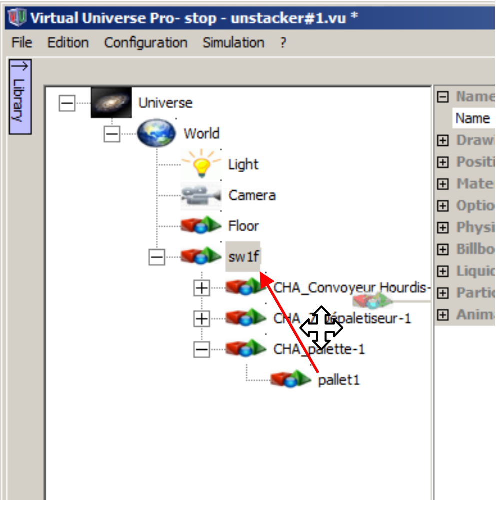
4.1.5.4- Close the object



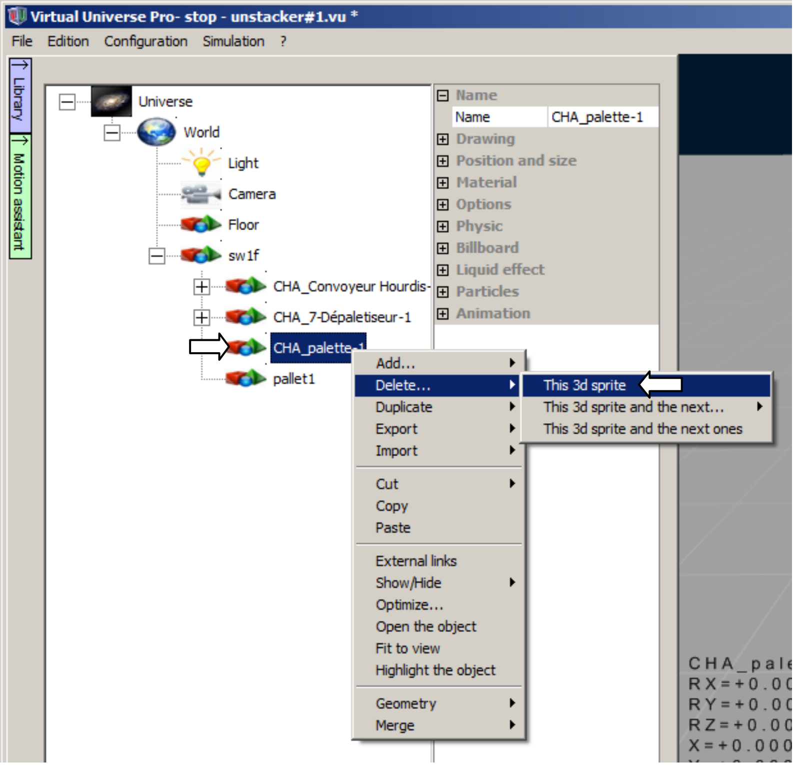
4.1.5.5- Rename the object



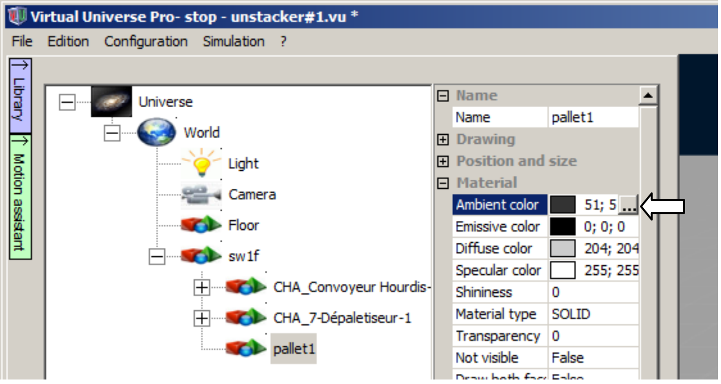
4.1.5.5- Make the pallet child of sw1f



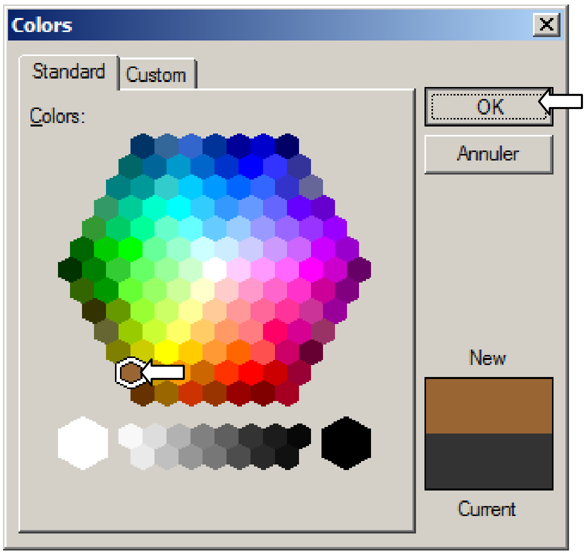
4.1.5.6- Delete old parent

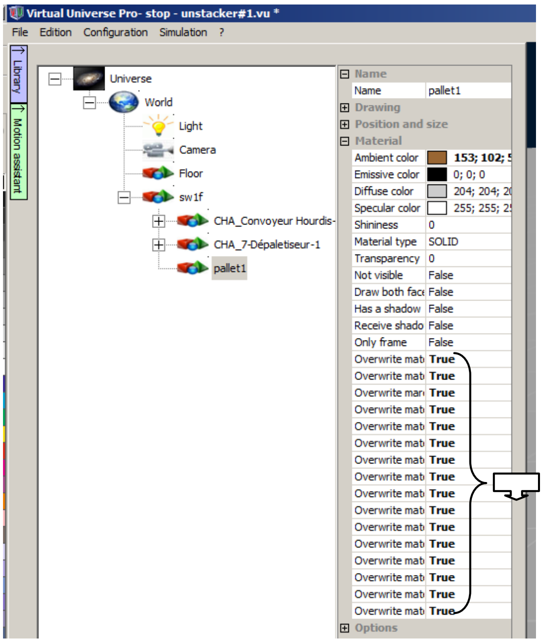


4.1.5.7- Set color



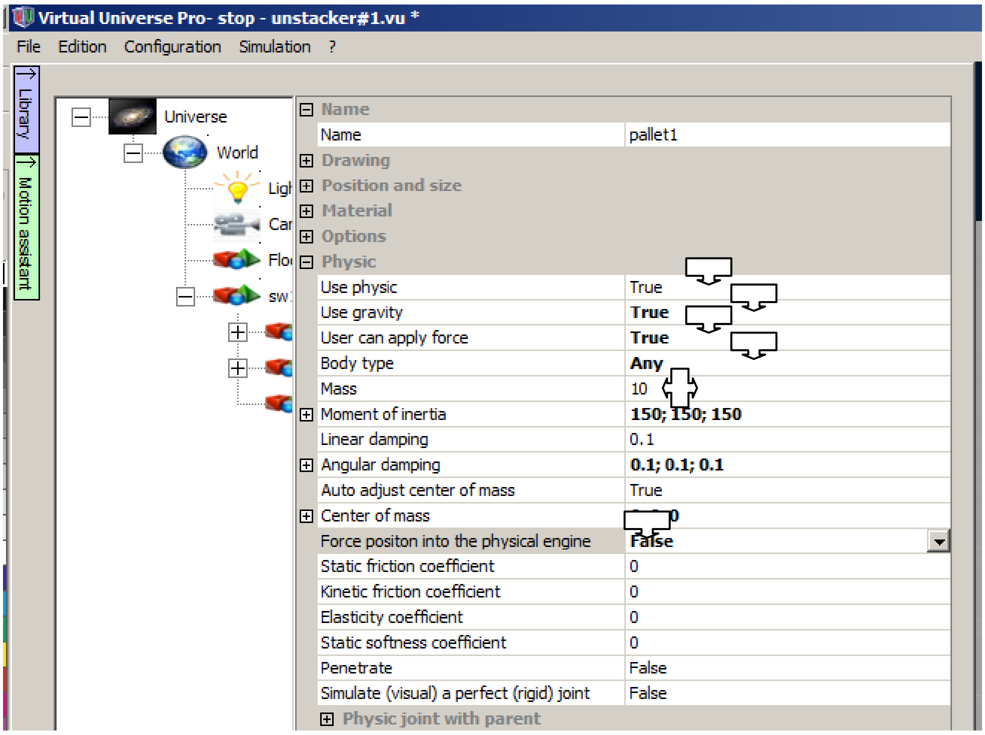
Name	
Name	pallet1
Drawing	
Position and size	
Material	
Ambient color	51; 5 ...
Emissive color	0; 0; 0
Diffuse color	204; 204
Specular color	255; 255
Shininess	0
Material type	SOLID
Transparency	0
Not visible	False
Draw both face	False





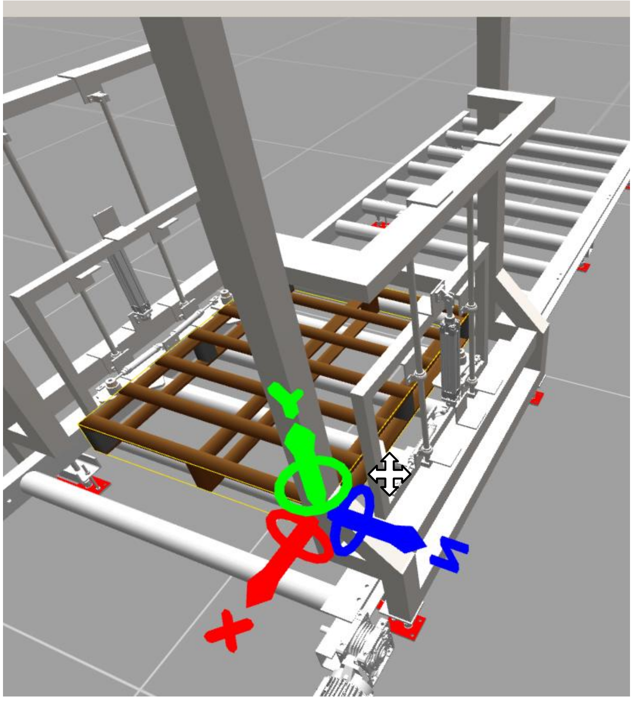
Name	
Name	pallet1
Drawing	
Position and size	
Material	
Ambient color	**153; 102; 5**
Emissive color	0; 0; 0
Diffuse color	204; 204; 20
Specular color	255; 255; 25
Shininess	0
Material type	SOLID
Transparency	0
Not visible	False
Draw both face	False
Has a shadow	False
Receive shado	False
Only frame	False
Overwrite mat	**True**
Overwrite mat	**True**
Overwrite mar	**True**
Overwrite mat	**True**
Overwrite mat	**True**
Overwrite mat	**True**
Overwrite mat	**True**
Overwrite mat	**True**
Overwrite mat	**True**
Overwrite mat	**True**
Overwrite mat	**True**
Overwrite mat	**True**
Overwrite mat	**True**
Overwrite mat	**True**
Overwrite mat	**True**
Overwrite mat	**True**
Options	

4.1.5.8- Define the physical properties



Name	
Name	pallet1
Drawing	
Position and size	
Material	
Options	
Physic	
Use physic	True
Use gravity	**True**
User can apply force	**True**
Body type	**Any**
Mass	10
Moment of inertia	**150; 150; 150**
Linear damping	0.1
Angular damping	**0.1; 0.1; 0.1**
Auto adjust center of mass	True
Center of mass	[illegible]0
Force positon into the physical engine	**False**
Static friction coefficient	0
Kinetic friction coefficient	0
Elasticity coefficient	0
Static softness coefficient	0
Penetrate	False
Simulate (visual) a perfect (rigid) joint	False
Physic joint with parent	

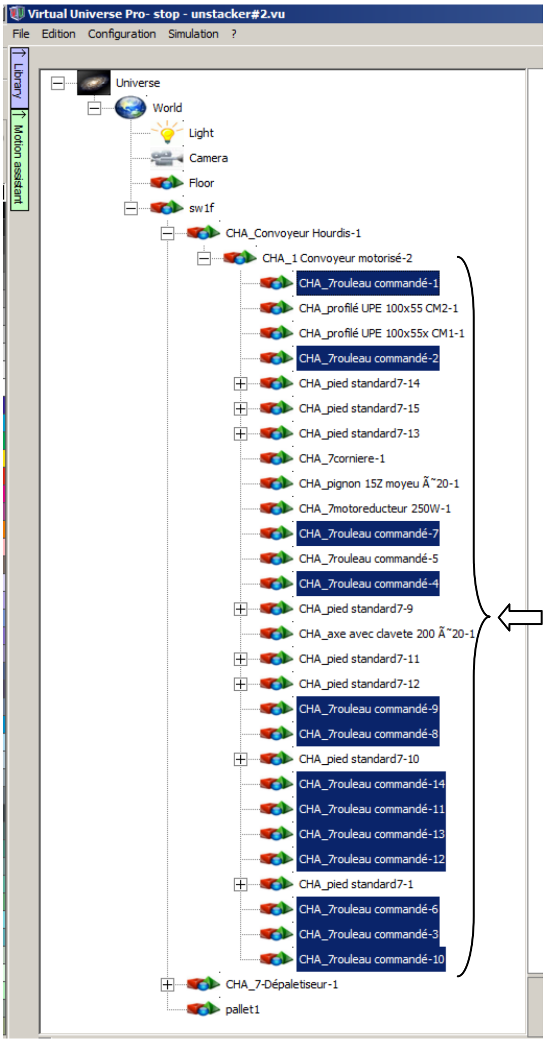
4.1.5.9- Back the pallet location



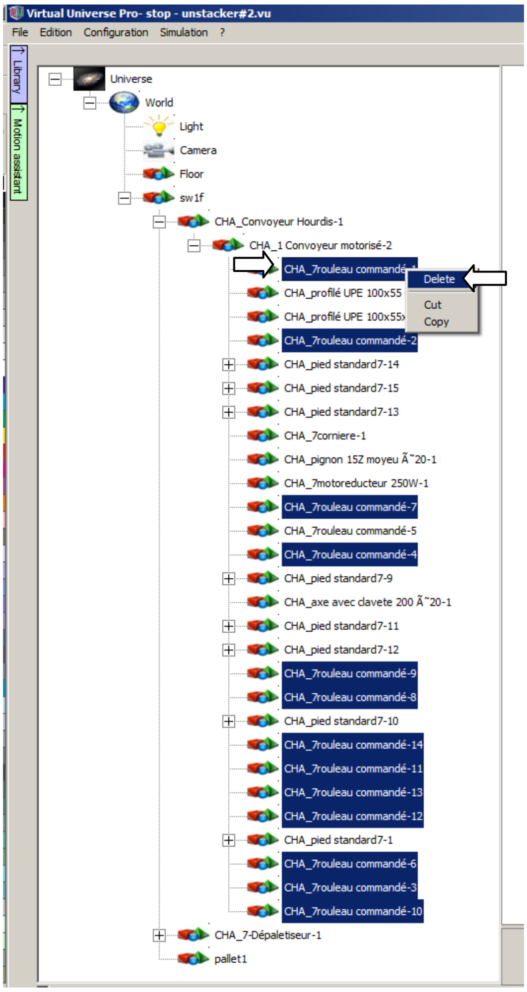
#2

4.2- Setting conveyor rollers

4.2.1- Remove all rollers except one

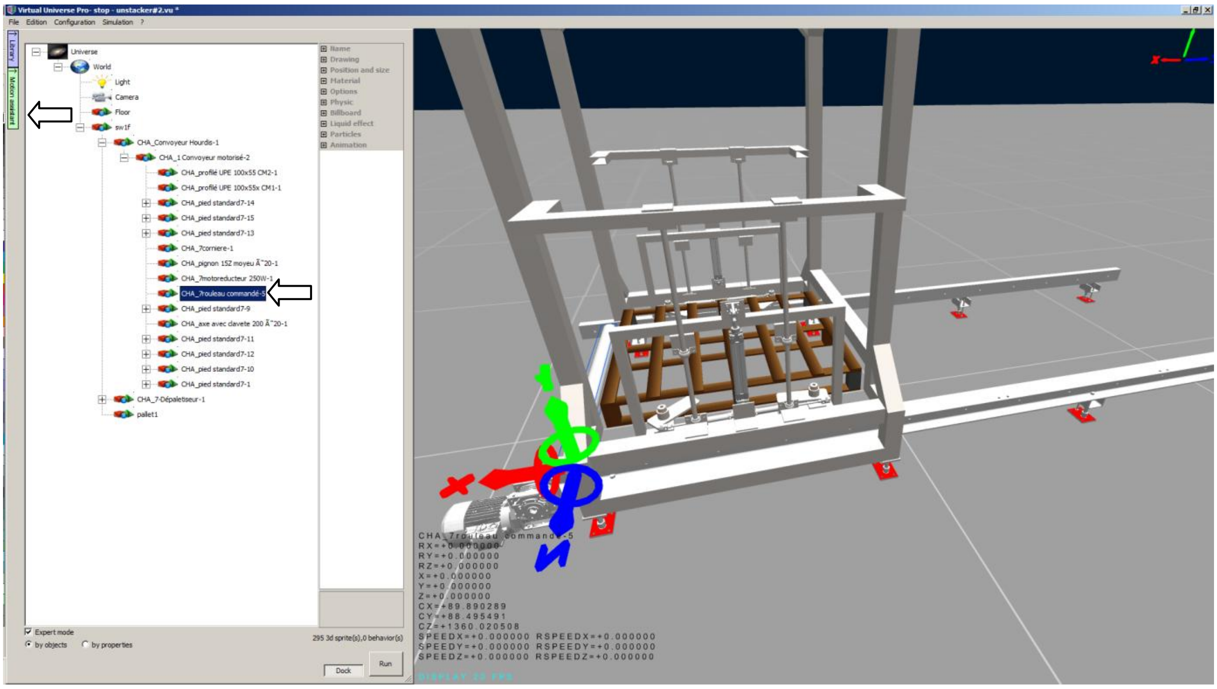


+ Ctrl


Virtual Universe Pro- stop - unstacker#2.vu
File
Edition
Configuration
Simulation
?
Library
Motion assistant
Universe
World
Light
Camera
Floor
sw1f
CHA_Convoyeur Hourdis-1
CHA_1 Convoyeur motorisé-2
CHA_7rouleau commandé-
CHA_profilé UPE 100x55
CHA_profilé UPE 100x55x
CHA_7rouleau commandé-2
CHA_pied standard7-14
CHA_pied standard7-15
CHA_pied standard7-13
CHA_7corniere-1
CHA_pignon 15Z moyeu Ã˜20-1
CHA_7motoreducteur 250W-1
CHA_7rouleau commandé-7
CHA_7rouleau commandé-5
CHA_7rouleau commandé-4
CHA_pied standard7-9
CHA_axe avec clavete 200 Ã˜20-1
CHA_pied standard7-11
CHA_pied standard7-12
CHA_7rouleau commandé-9
CHA_7rouleau commandé-8
CHA_pied standard7-10
CHA_7rouleau commandé-14
CHA_7rouleau commandé-11
CHA_7rouleau commandé-13
CHA_7rouleau commandé-12
CHA_pied standard7-1
CHA_7rouleau commandé-6
CHA_7rouleau commandé-3
CHA_7rouleau commandé-10
CHA_7-Dépaletiseur-1
pallet1
Delete
Cut
Copy

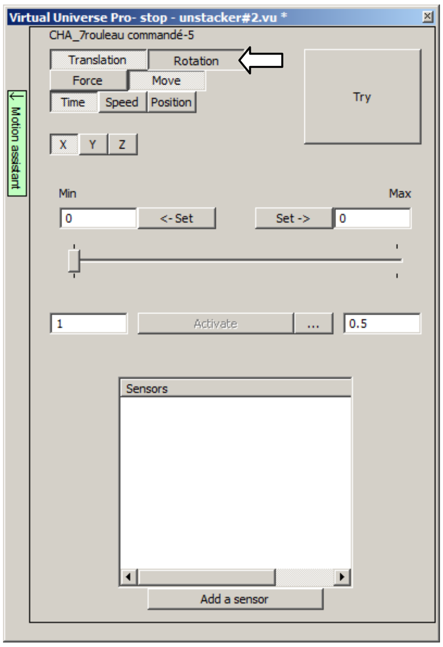
4.2.2- Setting the remaining roller

4.2.2.1- Opening the assistant

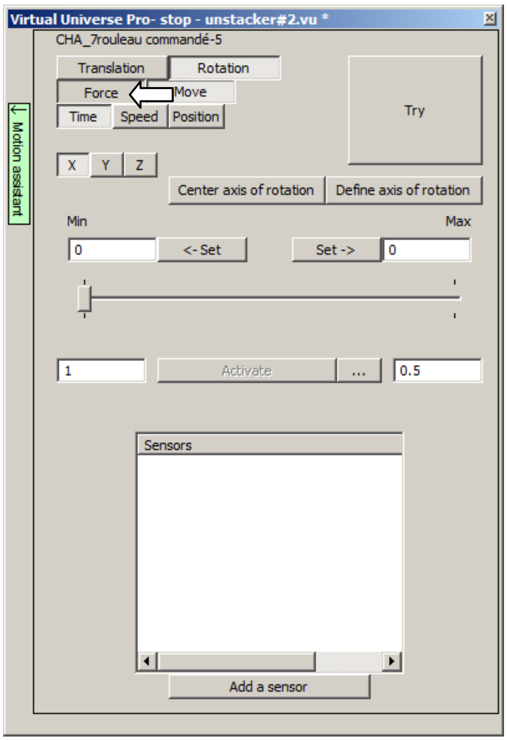


```
CHA_7rouleau commandé-5
RX=+0.000000
RY=+0.000000
RZ=+0.000000
X=+0.000000
Y=+0.000000
Z=+0.000000
CX=+89.890289
CY=+88.495491
CZ=+1360.020508
SPEEDX=+0.000000 RSPEEDX=+0.000000
SPEEDY=+0.000000 RSPEEDY=+0.000000
SPEEDZ=+0.000000 RSPEEDZ=+0.000000
```

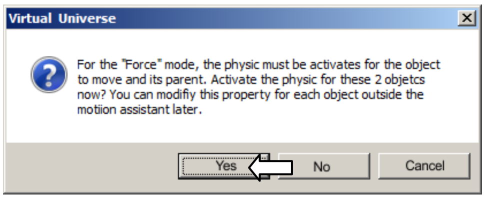
4.2.2.2- Selection of "rotation" mode



4.2.2.3- Selection of "force" mode

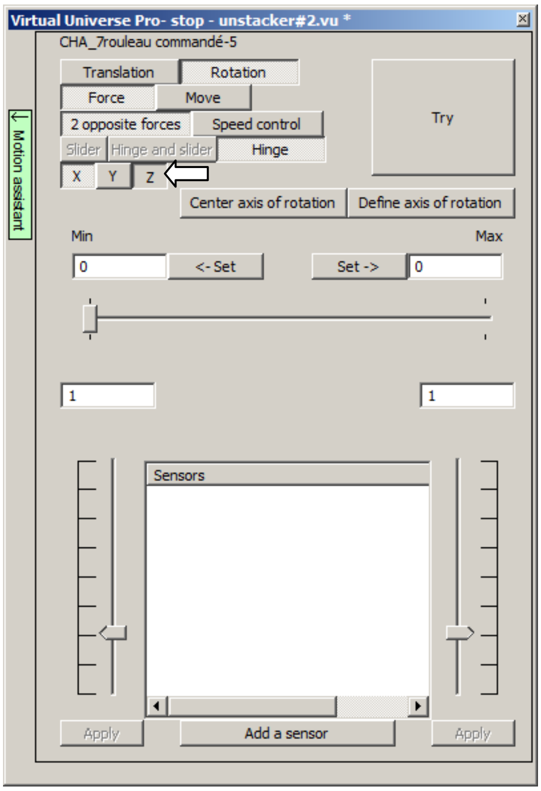


4.2.2.4- Accept the change for object attributes

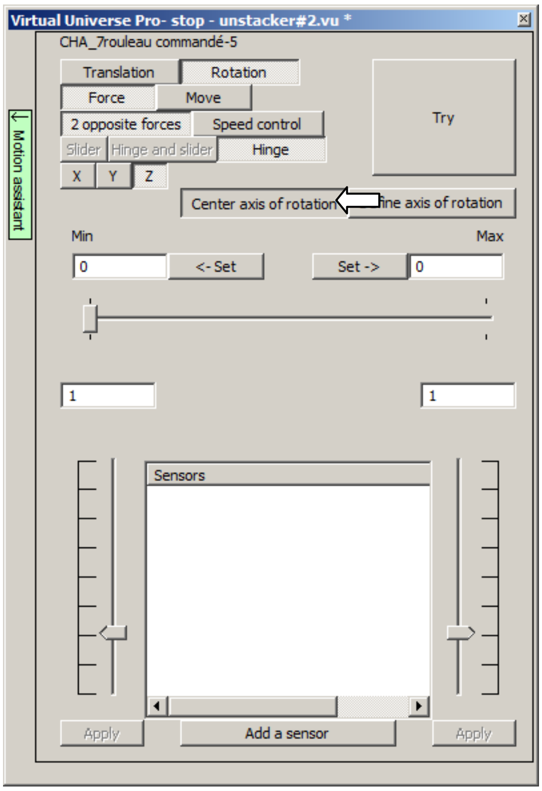


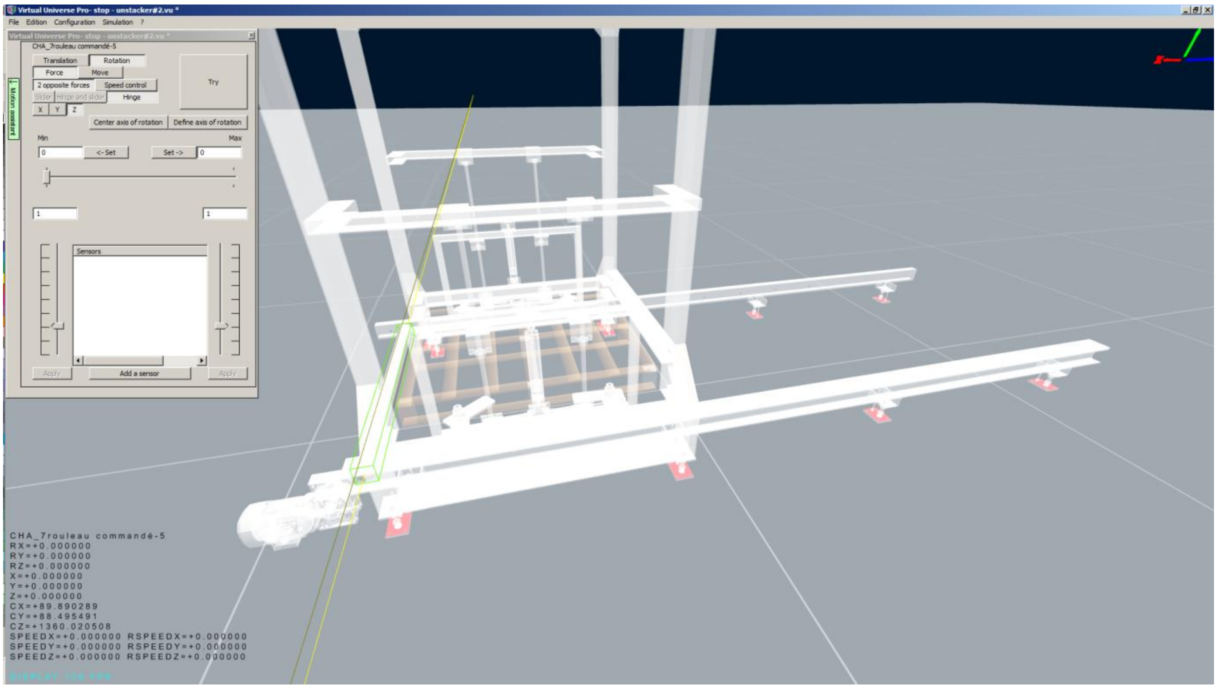
For the "Force" mode, the physic must be activates for the object to move and its parent. Activate the physic for these 2 objetcs now? You can modifiy this property for each object outside the motion assistant later.

4.2.2.5- Selection of the axis



4.2.2.6- Center the axis of rotation on the geometric center of the object





CHA_7rouleau commandé-5

Min 0

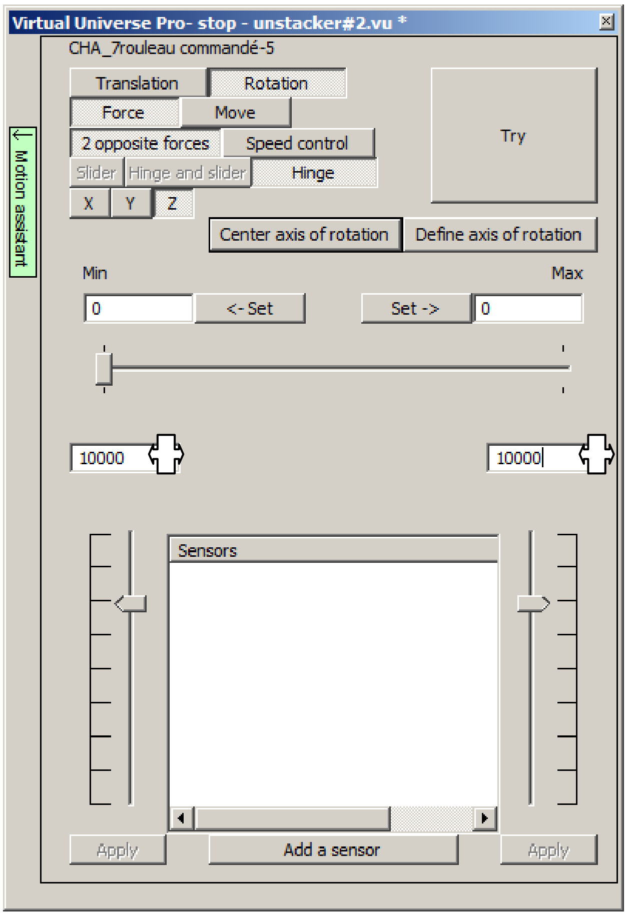
Max 0

1

1

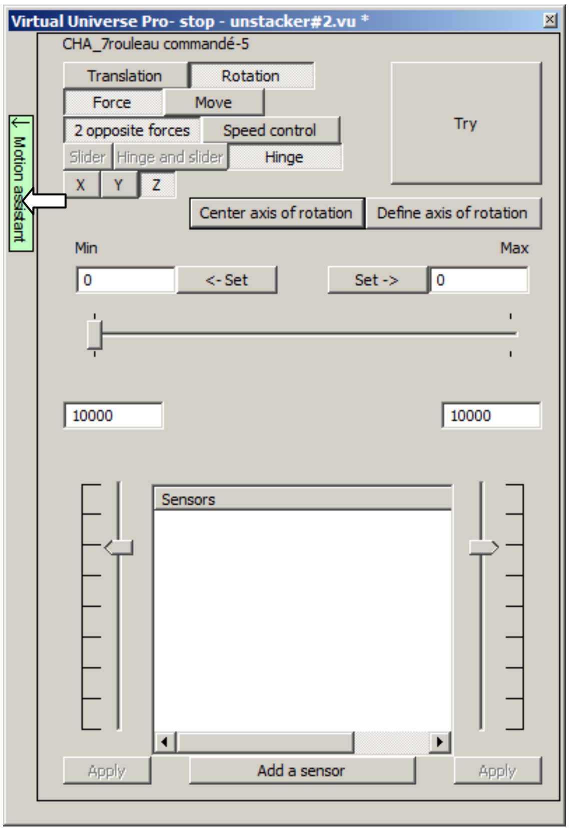
```
CHA_7rouleau commandé-5
RX=+0.000000
RY=+0.000000
RZ=+0.000000
X=+0.000000
Y=+0.000000
Z=+0.000000
CX=+89.890289
CY=+88.495491
CZ=+1360.020508
SPEEDX=+0.000000 RSPEEDX=+0.000000
SPEEDY=+0.000000 RSPEEDY=+0.000000
SPEEDZ=+0.000000 RSPEEDZ=+0.000000
```

4.2.2.7- Definition of net torque for each direction of rotation



Note: this can be done empirically or according with the data of the real system.

4.2.2.8- Wizard closes



Virtual Universe Pro- stop - unstacker#2.vu *

CHA_7rouleau commandé-5

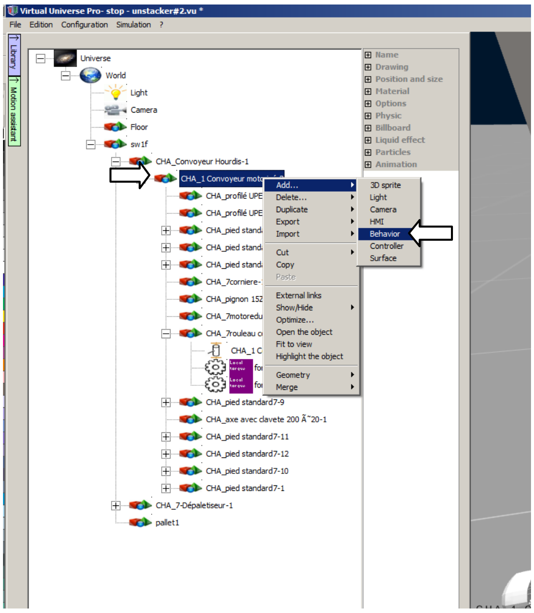
Min 0 Max 0

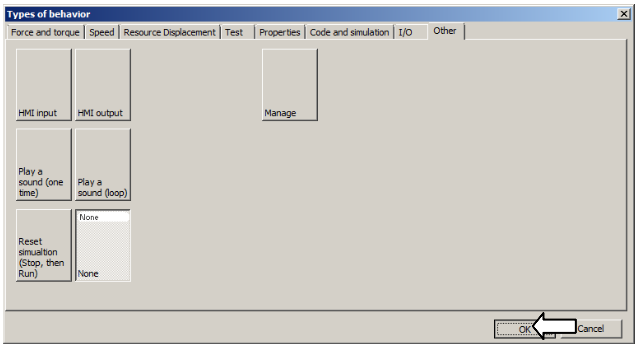
10000 10000

4.2.3- Create a behavior to control the rotation of the rollers

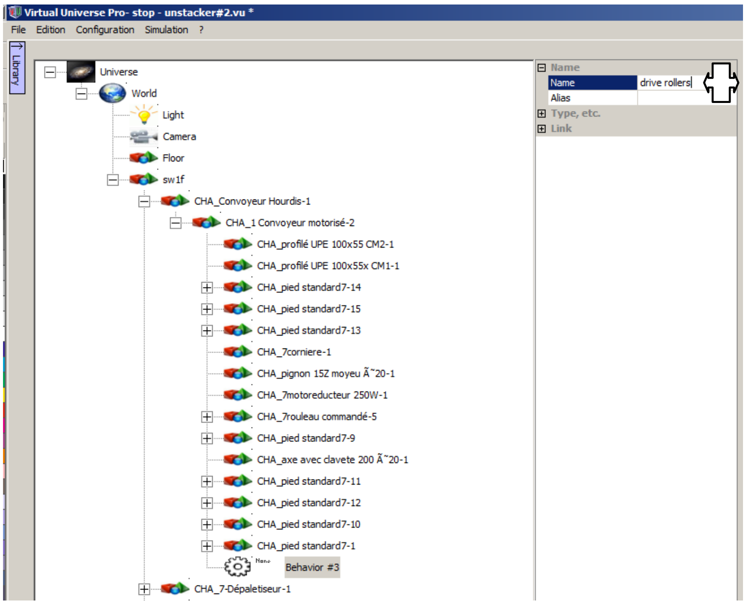
We can thus bind all drive rollers to this behavior and have a single state to change to drive all rollers.

4.2.3.1- Create a behavior



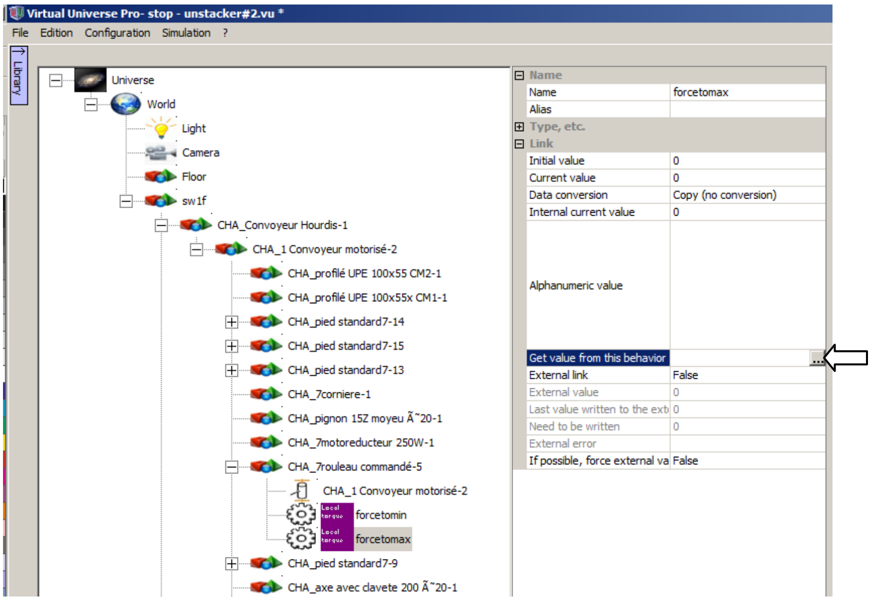


4.2.3.2- Rename the behavior

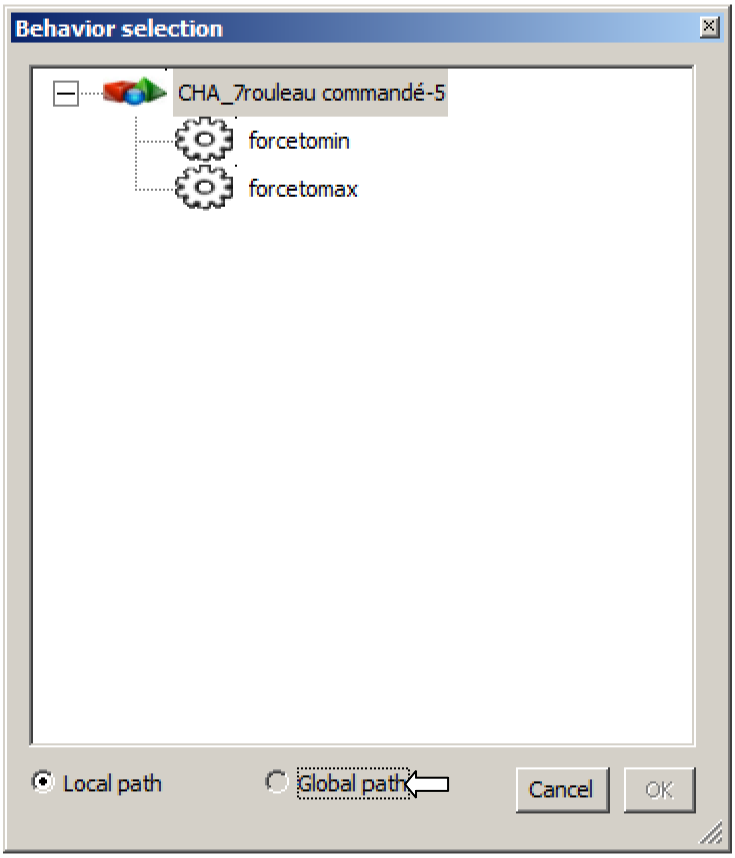


Name	drive rollers
Alias	

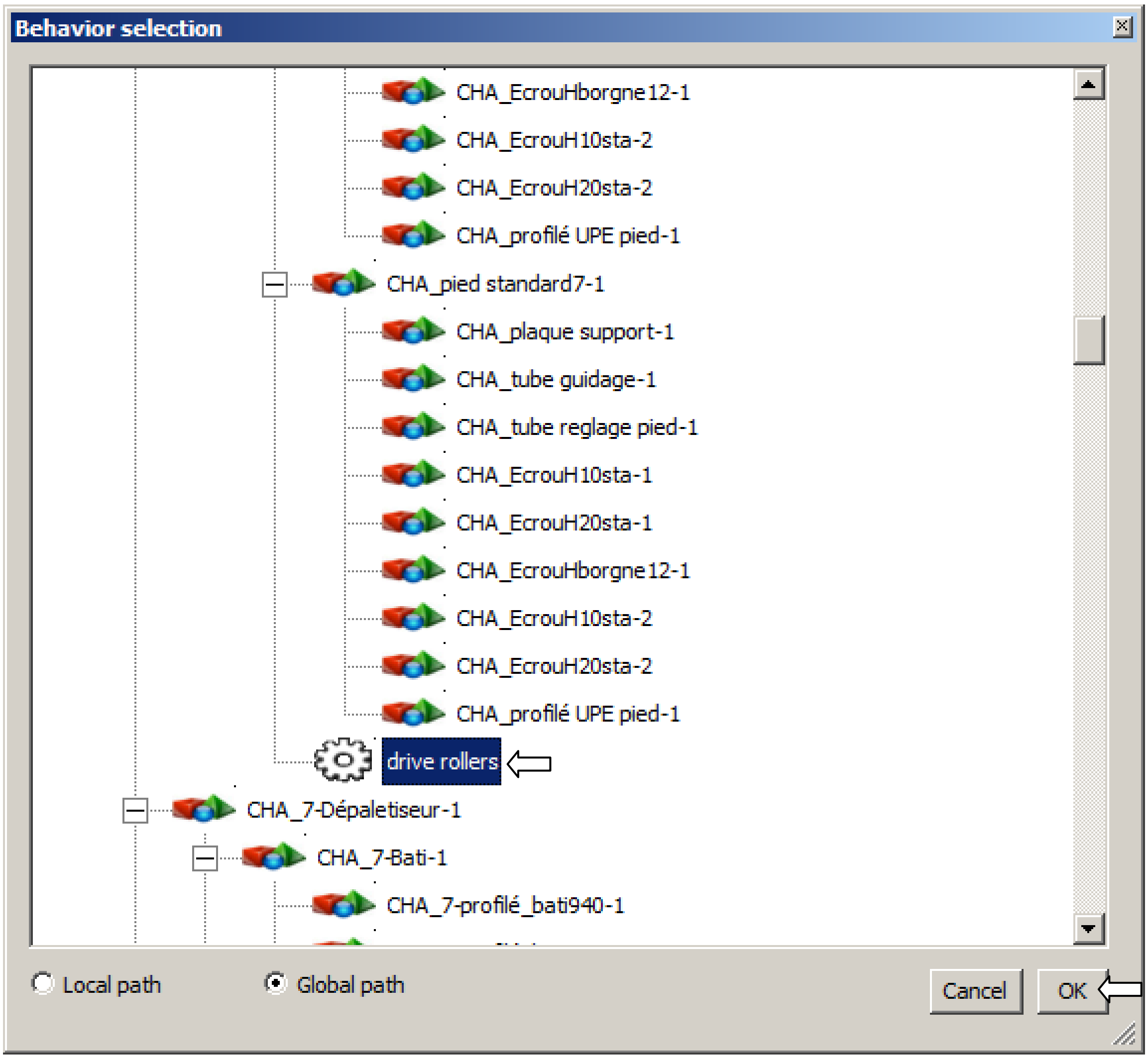
4.2.3.3- Define a link


Virtual Universe Pro- stop - unstacker#2.vu *
File Edition Configuration Simulation ?
Library
Universe
World
Light
Camera
Floor
sw1f
CHA_Convoyeur Hourdis-1
CHA_1 Convoyeur motorisé-2
CHA_profilé UPE 100x55 CM2-1
CHA_profilé UPE 100x55x CM1-1
CHA_pied standard7-14
CHA_pied standard7-15
CHA_pied standard7-13
CHA_7corniere-1
CHA_pignon 15Z moyeu Ã˜20-1
CHA_7motoreducteur 250W-1
CHA_7rouleau commandé-5
CHA_1 Convoyeur motorisé-2
forcetomin
forcetomax
CHA_pied standard7-9
CHA_axe avec clavete 200 Ã˜20-1
Name
Type, etc.
Link

Name	forcetomax
Alias	
Initial value	0
Current value	0
Data conversion	Copy (no conversion)
Internal current value	0
Alphanumeric value	
Get value from this behavior	...
External link	False
External value	0
Last value written to the ext	0
Need to be written	0
External error	
If possible, force external va	False

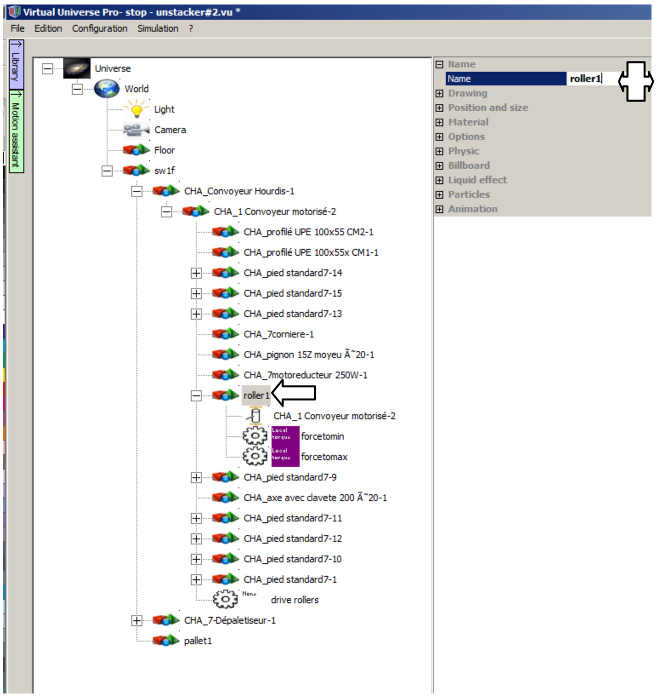


Behavior selection
CHA_7rouleau commandé-5
forcetomin
forcetomax
● Local path
○ Global path
Cancel
OK



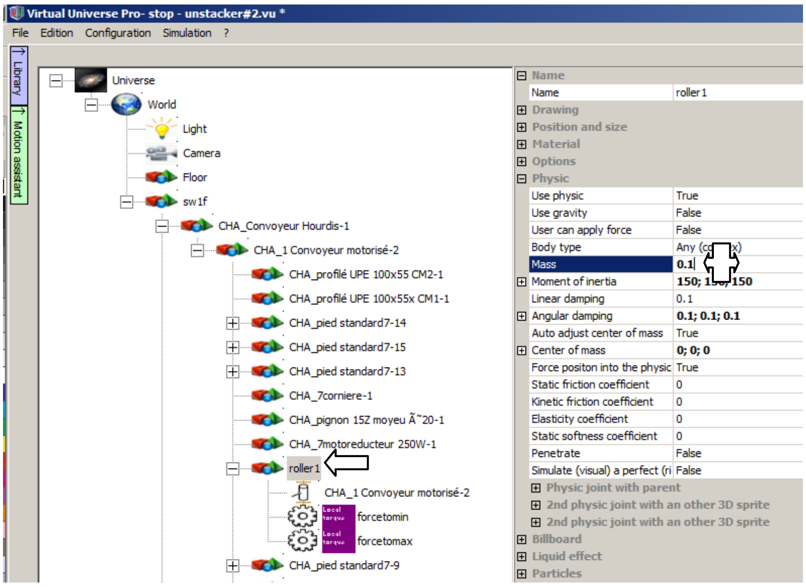
Behavior selection
CHA_EcrouHborgne12-1
CHA_EcrouH10sta-2
CHA_EcrouH20sta-2
CHA_profilé UPE pied-1
CHA_pied standard7-1
CHA_plaque support-1
CHA_tube guidage-1
CHA_tube reglage pied-1
CHA_EcrouH10sta-1
CHA_EcrouH20sta-1
CHA_EcrouHborgne12-1
CHA_EcrouH10sta-2
CHA_EcrouH20sta-2
CHA_profilé UPE pied-1
drive rollers
CHA_7-Dépaletiseur-1
CHA_7-Bati-1
CHA_7-profilé_bati940-1
○ Local path
● Global path
Cancel
OK

4.2.4- Rename



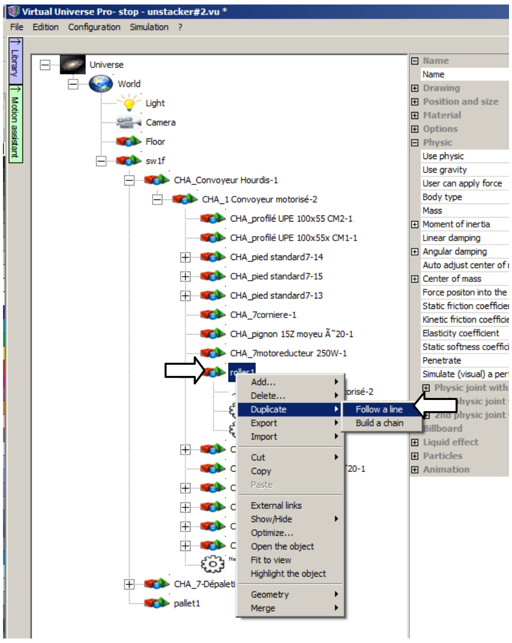
Name	roller1

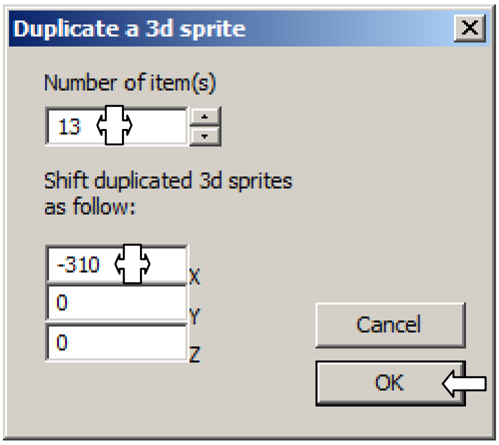
4.2.5- Adjust the physical properties of the roller



Name	roller1
Use physic	True
Use gravity	False
User can apply force	False
Body type	Any (convex)
Mass	0.1
Moment of inertia	150; 150; 150
Linear damping	0.1
Angular damping	0.1; 0.1; 0.1
Auto adjust center of mass	True
Center of mass	0; 0; 0
Force positon into the physic	True
Static friction coefficient	0
Kinetic friction coefficient	0
Elasticity coefficient	0
Static softness coefficient	0
Penetrate	False
Simulate (visual) a perfect (ri	False

4.2.6- Duplicate the rollers




Duplicate a 3d sprite

Number of item(s)

13

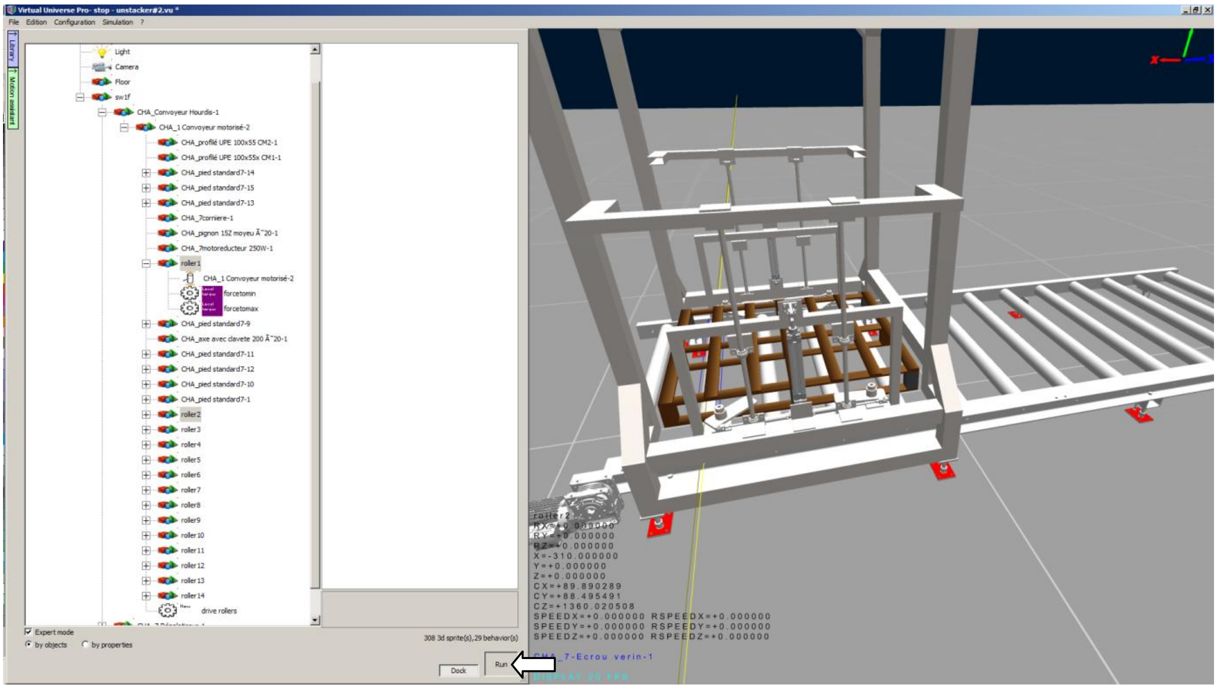
Shift duplicated 3d sprites as follow:

-310 X

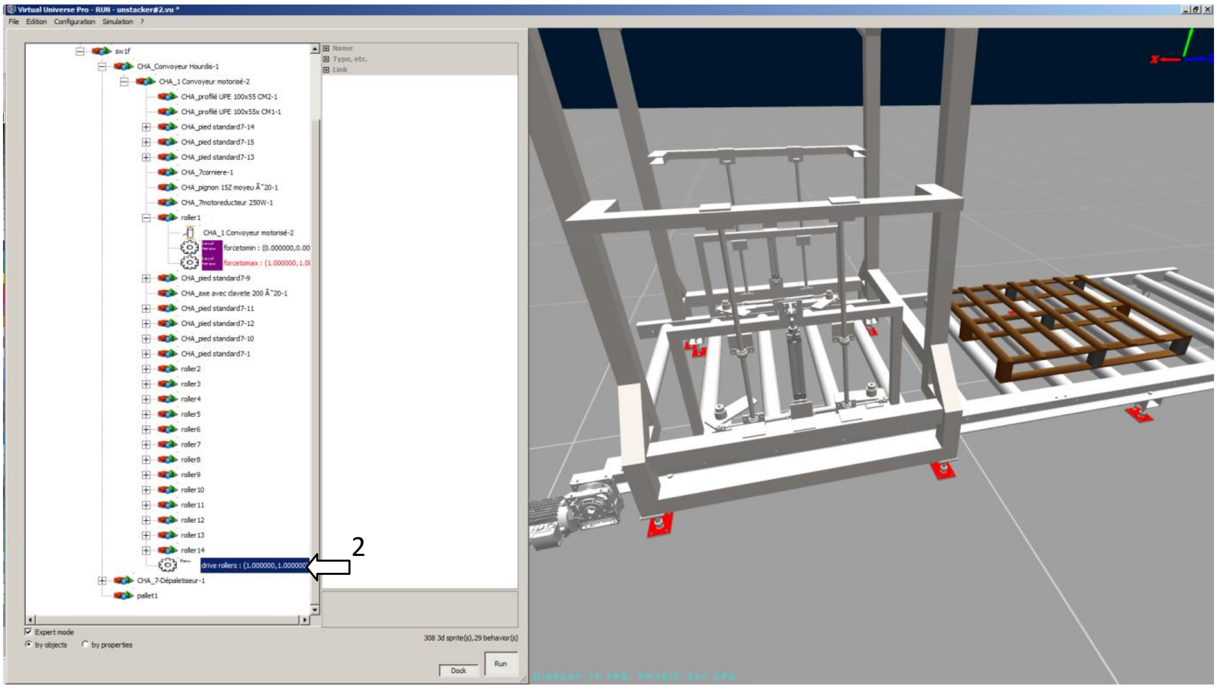
0 Y

0 Z

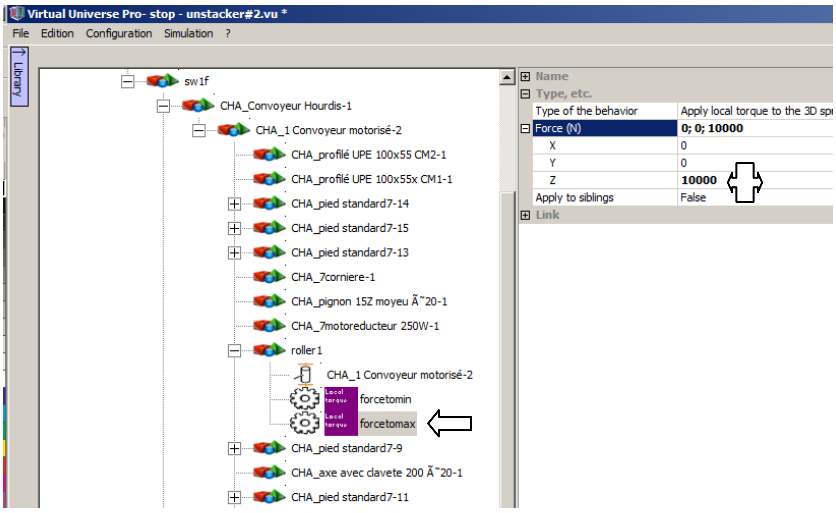
4.2.7- Testing the conveying part



```
roller2
RX=+0.000000
RY=+0.000000
RZ=+0.000000
X=-310.000000
Y=+0.000000
Z=+0.000000
CX=+89.890289
CY=+88.495491
CZ=+1360.020508
SPEEDX=+0.000000 RSPEEDX=+0.000000
SPEEDY=+0.000000 RSPEEDY=+0.000000
SPEEDZ=+0.000000 RSPEEDZ=+0.000000
```


Virtual Universe Pro - RUN - unstacker#2.vu *
File Edition Configuration Simulation ?
Name
Type, etc.
Link
sw1f
CHA_Convoyeur Hourdis-1
CHA_1 Convoyeur motorisé-2
CHA_profilé UPE 100x55 CM2-1
CHA_profilé UPE 100x55x CM1-1
CHA_pied standard7-14
CHA_pied standard7-15
CHA_pied standard7-13
CHA_7corniere-1
CHA_pignon 15Z moyeu Ã˜20-1
CHA_7motoreducteur 250W-1
roller1
CHA_1 Convoyeur motorisé-2
forcetomin : (0.000000,0.00
forcetomax : (1.000000,1.00
CHA_pied standard7-9
CHA_axe avec clavete 200 Ã˜20-1
CHA_pied standard7-11
CHA_pied standard7-12
CHA_pied standard7-10
CHA_pied standard7-1
roller2
roller3
roller4
roller5
roller6
roller7
roller8
roller9
roller10
roller11
roller12
roller13
roller14
drive rollers : (1.000000,1.000000
2
CHA_7-Dépaletiseur-1
pallet1
☑ Expert mode
● by objects ○ by properties
308 3d sprite(s),29 behavior(s)
Dock
Run
DISPLAY 19 FPS PHYSIC 222 FPS

The values of the net torque can be adjusted on each roller depending on the desired speed:



```
sw1f
  CHA_Convoyeur Hourdis-1
    CHA_1 Convoyeur motorisé-2
      CHA_profilé UPE 100x55 CM2-1
      CHA_profilé UPE 100x55x CM1-1
      CHA_pied standard7-14
      CHA_pied standard7-15
      CHA_pied standard7-13
      CHA_7corniere-1
      CHA_pignon 15Z moyeu Ã˜20-1
      CHA_7motoreducteur 250W-1
      roller1
        CHA_1 Convoyeur motorisé-2
        forcetomin
        forcetomax
      CHA_pied standard7-9
      CHA_axe avec clavete 200 Ã˜20-1
      CHA_pied standard7-11
```

Name	
Type, etc.	
Type of the behavior	Apply local torque to the 3D spr
Force (N)	0; 0; 10000
X	0
Y	0
Z	10000
Apply to siblings	False
Link	

Switching between the STOP mode and RUN mode allow you to change settings and observe the result immediately.

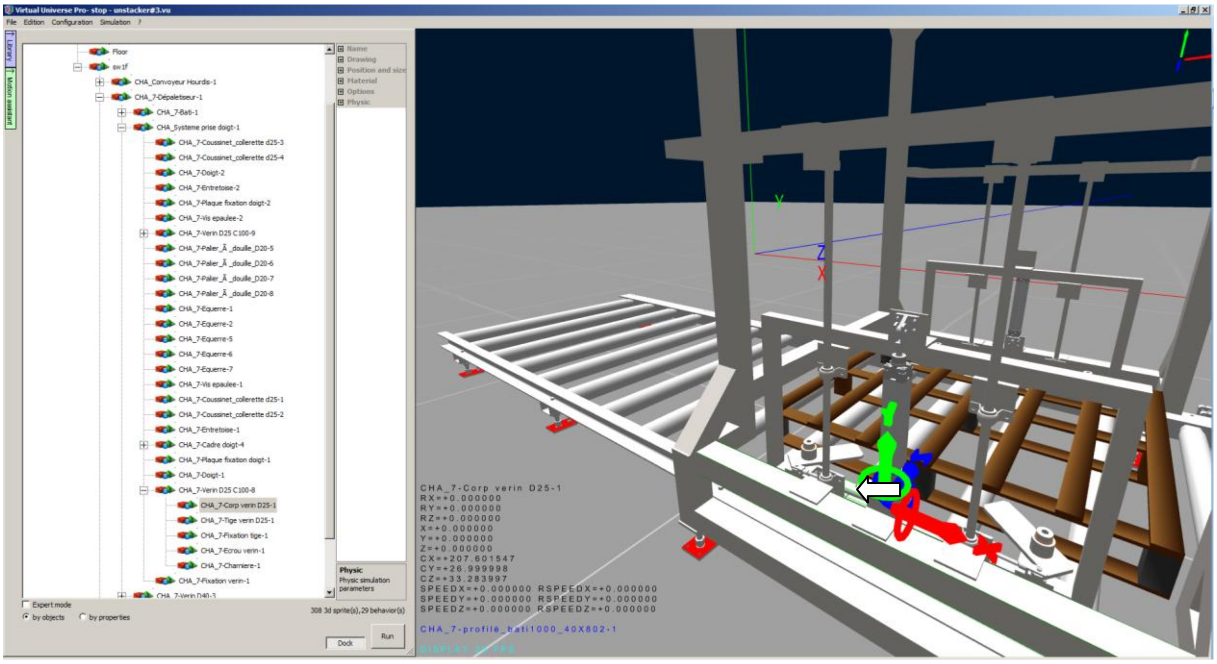
#3

4.3- Setting a finger

4.3.1- Setting the cylinder rod

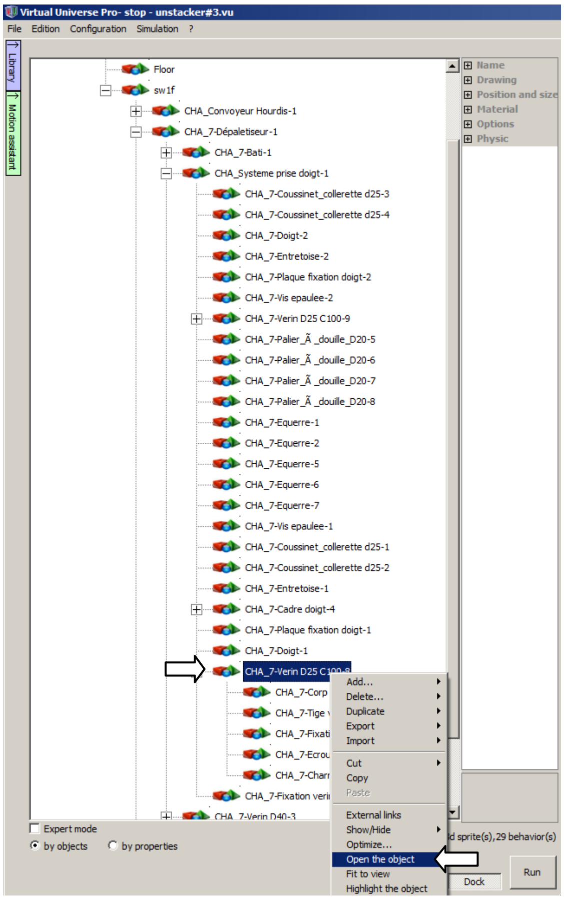
4.3.1.1- Preparation of the cylinder

4.3.1.1.1- Visual selection of cylinder



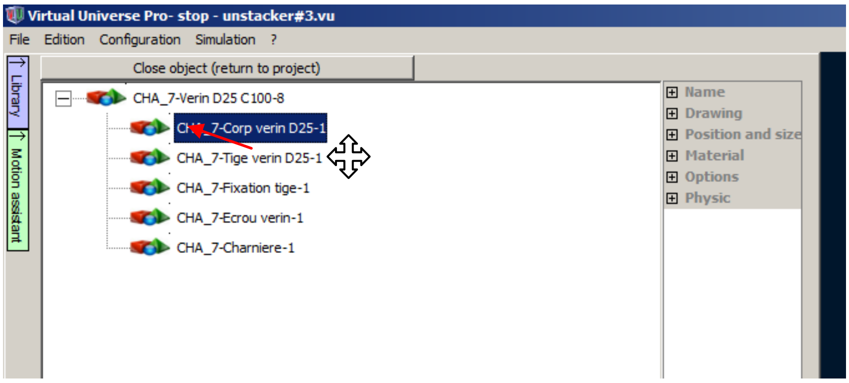
```
CHA_7-Corp verin D25-1
RX=+0.000000
RY=+0.000000
RZ=+0.000000
X=+0.000000
Y=+0.000000
Z=+0.000000
CX=+207.601547
CY=+26.999998
CZ=+33.283997
SPEEDX=+0.000000 RSPEEDX=+0.000000
SPEEDY=+0.000000 RSPEEDY=+0.000000
SPEEDZ=+0.000000 RSPEEDZ=+0.000000

CHA_7-profile_bati1000_40X802-1
```

4.3.1.1.2- Opening the parent

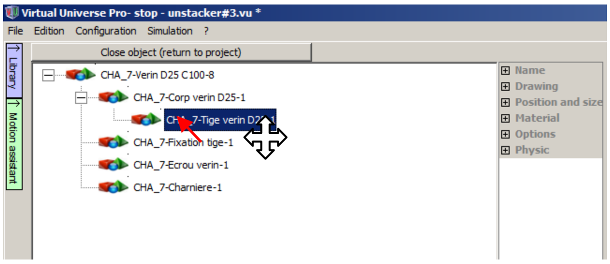


4.3.1.1.3- Restructuring data

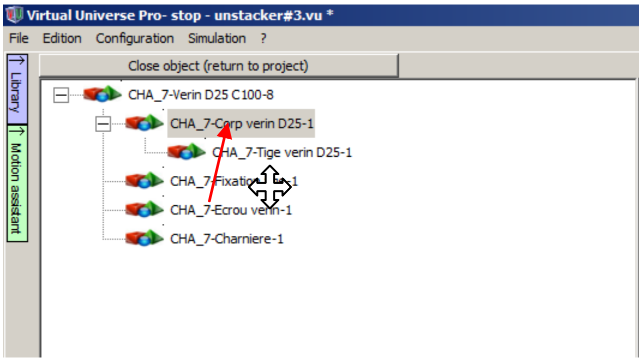
4.3.1.1.3.1- Make the rod child of the cylinder body



4.3.1.1.3.2- Make the rod fixation child of the rod

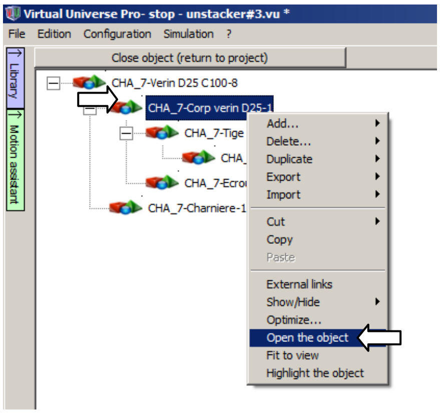


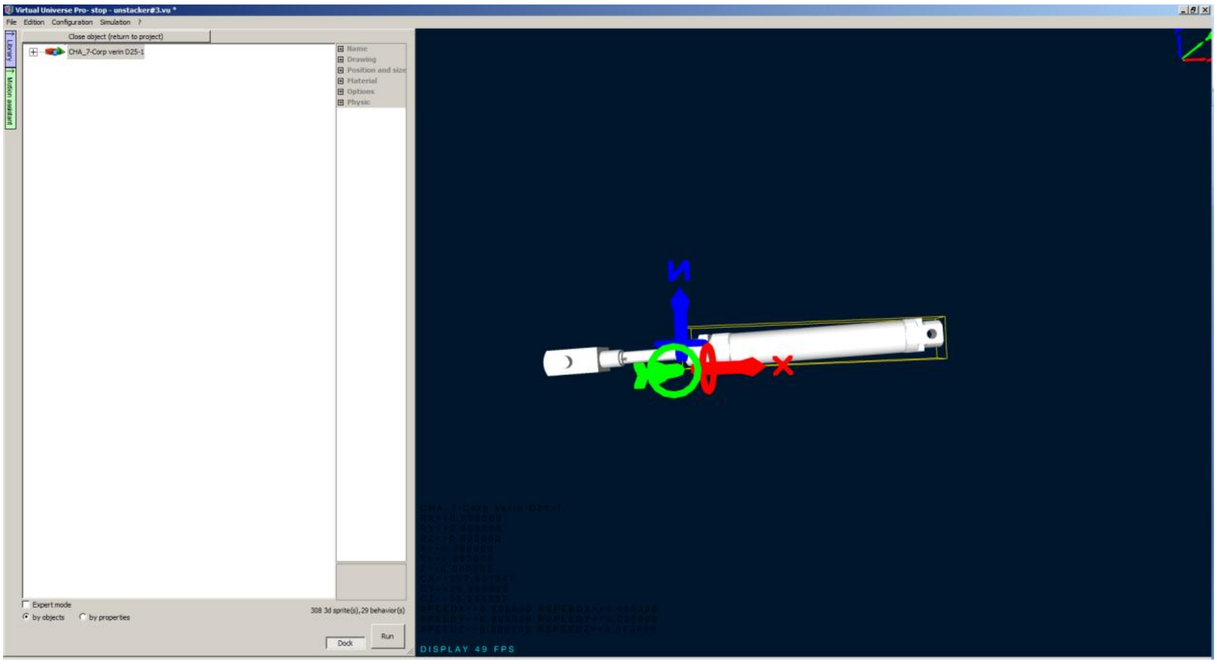
4.3.1.1.3.3- Make the nut child of the cylinder body



4.3.1.1.4- Realignment of the cylinder axis

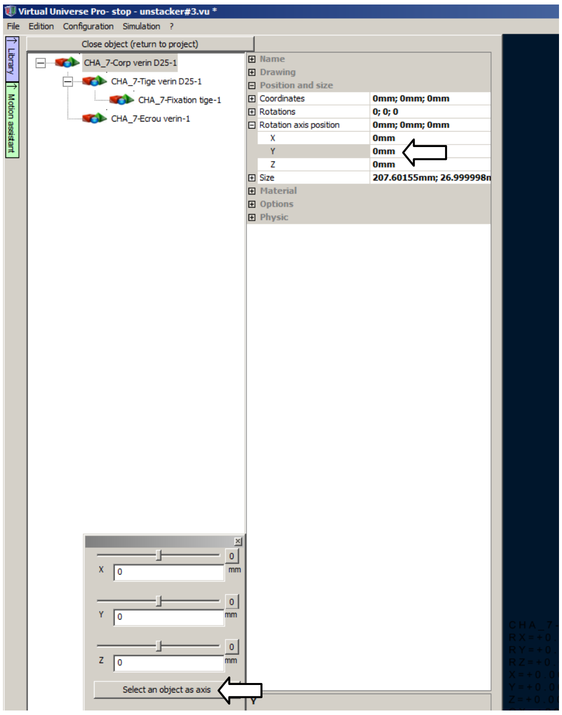
4.3.1.1.4.1- Opening of the cylinder body





We see that the objects are not aligned along the X axis It is easier to create objects aligned with the axes in the design software. However, we can realign objects in Virtual Universe Pro with the following procedure.

4.3.1.1.4.2- Setting the position of the axis of rotation

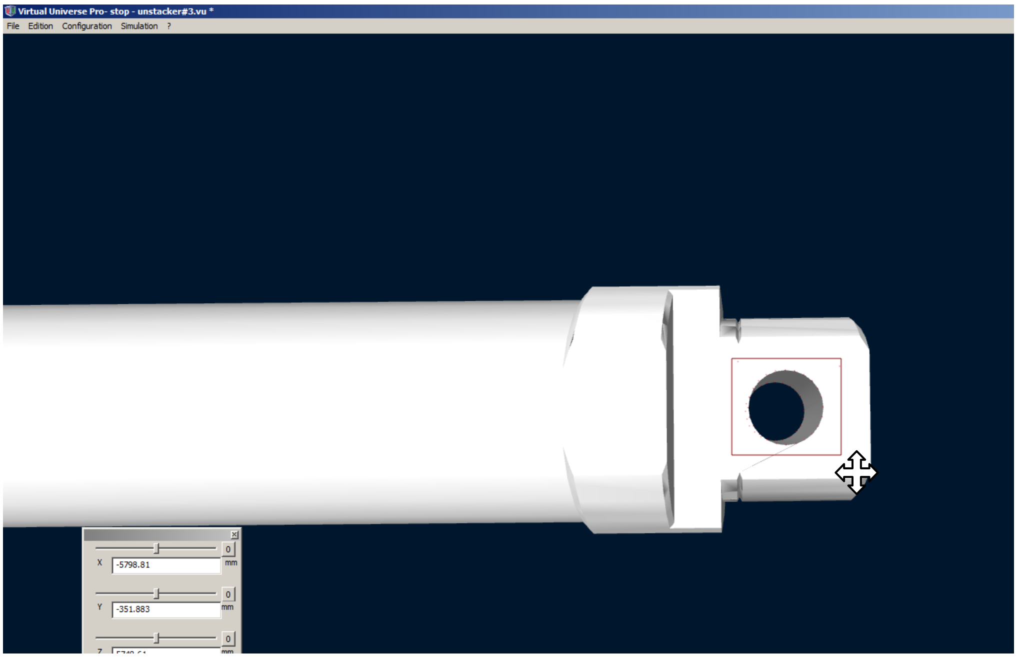


Coordinates	0mm; 0mm; 0mm
Rotations	0; 0; 0
Rotation axis position	0mm; 0mm; 0mm
X	0mm
Y	0mm
Z	0mm
Size	207.60155mm; 26.999998n

X 0 mm

Y 0 mm

Z 0 mm


Virtual Universe Pro- stop - unstacker#3.vu *
File Edition Configuration Simulation ?

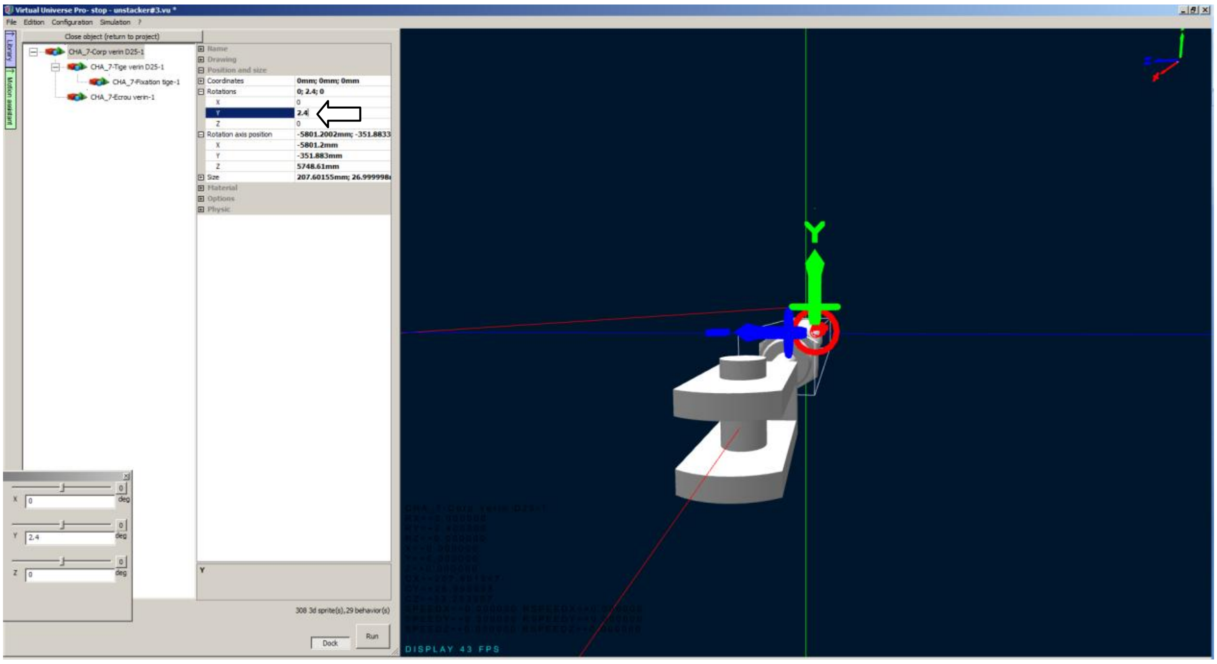
X -5798.81 mm

Y -351.883 mm

The selection of an area on the screen will center the axis of rotation relative to the points cloud included in the selection.

4.3.1.1.4.3- Rotation to be aligned with the axis

We perform a visual realignment.



Coordinates	0mm; 0mm; 0mm
Rotations	0; 2.4; 0
X	0
Y	2.4
Z	0
Rotation axis position	-5801.2002mm; -351.8833
X	-5801.2mm
Y	-351.883mm
Z	5748.61mm
Size	207.60155mm; 26.999998

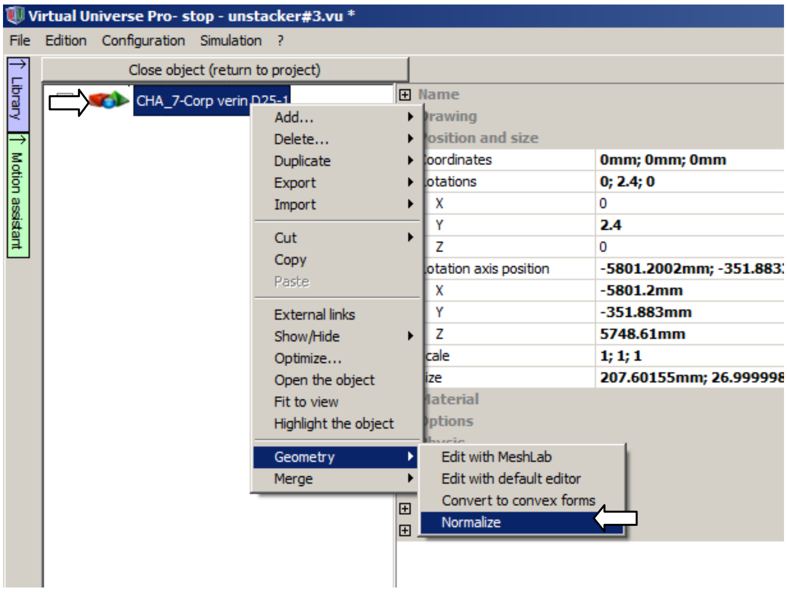
X 0 deg

Y 2.4 deg

Z 0 deg

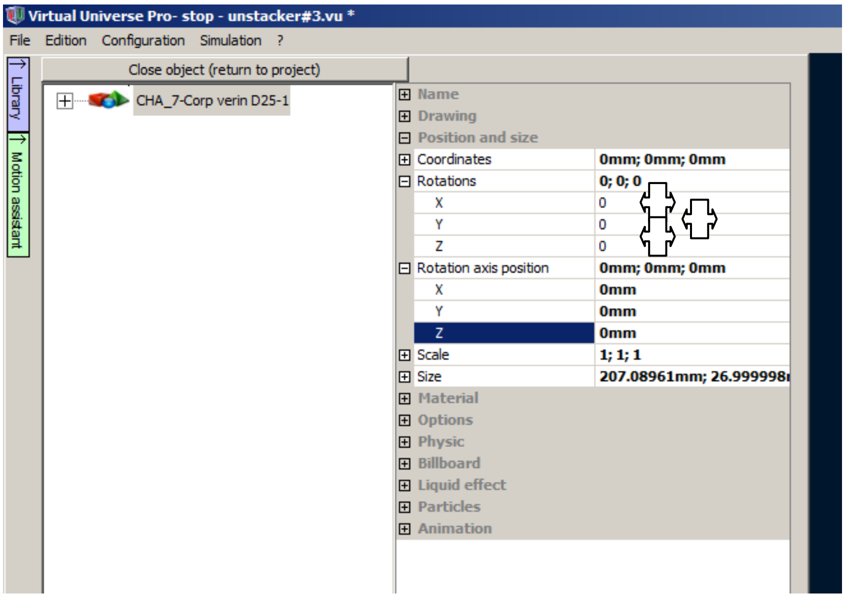
308 3d sprite(s),29 behavior(s)

4.3.1.1.4.4- Normalization of the geometry



oordinates	0mm; 0mm; 0mm
otations	0; 2.4; 0
X	0
Y	2.4
Z	0
otation axis position	-5801.2002mm; -351.883
X	-5801.2mm
Y	-351.883mm
Z	5748.61mm
cale	1; 1; 1
ize	207.60155mm; 26.999998

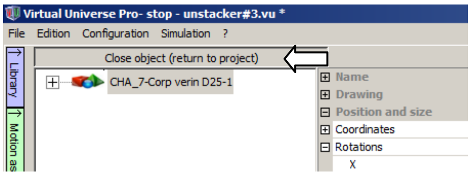
4.3.1.1.4.5- Restoration of the axis of rotation

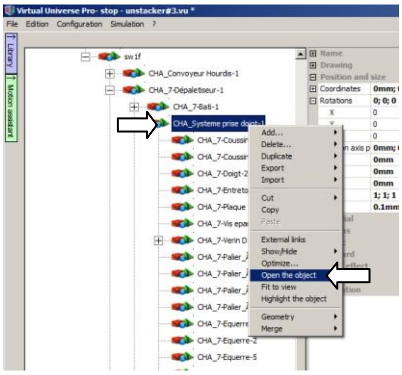


Coordinates	0mm; 0mm; 0mm
Rotations	0; 0; 0
X	0
Y	0
Z	0
Rotation axis position	0mm; 0mm; 0mm
X	0mm
Y	0mm
Z	0mm
Scale	1; 1; 1
Size	207.08961mm; 26.999998

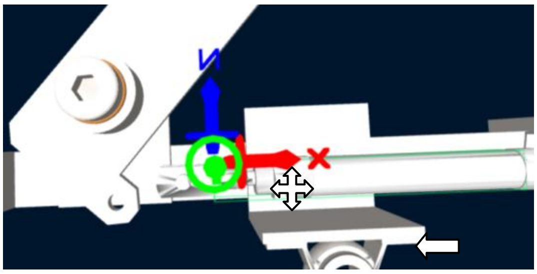
4.3.1.1.4.6- Redefinition of the initial positions

The purpose of this sequence is to define a starting position where the cylinder is aligned with the X axis by changing the initial position of the rod and of the finger. This could have been done in the CAD tool.

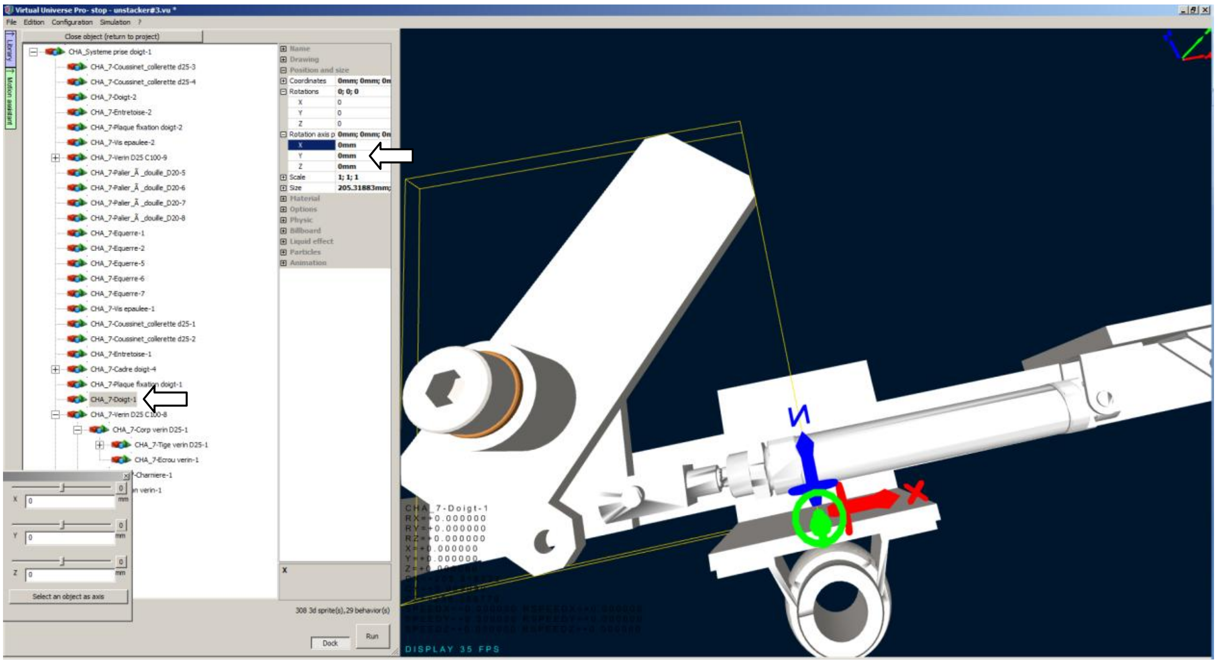


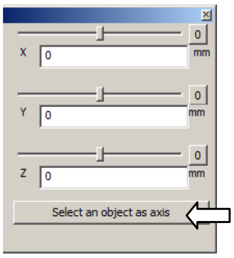


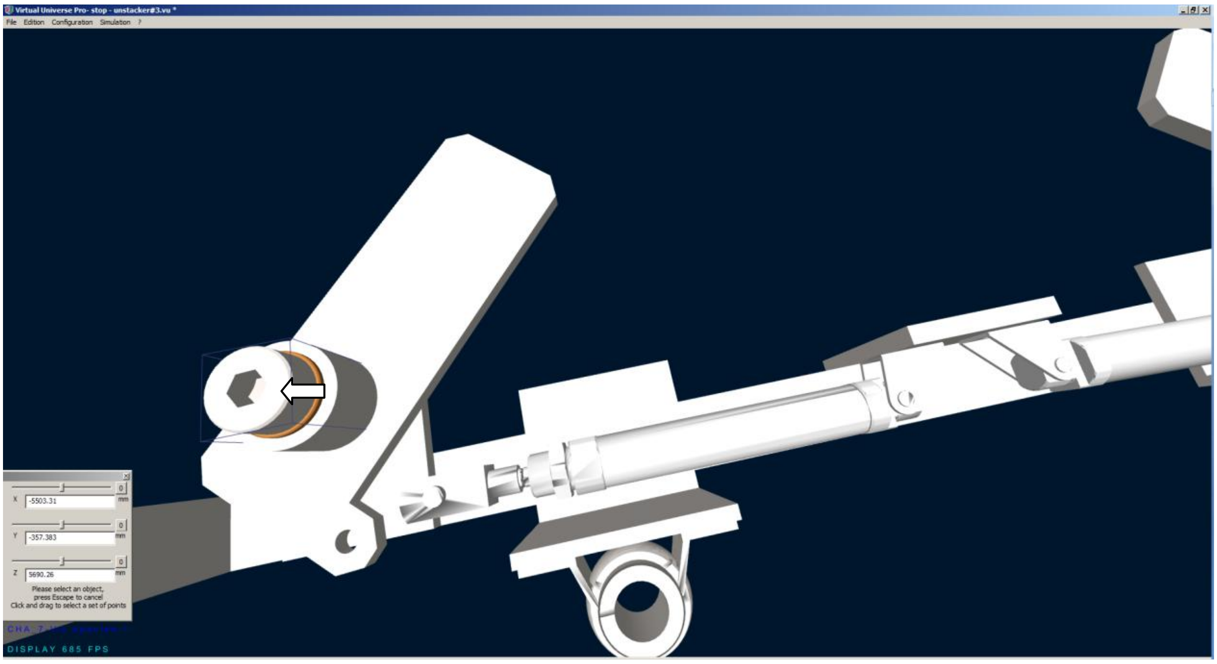
4.3.1.1.4.6.1- Cylinder rod



4.3.1.1.4.6.2- Finger







Virtual Universe Pro- stop - unstacker#3.vu *

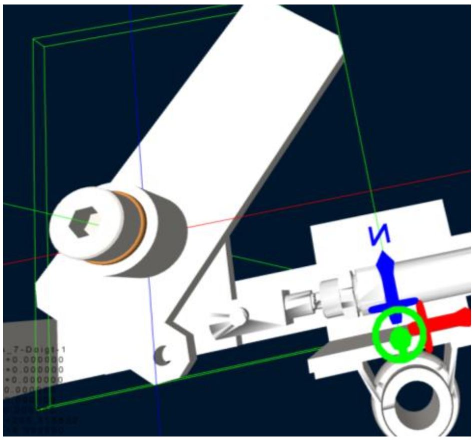
X -5503.31 mm

Y -357.383 mm

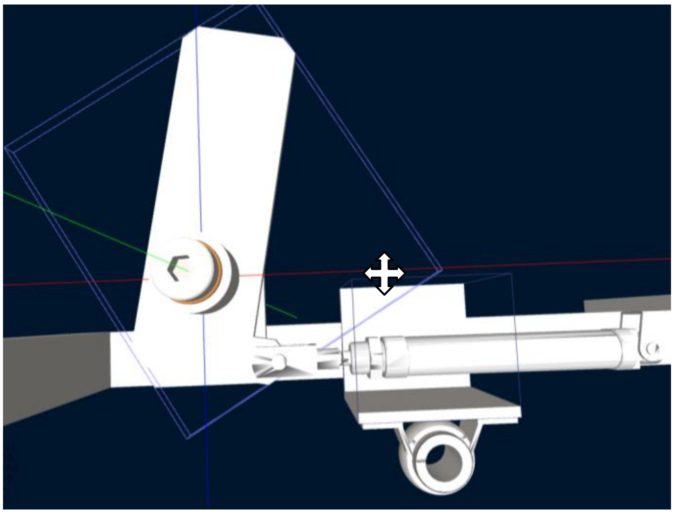
Z 5690.26 mm

Please select an object,
press Escape to cancel
Click and drag to select a set of points

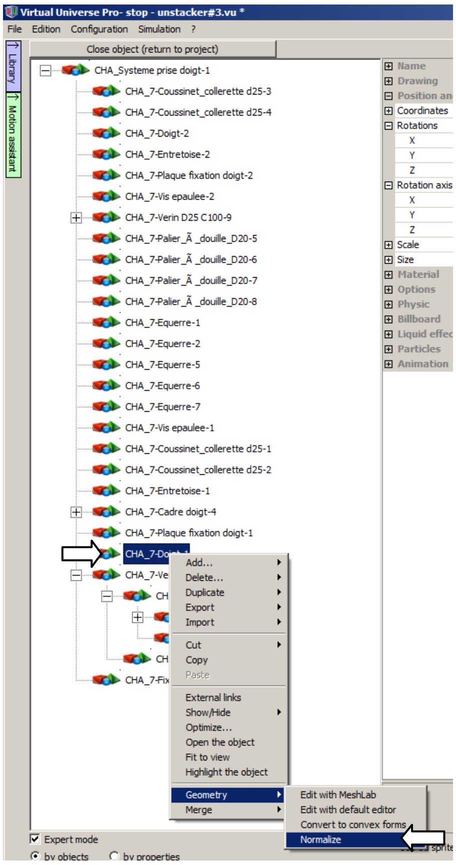
DISPLAY 685 FPS



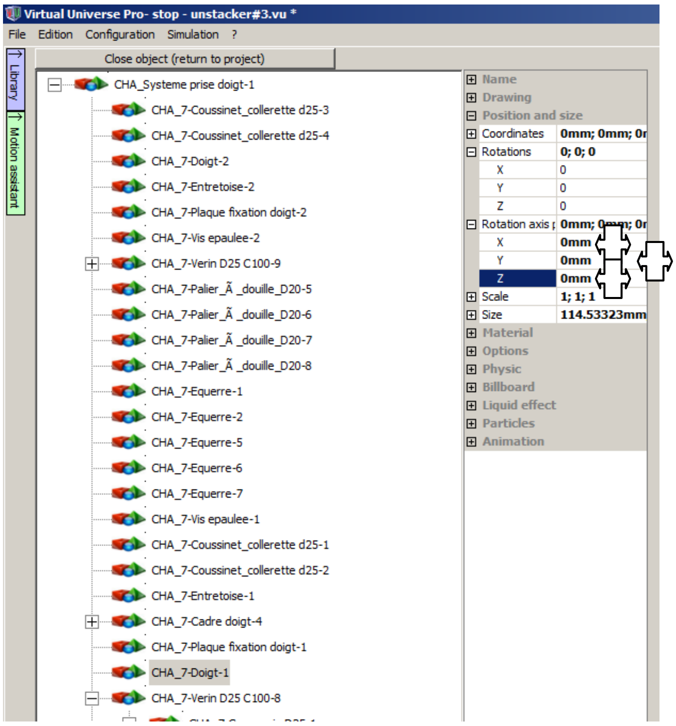
Take the green torus to rotate the finger on the Y axis



4.3.1.1.4.6.2.1- Normalize the position



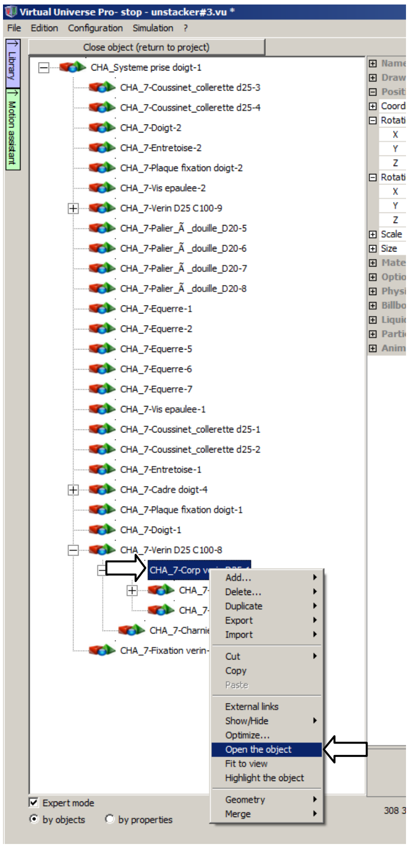
4.3.1.1.4.6.2.2- Restoration of the axis of rotation


Virtual Universe Pro- stop - unstacker#3.vu *
File
Edition
Configuration
Simulation
?
Library
Motion assistant
Close object (return to project)

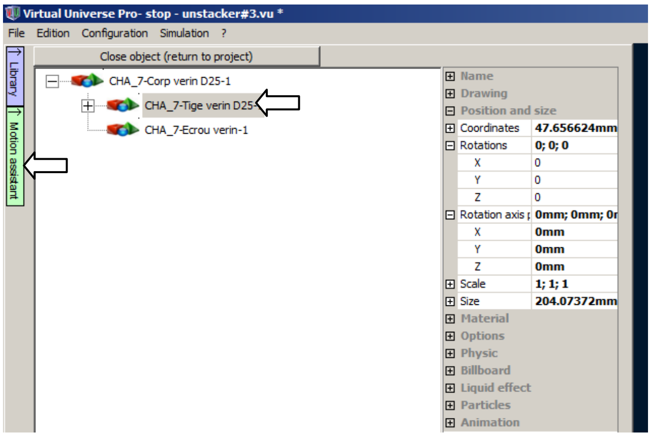
- CHA_Systeme prise doigt-1
  - CHA_7-Coussinet_collerette d25-3
  - CHA_7-Coussinet_collerette d25-4
  - CHA_7-Doigt-2
  - CHA_7-Entretoise-2
  - CHA_7-Plaque fixation doigt-2
  - CHA_7-Vis epaulee-2
  - CHA_7-Verin D25 C100-9
  - CHA_7-Palier_Ã _douille_D20-5
  - CHA_7-Palier_Ã _douille_D20-6
  - CHA_7-Palier_Ã _douille_D20-7
  - CHA_7-Palier_Ã _douille_D20-8
  - CHA_7-Equerre-1
  - CHA_7-Equerre-2
  - CHA_7-Equerre-5
  - CHA_7-Equerre-6
  - CHA_7-Equerre-7
  - CHA_7-Vis epaulee-1
  - CHA_7-Coussinet_collerette d25-1
  - CHA_7-Coussinet_collerette d25-2
  - CHA_7-Entretoise-1
  - CHA_7-Cadre doigt-4
  - CHA_7-Plaque fixation doigt-1
  - CHA_7-Doigt-1
  - CHA_7-Verin D25 C100-8

⊞ Name	
⊞ Drawing	
⊟ Position and size	
⊞ Coordinates	0mm; 0mm; 0r
⊟ Rotations	0; 0; 0
X	0
Y	0
Z	0
⊟ Rotation axis ¦	0mm; 0mm; 0r
X	0mm
Y	0mm
Z	0mm
⊞ Scale	1; 1; 1
⊞ Size	114.53323mm
⊞ Material	
⊞ Options	
⊞ Physic	
⊞ Billboard	
⊞ Liquid effect	
⊞ Particles	
⊞ Animation	

4.3.1.2- Setting the motion of the cylinder rod

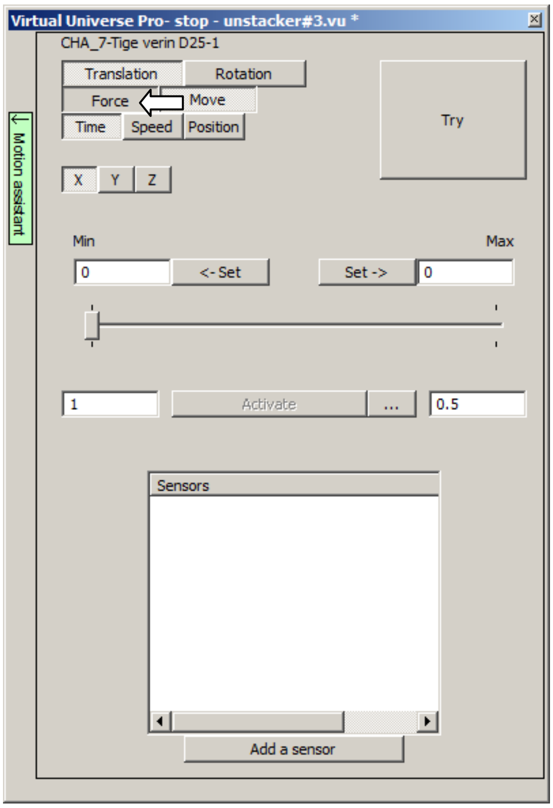


4.3.1.2.1- Opening the assistant



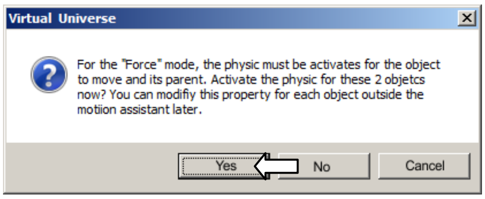
Coordinates	47.656624mm
Rotations	0; 0; 0
X	0
Y	0
Z	0
Rotation axis	0mm; 0mm; 0r
X	0mm
Y	0mm
Z	0mm
Scale	1; 1; 1
Size	204.07372mm

4.3.1.2.2- Selecting the "force" mode



Min	0
Max	0
	1
	0.5

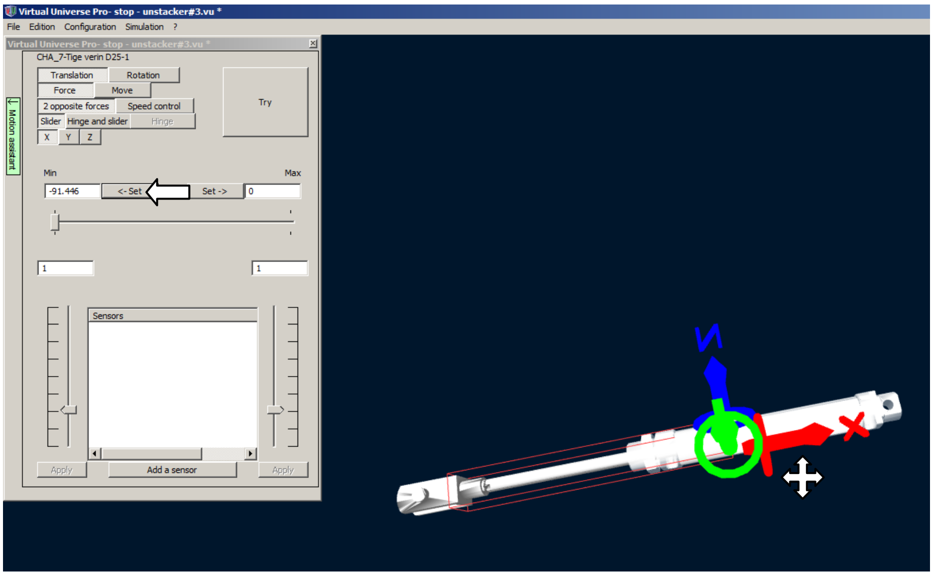
4.3.1.2.3- Accepting of the change object properties



Virtual Universe

For the "Force" mode, the physic must be activates for the object to move and its parent. Activate the physic for these 2 objetcs now? You can modifiy this property for each object outside the motiion assistant later.

4.3.1.2.4- Definition of the extreme position of the exit rod



Virtual Universe Pro- stop - unstacker#3.vu *

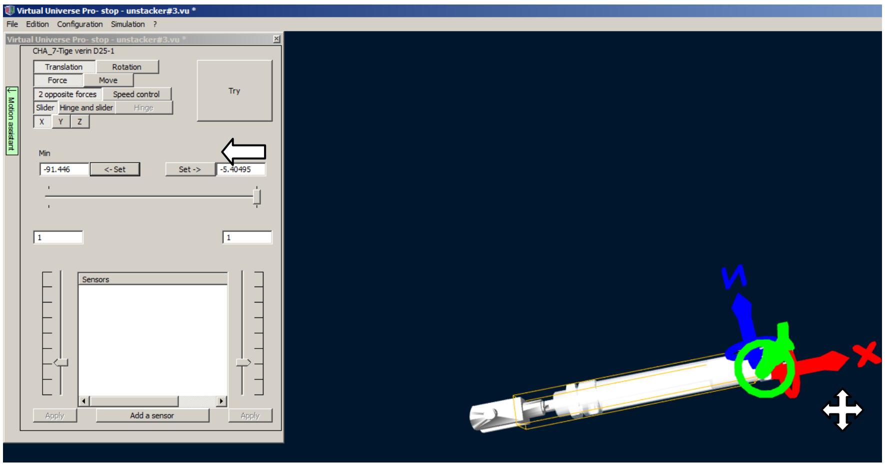
CHA_7-Tige verin D25-1

Min -91.446

Max 0

To move the rod, move the red arrow "X".

4.3.1.2.5- Definition of the extreme return position of the rod



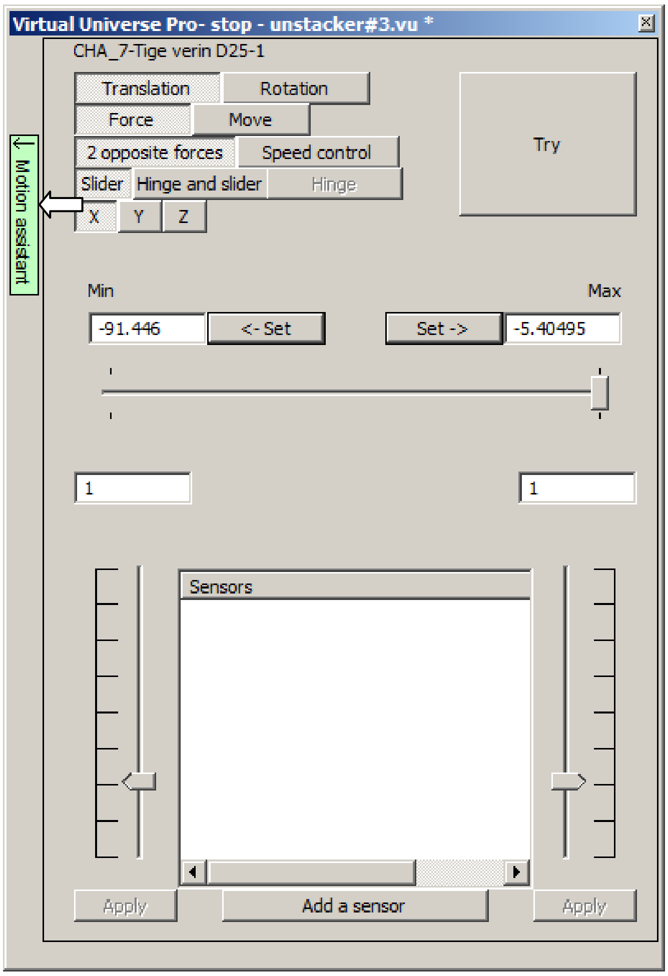
Min: -91.446

-5.40495

1

1

4.3.1.2.6- Exit the wizard



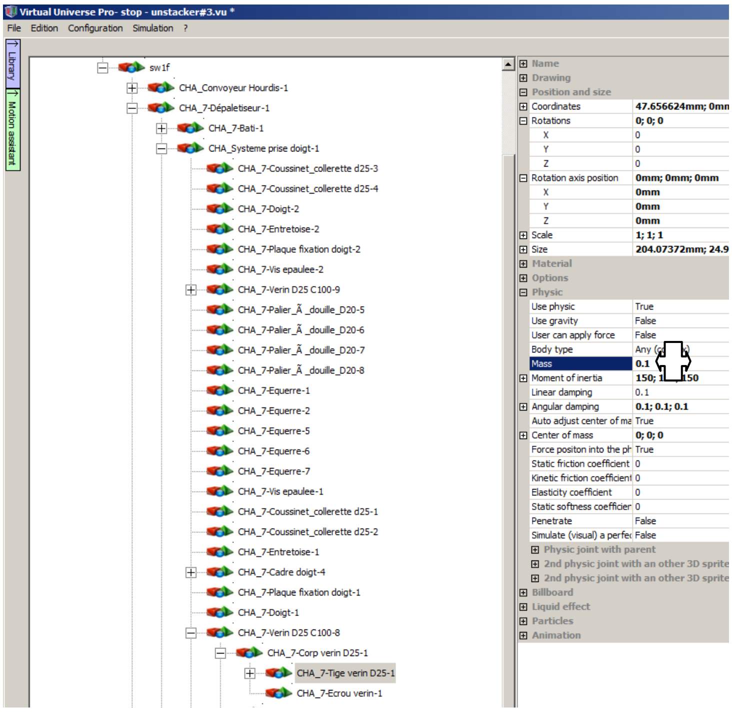
Min: -91.446

Max: -5.40495

1

1

4.3.1.3- Definition of physical properties of the cylinder rod

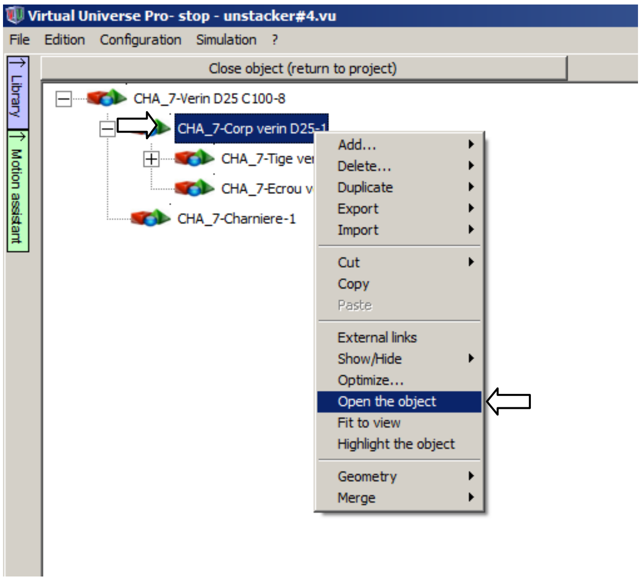


Coordinates	47.656624mm; 0mn
Rotations	0; 0; 0
X	0
Y	0
Z	0
Rotation axis position	0mm; 0mm; 0mm
X	0mm
Y	0mm
Z	0mm
Scale	1; 1; 1
Size	204.07372mm; 24.9
Use physic	True
Use gravity	False
User can apply force	False
Body type	Any (c x)
Mass	0.1
Moment of inertia	150; 1 150
Linear damping	0.1
Angular damping	0.1; 0.1; 0.1
Auto adjust center of ma	True
Center of mass	0; 0; 0
Force positon into the ph	True
Static friction coefficient	0
Kinetic friction coefficient	0
Elasticity coefficient	0
Static softness coefficier	0
Penetrate	False
Simulate (visual) a perfec	False

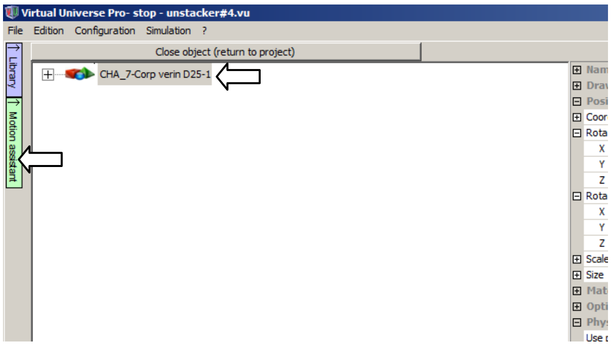
#4

4.3.1.4- Setting the motion of the cylinder body

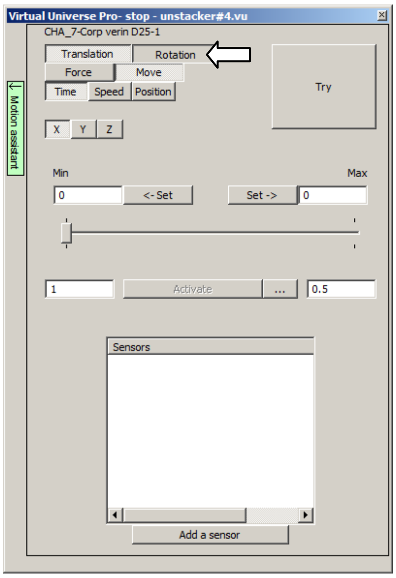
4.3.1.4.1- Opening of the cylinder body



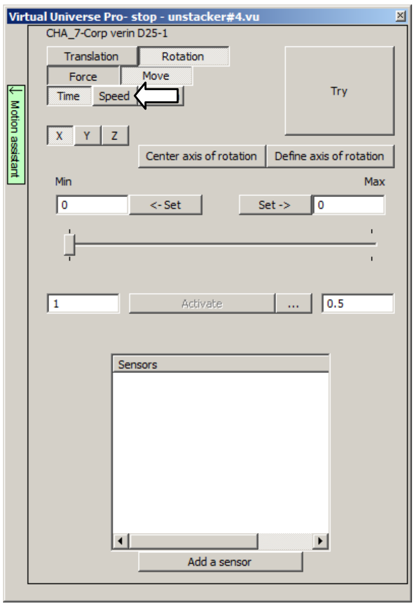
4.3.1.4.2- Opening the assistant


Virtual Universe Pro- stop - unstacker#4.vu
File Edition Configuration Simulation ?
Library
Motion assistant
Close object (return to project)
CHA_7-Corp verin D25-1
Nam
Draw
Posi
Coor
Rota
X
Y
Z
Rota
X
Y
Z
Scale
Size
Mat
Opti
Phys
Use

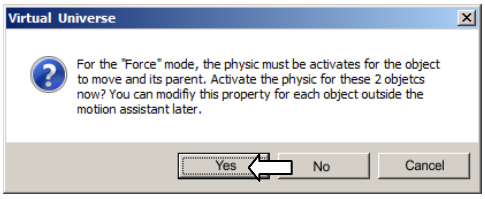
4.3.1.4.3- Selecting of "rotation" mode



4.3.1.4.5- Selecting of "force" mode

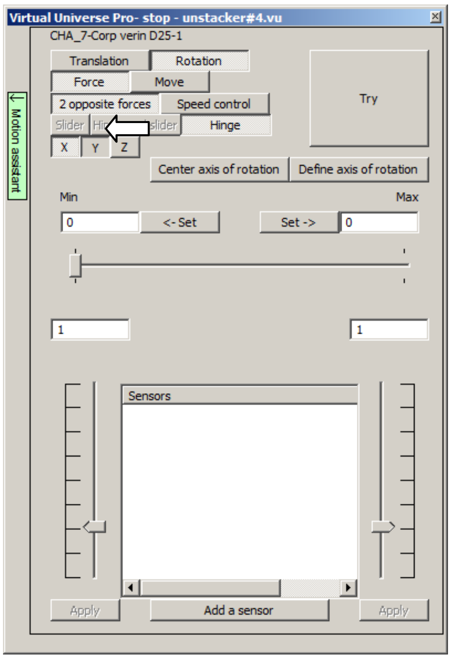


4.3.1.4.6- Accepting change object properties

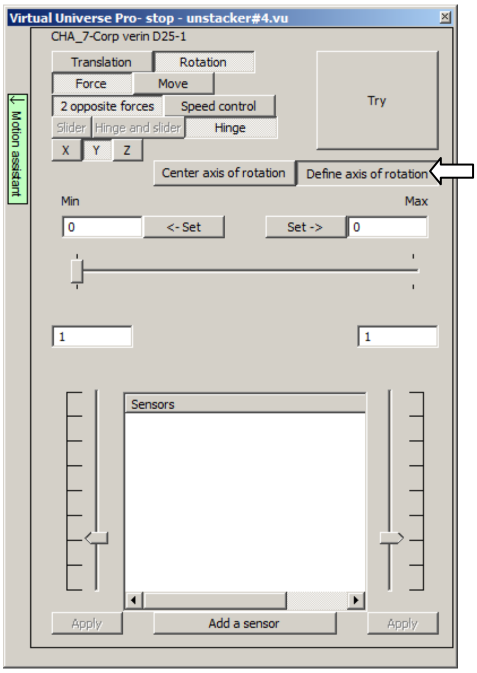

Virtual Universe

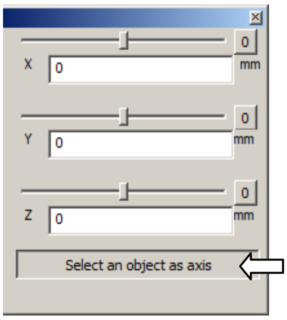
For the "Force" mode, the physic must be activates for the object to move and its parent. Activate the physic for these 2 objetcs now? You can modifiy this property for each object outside the motiion assistant later.

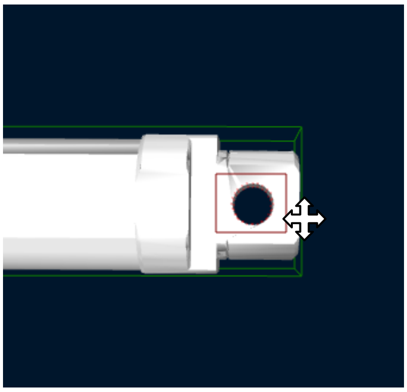
4.3.1.4.7- Definition of the axis of rotation



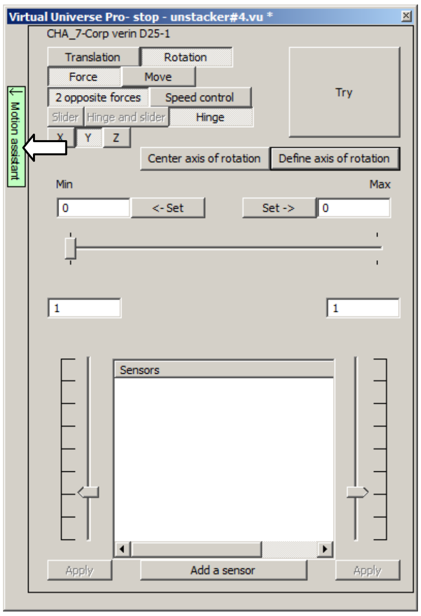
4.3.1.4.8- Setting the position of the axis of rotation



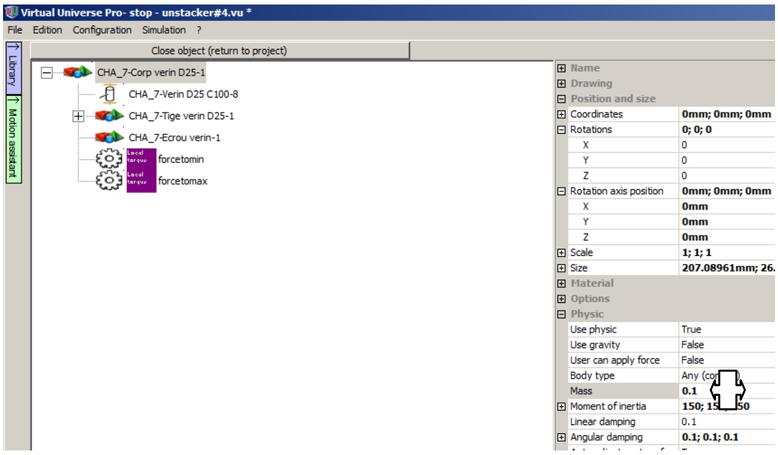




4.3.1.4.9- Exit the wizard



4.3.1.5- Setting the physical properties of the cylinder body



Virtual Universe Pro- stop - unstacker#4.vu *

File Edition Configuration Simulation ?

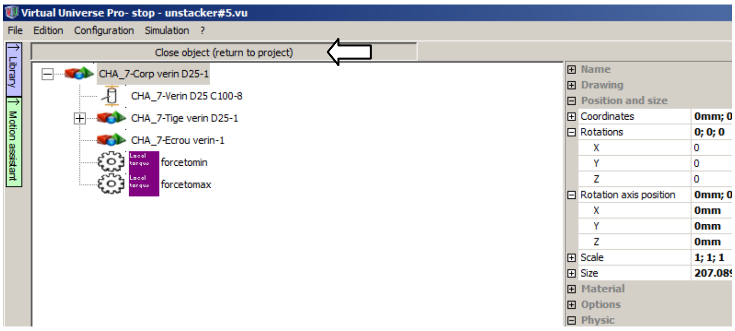
Close object (return to project)

- CHA_7-Corp verin D25-1
  - CHA_7-Verin D25 C100-8
  - CHA_7-Tige verin D25-1
  - CHA_7-Ecrou verin-1
  - forcetomin
  - forcetomax

Name	
Drawing	
Position and size	
Coordinates	0mm; 0mm; 0mm
Rotations	0; 0; 0
X	0
Y	0
Z	0
Rotation axis position	0mm; 0mm; 0mm
X	0mm
Y	0mm
Z	0mm
Scale	1; 1; 1
Size	207.08961mm; 26.
Material	
Options	
Physic	
Use physic	True
Use gravity	False
User can apply force	False
Body type	Any (co
Mass	0.1
Moment of inertia	150; 15 50
Linear damping	0.1
Angular damping	0.1; 0.1; 0.1

#5

4.3.1.6- Setting the finger movement



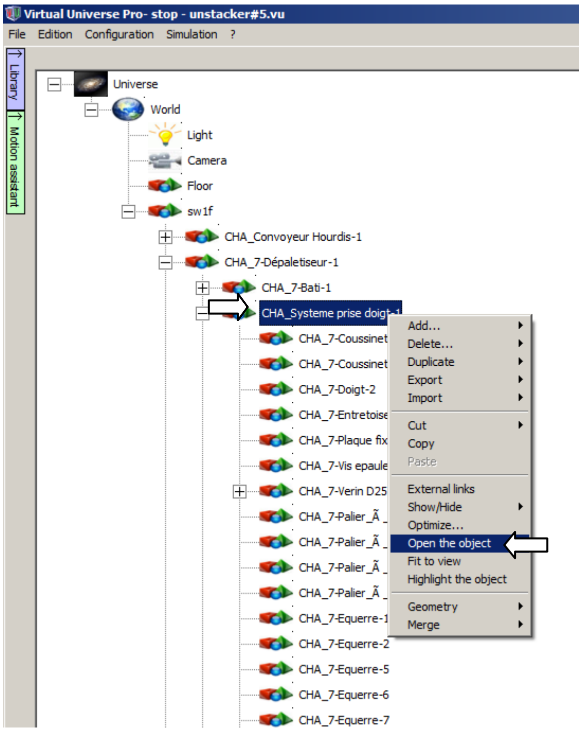
Virtual Universe Pro- stop - unstacker#5.vu

File Edition Configuration Simulation ?

Close object (return to project)

- CHA_7-Corp verin D25-1
  - CHA_7-Verin D25 C100-8
  - CHA_7-Tige verin D25-1
  - CHA_7-Ecrou verin-1
  - forcetomin
  - forcetomax

Name	
Drawing	
Position and size	
Coordinates	0mm; 0
Rotations	0; 0; 0
X	0
Y	0
Z	0
Rotation axis position	0mm; 0
X	0mm
Y	0mm
Z	0mm
Scale	1; 1; 1
Size	207.08!
Material	
Options	
Physic	

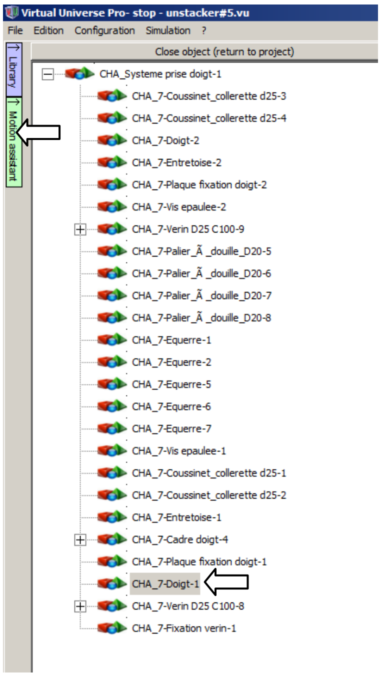


Virtual Universe Pro- stop - unstacker#5.vu

File Edition Configuration Simulation ?

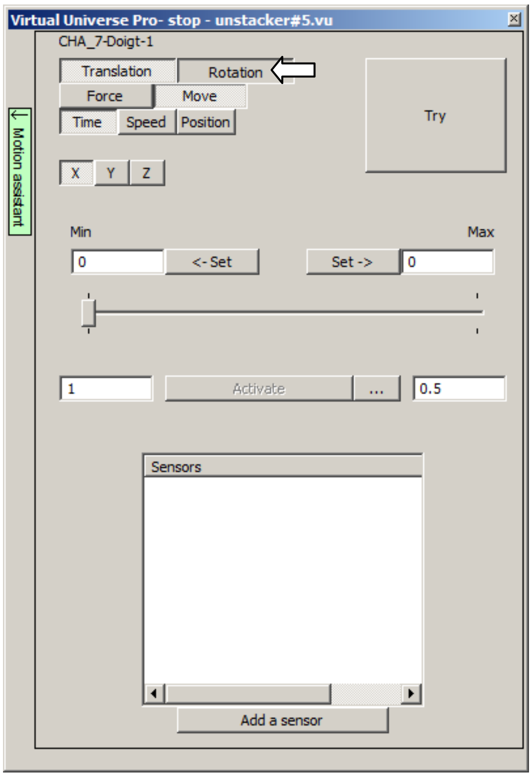
- Universe
  - World
    - Light
    - Camera
    - Floor
    - sw1f
      - CHA_Convoyeur Hourdis-1
      - CHA_7-Dépaletiseur-1
        - CHA_7-Bati-1
        - CHA_Systeme prise doigt-1
          - CHA_7-Coussinet
          - CHA_7-Coussinet
          - CHA_7-Doigt-2
          - CHA_7-Entretoise
          - CHA_7-Plaque fix
          - CHA_7-Vis epaule
          - CHA_7-Verin D25
          - CHA_7-Palier_Ã
          - CHA_7-Palier_Ã
          - CHA_7-Palier_Ã
          - CHA_7-Palier_Ã
          - CHA_7-Equerre-1
          - CHA_7-Equerre-2
          - CHA_7-Equerre-5
          - CHA_7-Equerre-6
          - CHA_7-Equerre-7

4.3.1.6.1- Opening the assistant


Virtual Universe Pro- stop - unstacker#5.vu
File
Edition
Configuration
Simulation
?
Close object (return to project)
Library
Motion assistant

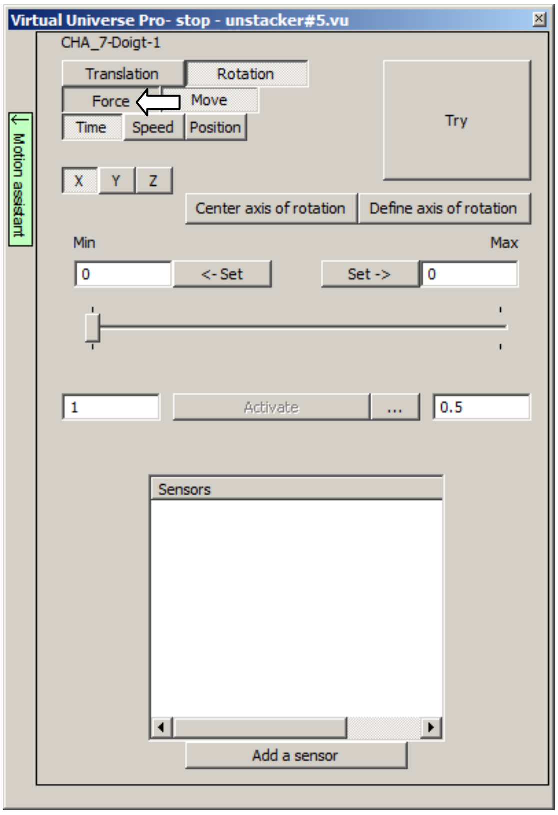
CHA_Systeme prise doigt-1
CHA_7-Coussinet_collerette d25-3
CHA_7-Coussinet_collerette d25-4
CHA_7-Doigt-2
CHA_7-Entretoise-2
CHA_7-Plaque fixation doigt-2
CHA_7-Vis epaulee-2
CHA_7-Verin D25 C100-9
CHA_7-Palier_Ã _douille_D20-5
CHA_7-Palier_Ã _douille_D20-6
CHA_7-Palier_Ã _douille_D20-7
CHA_7-Palier_Ã _douille_D20-8
CHA_7-Equerre-1
CHA_7-Equerre-2
CHA_7-Equerre-5
CHA_7-Equerre-6
CHA_7-Equerre-7
CHA_7-Vis epaulee-1
CHA_7-Coussinet_collerette d25-1
CHA_7-Coussinet_collerette d25-2
CHA_7-Entretoise-1
CHA_7-Cadre doigt-4
CHA_7-Plaque fixation doigt-1
CHA_7-Doigt-1
CHA_7-Verin D25 C100-8
CHA_7-Fixation verin-1

4.3.1.6.2- Selecting of "rotation" mode


Virtual Universe Pro- stop - unstacker#5.vu

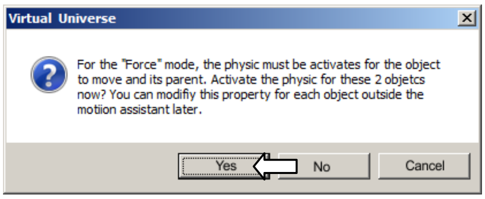
CHA_7-Doigt-1

4.3.1.6.3- Selecting of "force" mode


Virtual Universe Pro- stop - unstacker#5.vu

CHA_7-Doigt-1

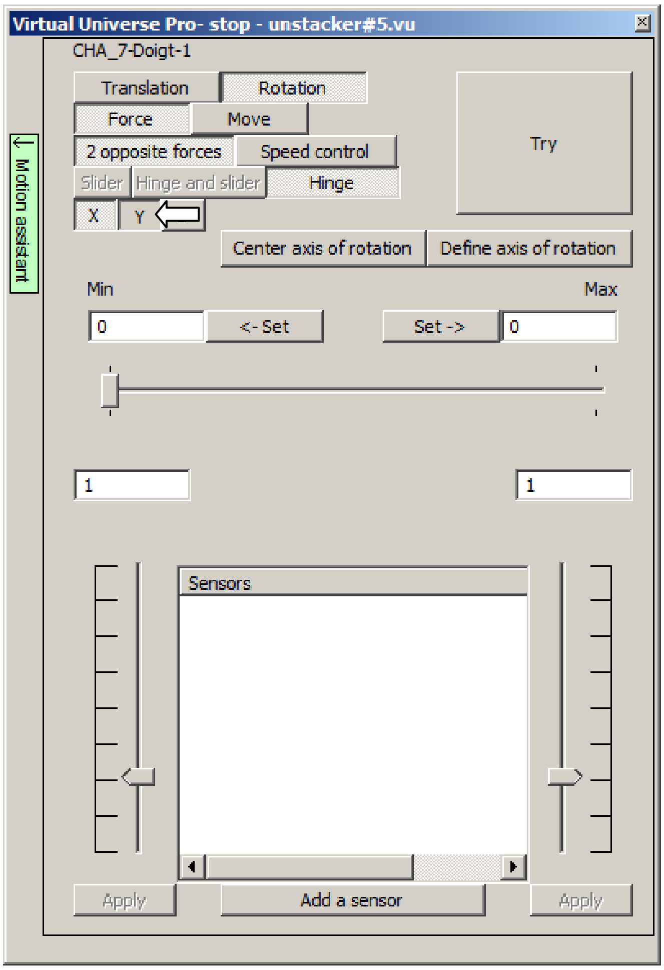
4.3.1.6.4- Accepting of the change object properties



Virtual Universe

For the "Force" mode, the physic must be activates for the object to move and its parent. Activate the physic for these 2 objetcs now? You can modify this property for each object outside the motiion assistant later.

4.3.1.6.5- Definition of the axis of rotation



Virtual Universe Pro- stop - unstacker#5.vu

CHA_7-Doigt-1

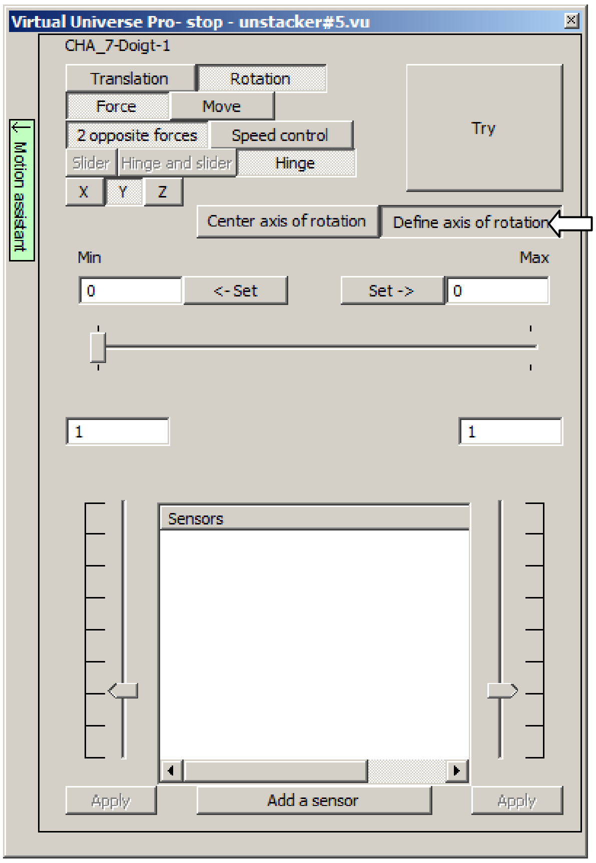
Min: 0

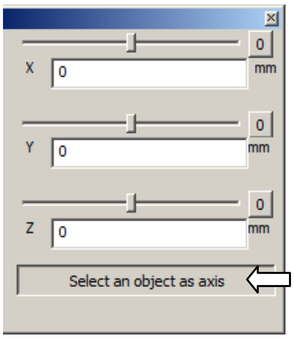
Max: 0

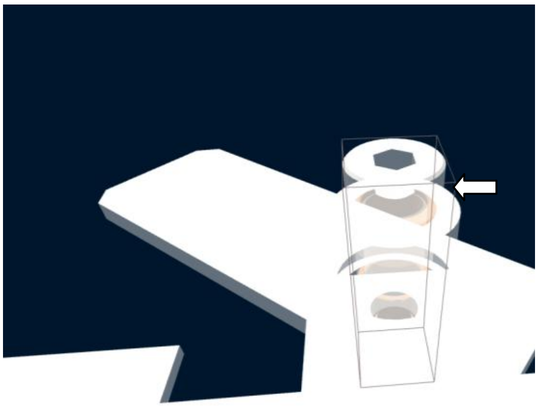
1

1

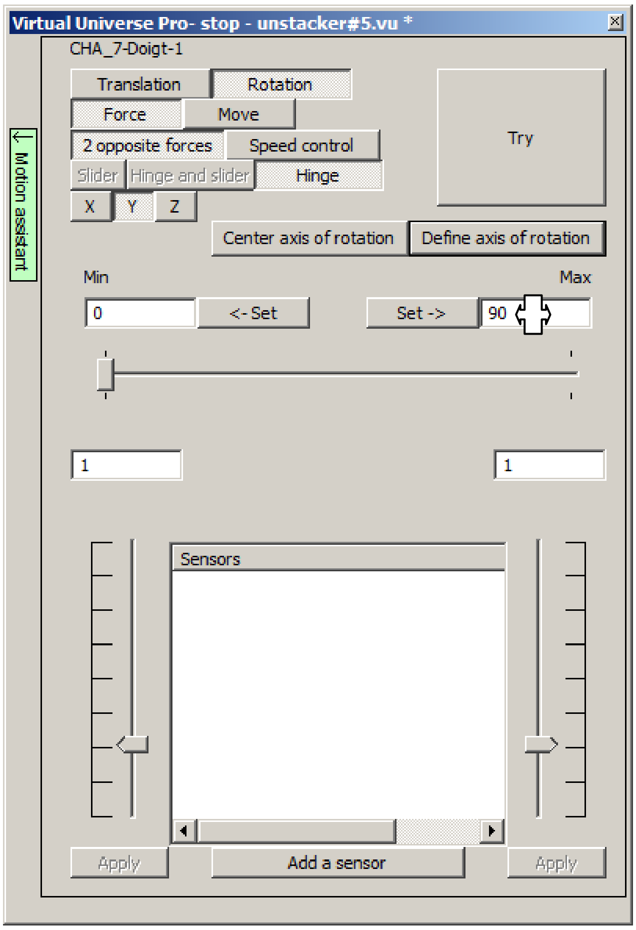
4.3.1.6.6- Setting the position of the axis of rotation







4.3.1.6.7- Setting the maximum rotation



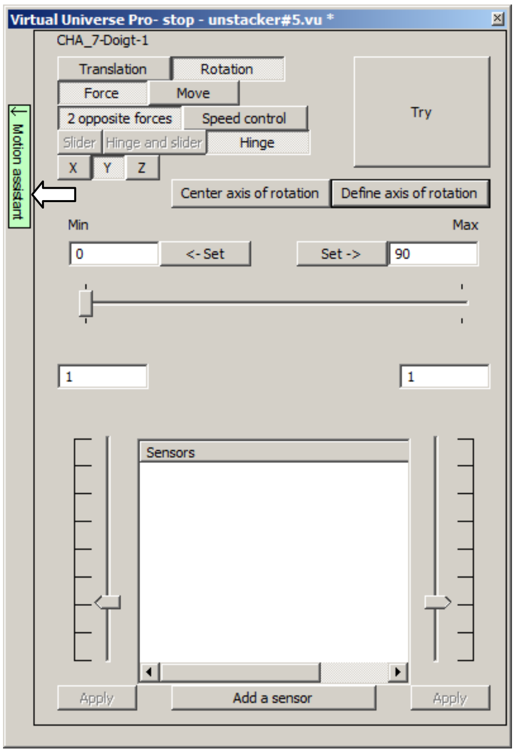
Virtual Universe Pro- stop - unstacker#5.vu *

CHA_7-Doigt-1

Min: 0

Max: 90

4.3.1.6.8- Exit from the assistant



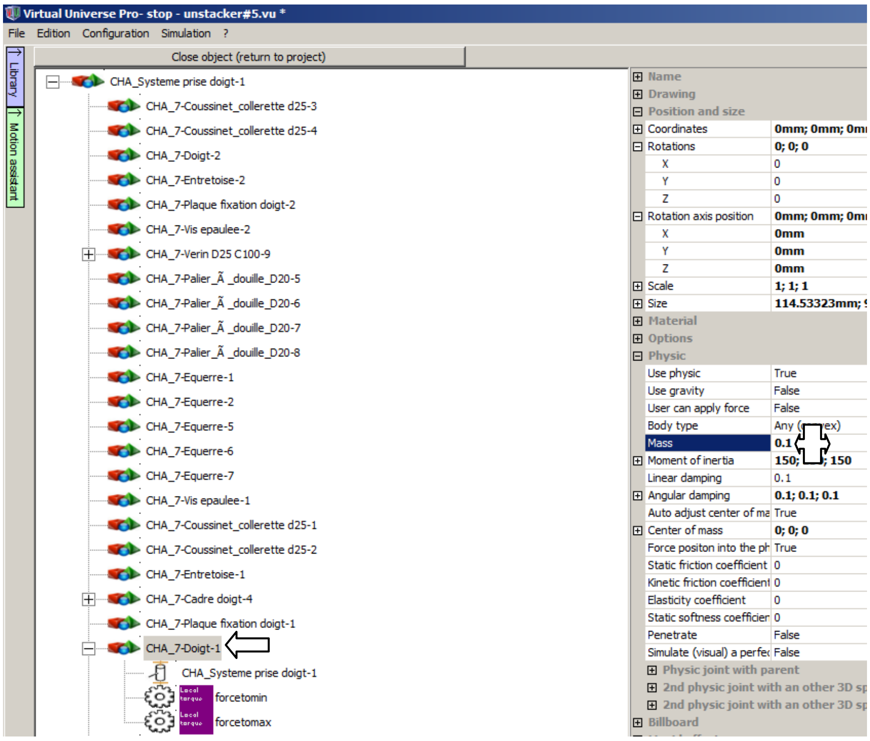
Min: 0

Max: 90

1

1

4.3.1.7- Setting the physical properties of the finger

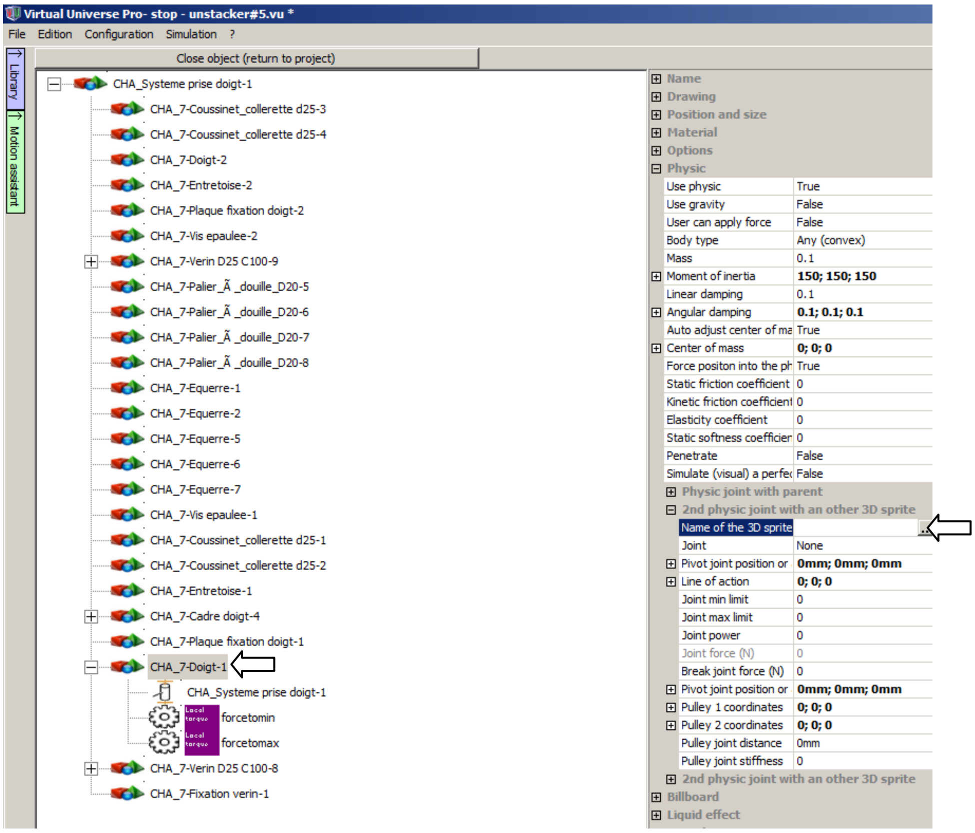

Virtual Universe Pro- stop - unstacker#5.vu *
File
Edition
Configuration
Simulation
?
Library
Motion assistant
Close object (return to project)

- CHA_Systeme prise doigt-1
  - CHA_7-Coussinet_collerette d25-3
  - CHA_7-Coussinet_collerette d25-4
  - CHA_7-Doigt-2
  - CHA_7-Entretoise-2
  - CHA_7-Plaque fixation doigt-2
  - CHA_7-Vis epaulee-2
  - CHA_7-Verin D25 C100-9
  - CHA_7-Palier_Ã _douille_D20-5
  - CHA_7-Palier_Ã _douille_D20-6
  - CHA_7-Palier_Ã _douille_D20-7
  - CHA_7-Palier_Ã _douille_D20-8
  - CHA_7-Equerre-1
  - CHA_7-Equerre-2
  - CHA_7-Equerre-5
  - CHA_7-Equerre-6
  - CHA_7-Equerre-7
  - CHA_7-Vis epaulee-1
  - CHA_7-Coussinet_collerette d25-1
  - CHA_7-Coussinet_collerette d25-2
  - CHA_7-Entretoise-1
  - CHA_7-Cadre doigt-4
  - CHA_7-Plaque fixation doigt-1
  - CHA_7-Doigt-1
    - CHA_Systeme prise doigt-1
    - forcetomin
    - forcetomax

⊞ Name	
⊞ Drawing	
⊟ Position and size	
⊞ Coordinates	0mm; 0mm; 0mı
⊟ Rotations	0; 0; 0
X	0
Y	0
Z	0
⊟ Rotation axis position	0mm; 0mm; 0mı
X	0mm
Y	0mm
Z	0mm
⊞ Scale	1; 1; 1
⊞ Size	114.53323mm; !
⊞ Material	
⊞ Options	
⊟ Physic	
Use physic	True
Use gravity	False
User can apply force	False
Body type	Any (c[illegible]ex)
Mass	0.1
⊞ Moment of inertia	150; [illegible]; 150
Linear damping	0.1
⊞ Angular damping	0.1; 0.1; 0.1
Auto adjust center of ma	True
⊞ Center of mass	0; 0; 0
Force positon into the ph	True
Static friction coefficient	0
Kinetic friction coefficient	0
Elasticity coefficient	0
Static softness coefficier	0
Penetrate	False
Simulate (visual) a perfec	False
⊞ Physic joint with parent	
⊞ 2nd physic joint with an other 3D sp	
⊞ 2nd physic joint with an other 3D sp	
⊞ Billboard	

4.3.1.8- Setting the "finger / rod cylinder" link

4.3.1.8.1- Selection of the object that shares the link


Virtual Universe Pro- stop - unstacker#5.vu *
File Edition Configuration Simulation ?
Library
Motion assistant
Close object (return to project)

- CHA_Systeme prise doigt-1
  - CHA_7-Coussinet_collerette d25-3
  - CHA_7-Coussinet_collerette d25-4
  - CHA_7-Doigt-2
  - CHA_7-Entretoise-2
  - CHA_7-Plaque fixation doigt-2
  - CHA_7-Vis epaulee-2
  - CHA_7-Verin D25 C100-9
  - CHA_7-Palier_Ã _douille_D20-5
  - CHA_7-Palier_Ã _douille_D20-6
  - CHA_7-Palier_Ã _douille_D20-7
  - CHA_7-Palier_Ã _douille_D20-8
  - CHA_7-Equerre-1
  - CHA_7-Equerre-2
  - CHA_7-Equerre-5
  - CHA_7-Equerre-6
  - CHA_7-Equerre-7
  - CHA_7-Vis epaulee-1
  - CHA_7-Coussinet_collerette d25-1
  - CHA_7-Coussinet_collerette d25-2
  - CHA_7-Entretoise-1
  - CHA_7-Cadre doigt-4
  - CHA_7-Plaque fixation doigt-1
  - CHA_7-Doigt-1
    - CHA_Systeme prise doigt-1
    - forcetomin
    - forcetomax
  - CHA_7-Verin D25 C100-8
  - CHA_7-Fixation verin-1

Name
Drawing
Position and size
Material
Options
Physic

Use physic	True
Use gravity	False
User can apply force	False
Body type	Any (convex)
Mass	0.1
Moment of inertia	**150; 150; 150**
Linear damping	0.1
Angular damping	**0.1; 0.1; 0.1**
Auto adjust center of ma	True
Center of mass	**0; 0; 0**
Force positon into the ph	True
Static friction coefficient	0
Kinetic friction coefficient	0
Elasticity coefficient	0
Static softness coefficier	0
Penetrate	False
Simulate (visual) a perfe	False

Physic joint with parent

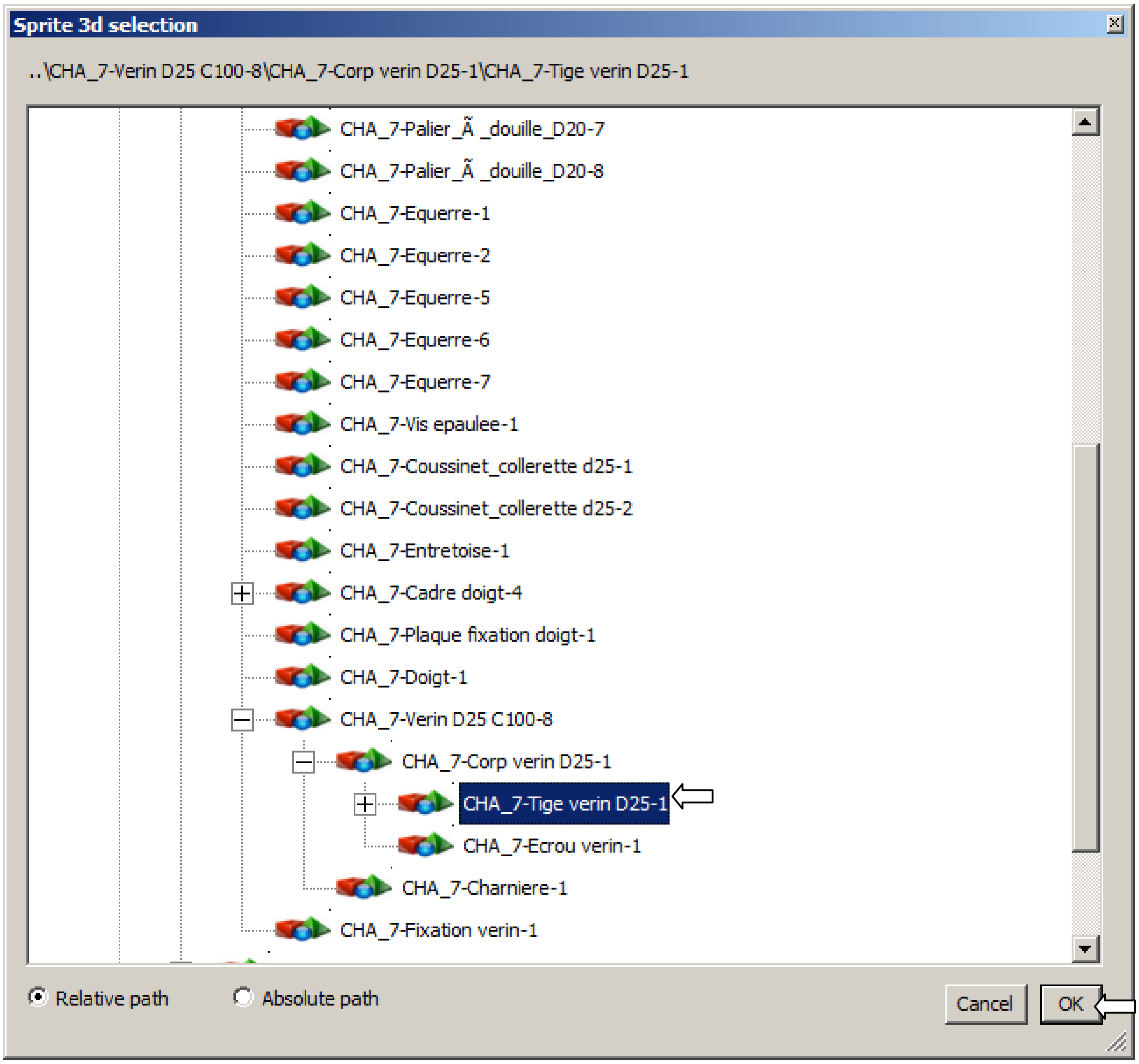
2nd physic joint with an other 3D sprite

Name of the 3D sprite	
Joint	None
Pivot joint position or	**0mm; 0mm; 0mm**
Line of action	**0; 0; 0**
Joint min limit	0
Joint max limit	0
Joint power	0
Joint force (N)	0
Break joint force (N)	0
Pivot joint position or	**0mm; 0mm; 0mm**
Pulley 1 coordinates	**0; 0; 0**
Pulley 2 coordinates	**0; 0; 0**
Pulley joint distance	0mm
Pulley joint stiffness	0

2nd physic joint with an other 3D sprite

Billboard

Liquid effect



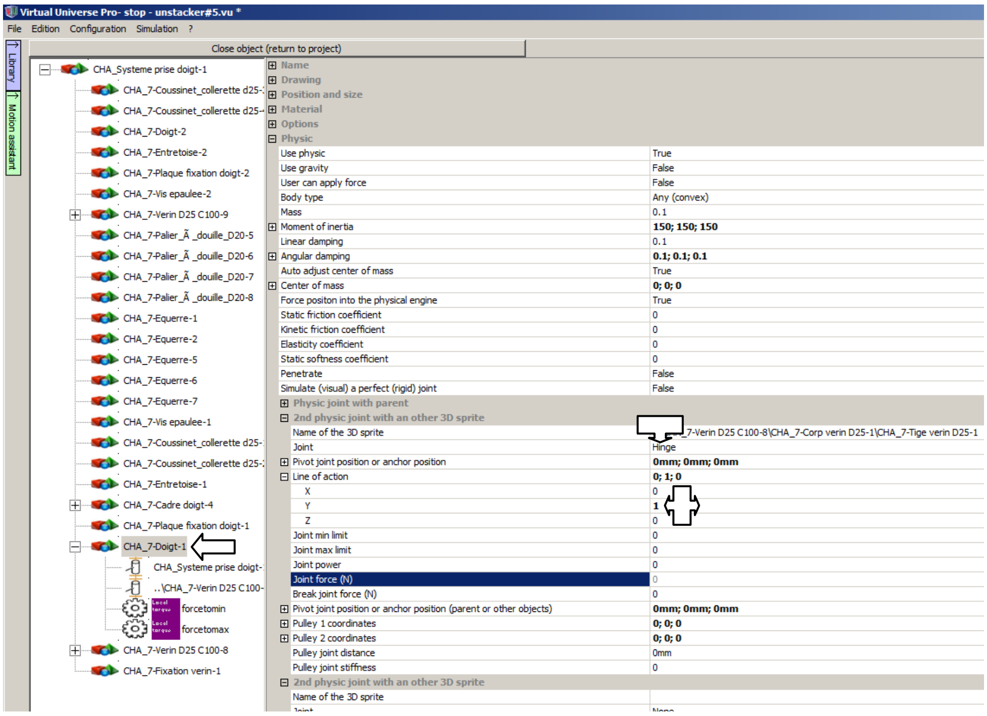
Sprite 3d selection

..\CHA_7-Verin D25 C100-8\CHA_7-Corp verin D25-1\CHA_7-Tige verin D25-1

- CHA_7-Palier_Ã _douille_D20-7
- CHA_7-Palier_Ã _douille_D20-8
- CHA_7-Equerre-1
- CHA_7-Equerre-2
- CHA_7-Equerre-5
- CHA_7-Equerre-6
- CHA_7-Equerre-7
- CHA_7-Vis epaulee-1
- CHA_7-Coussinet_collerette d25-1
- CHA_7-Coussinet_collerette d25-2
- CHA_7-Entretoise-1
- CHA_7-Cadre doigt-4
- CHA_7-Plaque fixation doigt-1
- CHA_7-Doigt-1
- CHA_7-Verin D25 C100-8
  - CHA_7-Corp verin D25-1
    - CHA_7-Tige verin D25-1
    - CHA_7-Ecrou verin-1
  - CHA_7-Charniere-1
- CHA_7-Fixation verin-1

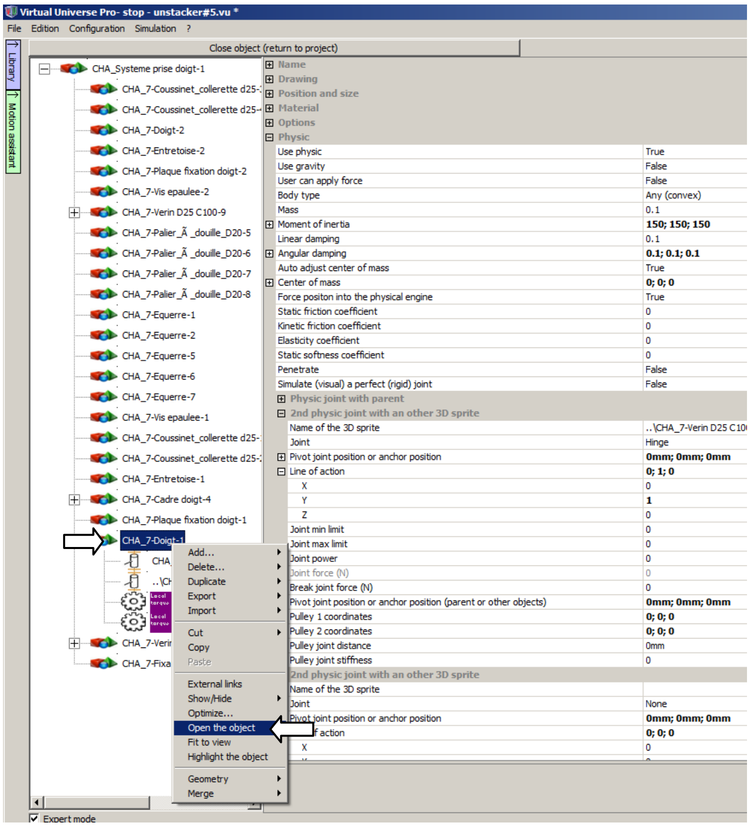
● Relative path ○ Absolute path

4.3.1.8.2- Configuring the link

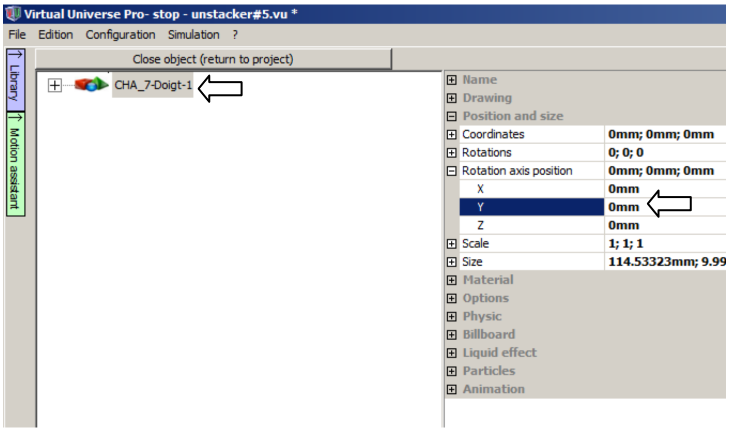


⊞ Name	
⊞ Drawing	
⊞ Position and size	
⊞ Material	
⊞ Options	
⊟ Physic	
Use physic	True
Use gravity	False
User can apply force	False
Body type	Any (convex)
Mass	0.1
⊞ Moment of inertia	**150; 150; 150**
Linear damping	0.1
⊞ Angular damping	**0.1; 0.1; 0.1**
Auto adjust center of mass	True
⊞ Center of mass	**0; 0; 0**
Force positon into the physical engine	True
Static friction coefficient	0
Kinetic friction coefficient	0
Elasticity coefficient	0
Static softness coefficient	0
Penetrate	False
Simulate (visual) a perfect (rigid) joint	False
⊞ Physic joint with parent	
⊟ 2nd physic joint with an other 3D sprite	
Name of the 3D sprite	_7-Verin D25 C100-8\CHA_7-Corp verin D25-1\CHA_7-Tige verin D25-1
Joint	Hinge
⊞ Pivot joint position or anchor position	**0mm; 0mm; 0mm**
⊟ Line of action	**0; 1; 0**
X	0
Y	**1**
Z	0
Joint min limit	0
Joint max limit	0
Joint power	0
Joint force (N)	0
Break joint force (N)	0
⊞ Pivot joint position or anchor position (parent or other objects)	**0mm; 0mm; 0mm**
⊞ Pulley 1 coordinates	**0; 0; 0**
⊞ Pulley 2 coordinates	**0; 0; 0**
Pulley joint distance	0mm
Pulley joint stiffness	0
⊟ 2nd physic joint with an other 3D sprite	
Name of the 3D sprite	
Joint	None

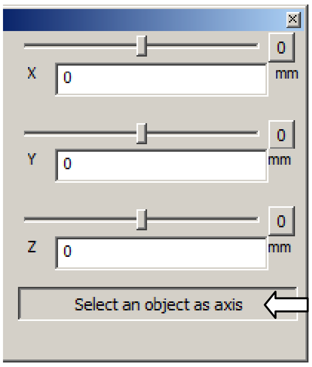
4.3.1.8.3- Definition of the axis of rotation



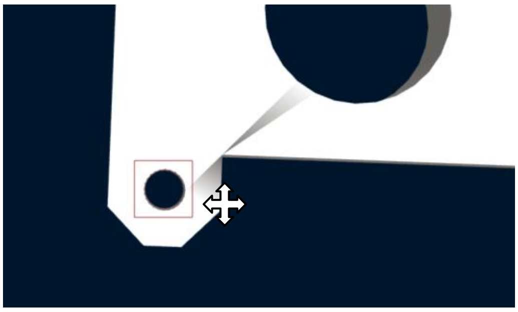
Name	
Drawing	
Position and size	
Material	
Options	
Physic	
Use physic	True
Use gravity	False
User can apply force	False
Body type	Any (convex)
Mass	0.1
Moment of inertia	**150; 150; 150**
Linear damping	0.1
Angular damping	**0.1; 0.1; 0.1**
Auto adjust center of mass	True
Center of mass	**0; 0; 0**
Force positon into the physical engine	True
Static friction coefficient	0
Kinetic friction coefficient	0
Elasticity coefficient	0
Static softness coefficient	0
Penetrate	False
Simulate (visual) a perfect (rigid) joint	False
Physic joint with parent	
2nd physic joint with an other 3D sprite	
Name of the 3D sprite	..\CHA_7-Verin D25 C10
Joint	Hinge
Pivot joint position or anchor position	**0mm; 0mm; 0mm**
Line of action	**0; 1; 0**
X	0
Y	**1**
Z	0
Joint min limit	0
Joint max limit	0
Joint power	0
Joint force (N)	0
Break joint force (N)	0
Pivot joint position or anchor position (parent or other objects)	**0mm; 0mm; 0mm**
Pulley 1 coordinates	**0; 0; 0**
Pulley 2 coordinates	**0; 0; 0**
Pulley joint distance	0mm
Pulley joint stiffness	0
2nd physic joint with an other 3D sprite	
Name of the 3D sprite	
Joint	None
Pivot joint position or anchor position	**0mm; 0mm; 0mm**
f action	**0; 0; 0**
X	0


Virtual Universe Pro- stop - unstacker#5.vu *
File
Edition
Configuration
Simulation
?
Library
Motion assistant
Close object (return to project)
CHA_7-Doigt-1

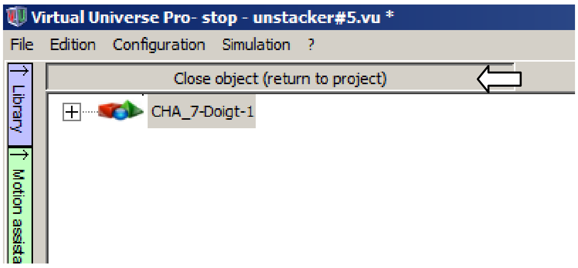
Name	
Drawing	
Position and size	
Coordinates	**0mm; 0mm; 0mm**
Rotations	**0; 0; 0**
Rotation axis position	**0mm; 0mm; 0mm**
X	**0mm**
Y	**0mm**
Z	**0mm**
Scale	**1; 1; 1**
Size	**114.53323mm; 9.99**
Material	
Options	
Physic	
Billboard	
Liquid effect	
Particles	
Animation	



X	0	mm
Y	0	mm
Z	0	mm



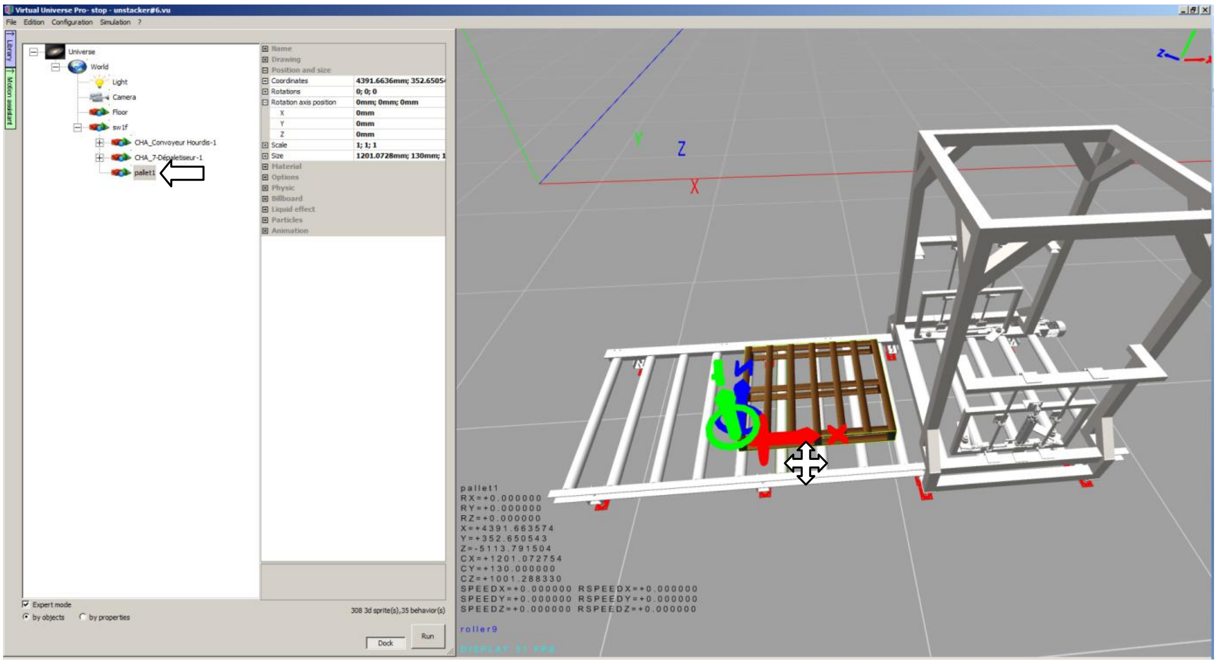
4.3.1.8.4- Closing of the object


Virtual Universe Pro- stop - unstacker#5.vu *
File
Edition
Configuration
Simulation
?
Library
Motion assista
Close object (return to project)
CHA_7-Doigt-1

#6

4.3.1.9- Setting the forces to be applied to the actuator

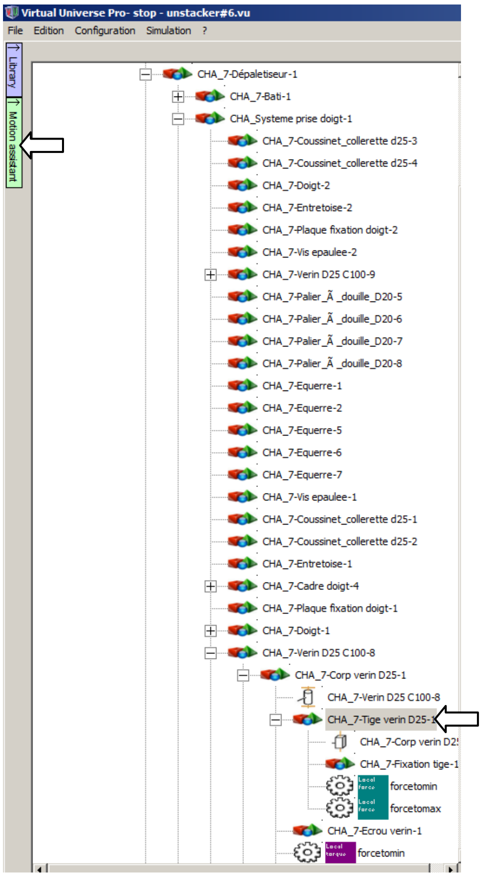
4.3.1.9.1- Move the pallet to avoid interferences



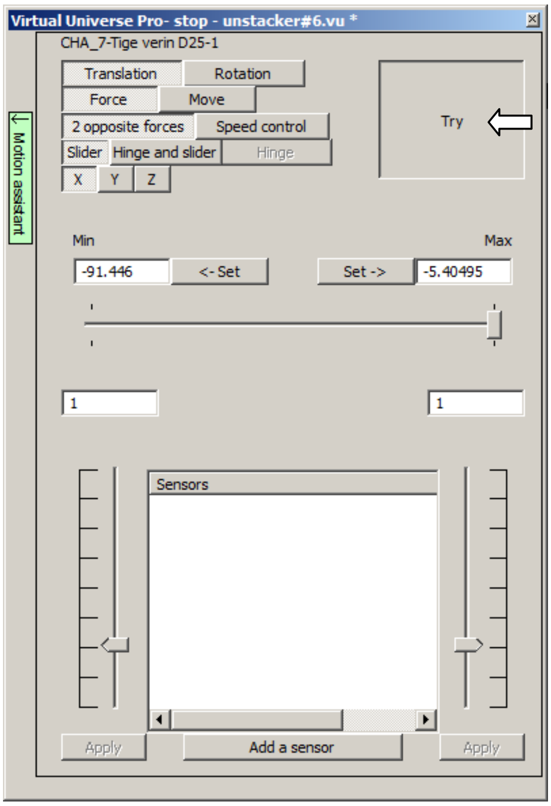
Coordinates	4391.6636mm; 352.6505
Rotations	0; 0; 0
Rotation axis position	0mm; 0mm; 0mm
X	0mm
Y	0mm
Z	0mm
Scale	1; 1; 1
Size	1201.0728mm; 130mm; 1

```
pallet1
RX=+0.000000
RY=+0.000000
RZ=+0.000000
X=+4391.663574
Y=+352.650543
Z=-5113.791504
CX=+1201.072754
CY=+130.000000
CZ=+1001.288330
SPEEDX=+0.000000 RSPEEDX=+0.000000
SPEEDY=+0.000000 RSPEEDY=+0.000000
SPEEDZ=+0.000000 RSPEEDZ=+0.000000
```

4.3.1.9.2- Reopening of the wizard to define the force for the cylinder



4.3.1.9.3- Switch to "try" mode



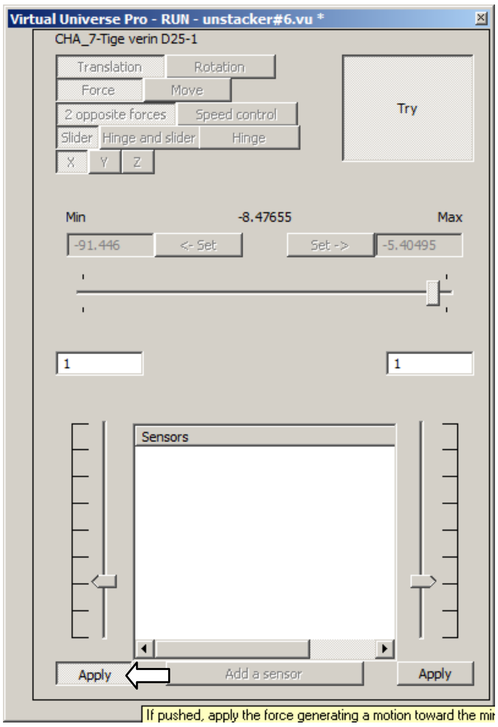
Virtual Universe Pro- stop - unstacker#6.vu *

CHA_7-Tige verin D25-1

Min: -91.446

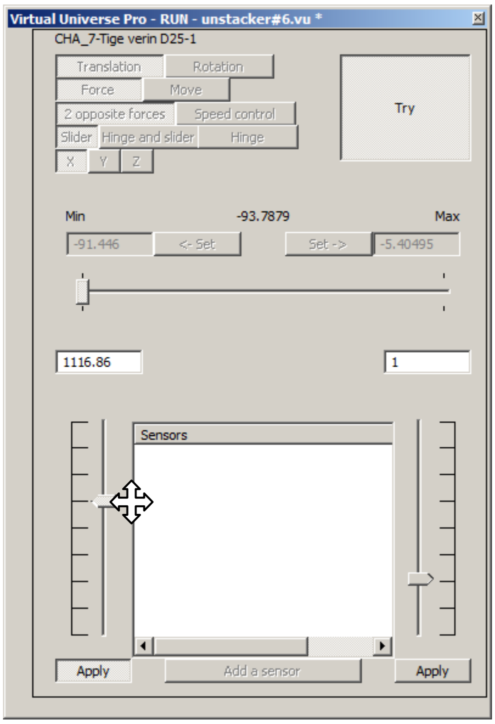
Max: -5.40495

4.3.1.9.4- Activating the force for making the rod go out

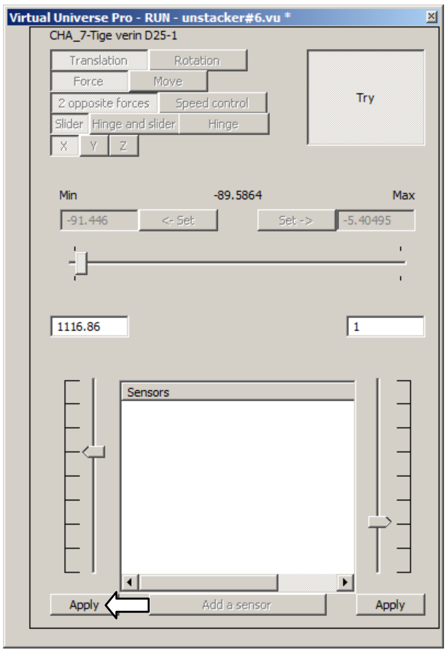


If pushed, apply the force generating a motion toward the mi

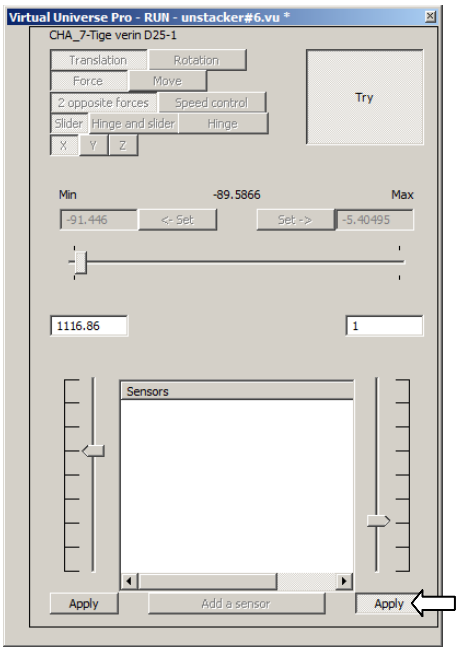
4.3.1.9.5- Defining the force for making the rod go out



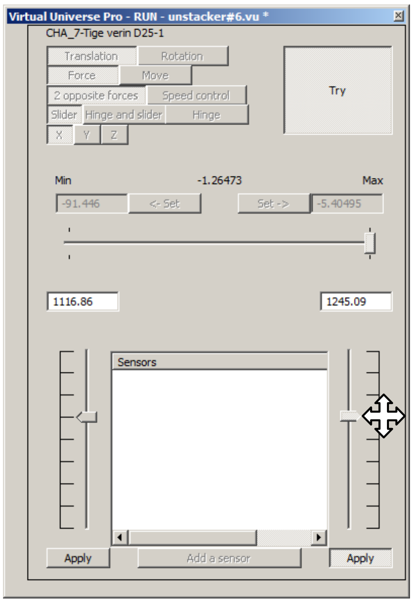
4.3.1.9.6- Disabling the force for making the rod go out



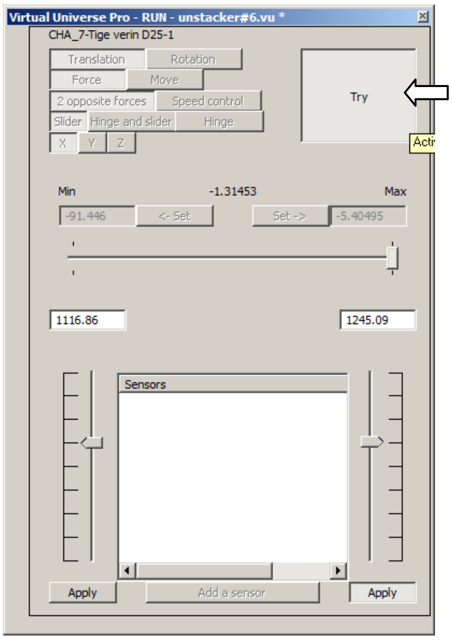
4.3.1.9.7- Activating the force for making the rod returning



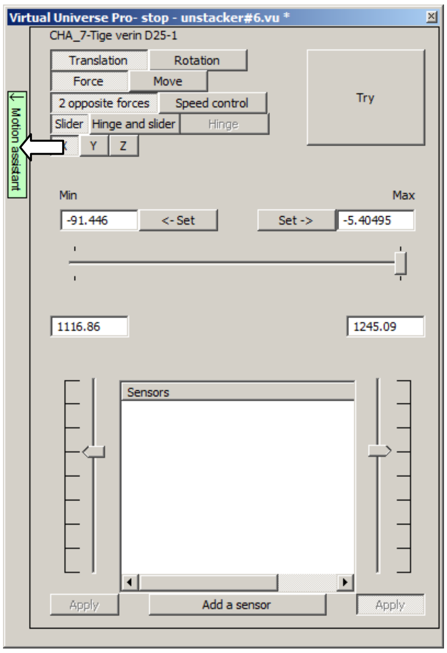
4.3.1.9.8- Defining the force for making the rod returning



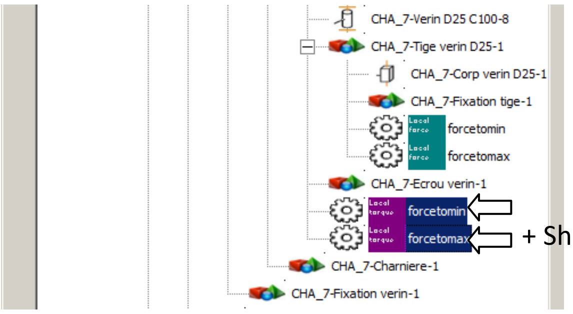
4.3.1.9.9- End of the "try" mode



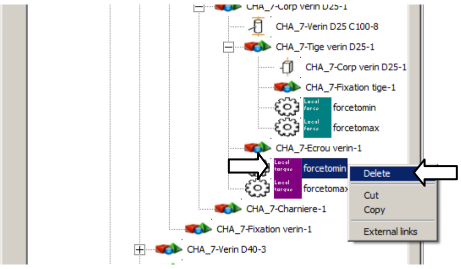
4.3.1.9.10- Exit from the wizard

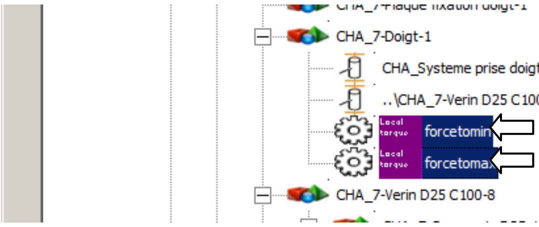


4.3.1.9.11- Deleting unused behaviors

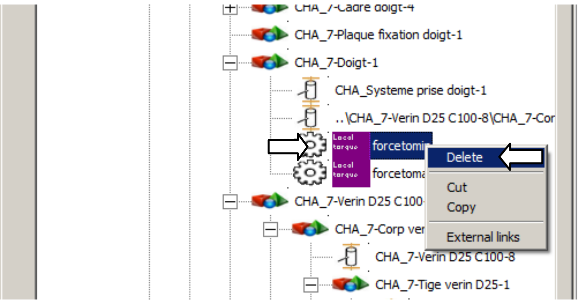


+ Shift



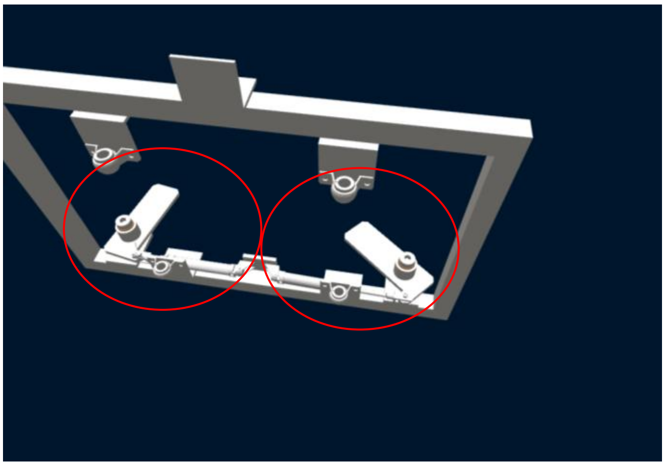

CHA_7-Plaque fixation doigt-1
CHA_7-Doigt-1
CHA_Systeme prise doigt-1
..\CHA_7-Verin D25 C100-8\C
Local torque
forcetomin
Local torque
forcetomax
CHA_7-Verin D25 C100-8

+ Shift

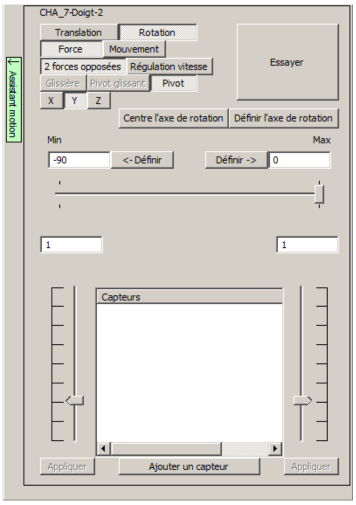


#7

4.4- Setting the opposite finger



The setting is identical to the first finger. The maximum angle of rotation of the finger (4.3.1.6.7) parameter is reversed (-90 instead of 90):



Min -90

Max 0

1

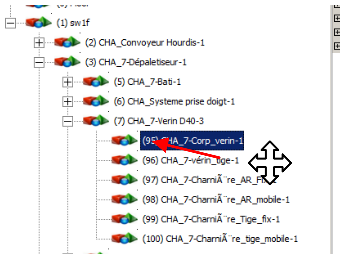
1

#8

4.5- Setting the movement up / down

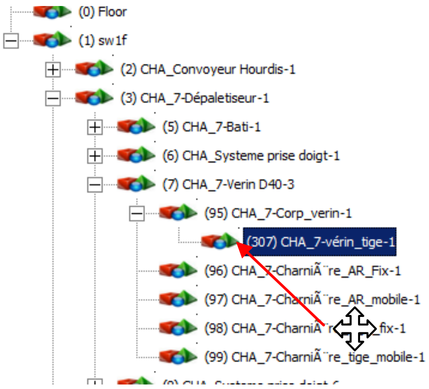
4.5.1- Reorganization of the structure

4.5.1.1- Make the rod child of the cylinder body



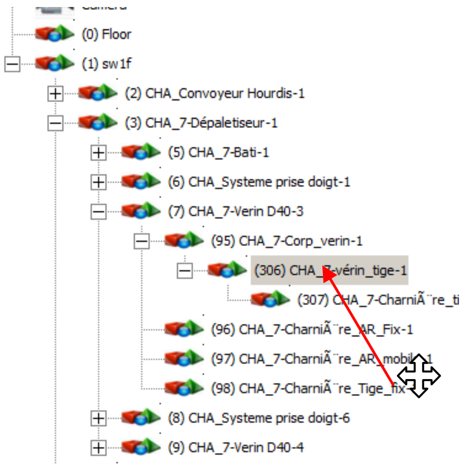
(1) sw1f
(2) CHA_Convoyeur Hourdis-1
(3) CHA_7-Dépaletiseur-1
(5) CHA_7-Bati-1
(6) CHA_Systeme prise doigt-1
(7) CHA_7-Verin D40-3
(95) CHA_7-Corp_verin-1
(96) CHA_7-vérin_tige-1
(97) CHA_7-CharniÃ¨re_AR_Fix-1
(98) CHA_7-CharniÃ¨re_AR_mobile-1
(99) CHA_7-CharniÃ¨re_Tige_fix-1
(100) CHA_7-CharniÃ¨re_tige_mobile-1

4.5.1.2- Make the rod hinge child of the rod

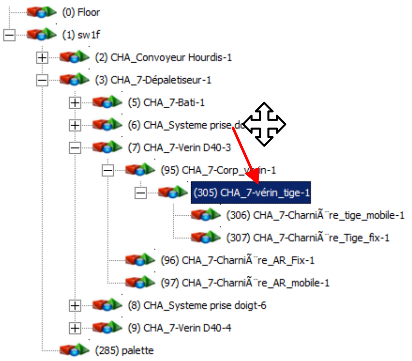


(0) Floor
(1) sw1f
(2) CHA_Convoyeur Hourdis-1
(3) CHA_7-Dépaletiseur-1
(5) CHA_7-Bati-1
(6) CHA_Systeme prise doigt-1
(7) CHA_7-Verin D40-3
(95) CHA_7-Corp_verin-1
(307) CHA_7-vérin_tige-1
(96) CHA_7-CharniÃ¨re_AR_Fix-1
(97) CHA_7-CharniÃ¨re_AR_mobile-1
(98) CHA_7-CharniÃ¨re_Tige_fix-1
(99) CHA_7-CharniÃ¨re_tige_mobile-1

4.5.1.3- Make the fixed rod hinge child of the rod

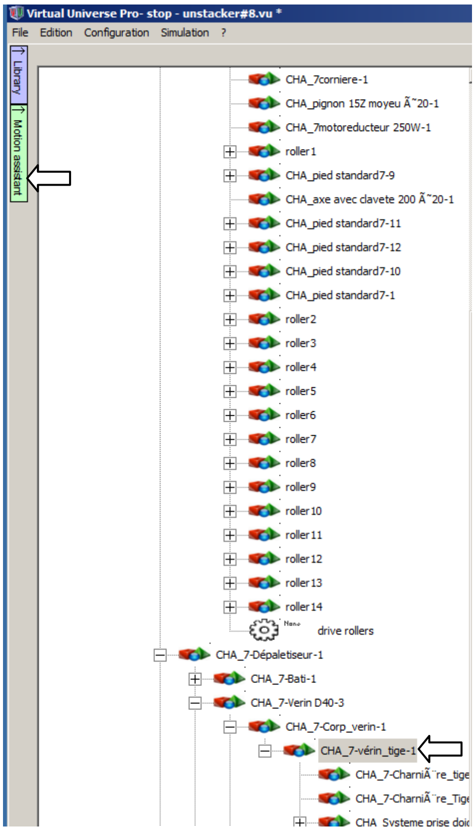

(0) Floor
(1) sw1f
(2) CHA_Convoyeur Hourdis-1
(3) CHA_7-Dépaletiseur-1
(5) CHA_7-Bati-1
(6) CHA_Systeme prise doigt-1
(7) CHA_7-Verin D40-3
(95) CHA_7-Corp_verin-1
(306) CHA_7-vérin_tige-1
(307) CHA_7-CharniÃ¨re_ti
(96) CHA_7-CharniÃ¨re_AR_Fix-1
(97) CHA_7-CharniÃ¨re_AR_mobile-1
(98) CHA_7-CharniÃ¨re_Tige_fix-1
(8) CHA_Systeme prise doigt-6
(9) CHA_7-Verin D40-4

4.5.1.4- Make the finger taking ststem child of the rod


(0) Floor
(1) sw1f
(2) CHA_Convoyeur Hourdis-1
(3) CHA_7-Dépaletiseur-1
(5) CHA_7-Bati-1
(6) CHA_Systeme prise do
(7) CHA_7-Verin D40-3
(95) CHA_7-Corp_verin-1
(305) CHA_7-vérin_tige-1
(306) CHA_7-CharniÃ¨re_tige_mobile-1
(307) CHA_7-CharniÃ¨re_Tige_fix-1
(96) CHA_7-CharniÃ¨re_AR_Fix-1
(97) CHA_7-CharniÃ¨re_AR_mobile-1
(8) CHA_Systeme prise doigt-6
(9) CHA_7-Verin D40-4
(285) palette

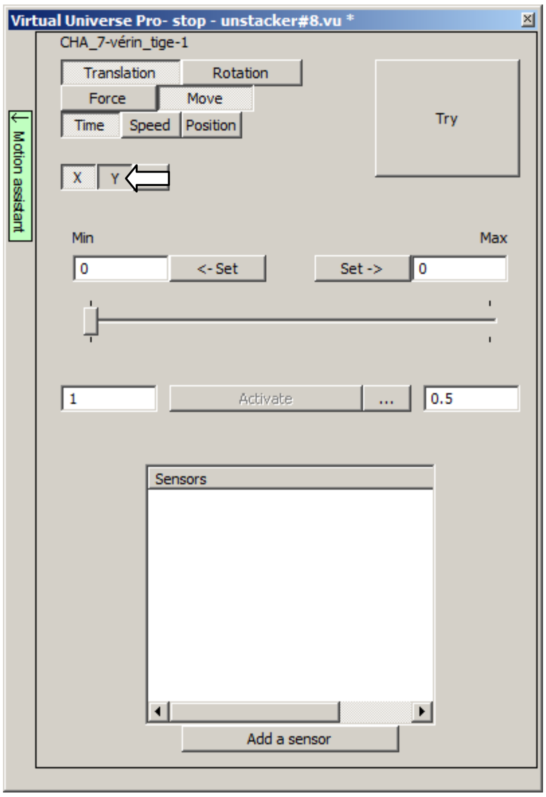
4.5.2- Define the move

4.5.2.1- Open the wizard



```
            CHA_7corniere-1
            CHA_pignon 15Z moyeu Ã˜20-1
            CHA_7motoreducteur 250W-1
        ⊞   roller1
        ⊞   CHA_pied standard7-9
            CHA_axe avec clavete 200 Ã˜20-1
        ⊞   CHA_pied standard7-11
        ⊞   CHA_pied standard7-12
        ⊞   CHA_pied standard7-10
        ⊞   CHA_pied standard7-1
        ⊞   roller2
        ⊞   roller3
        ⊞   roller4
        ⊞   roller5
        ⊞   roller6
        ⊞   roller7
        ⊞   roller8
        ⊞   roller9
        ⊞   roller10
        ⊞   roller11
        ⊞   roller12
        ⊞   roller13
        ⊞   roller14
              drive rollers
⊟   CHA_7-Dépaletiseur-1
    ⊞   CHA_7-Bati-1
    ⊟   CHA_7-Verin D40-3
        ⊟   CHA_7-Corp_verin-1
            ⊟   CHA_7-vérin_tige-1
                    CHA_7-CharniÃ¨re_tige
                    CHA_7-CharniÃ¨re_Tige
                ⊞   CHA_Systeme prise doic
```

4.5.2.2- Define the axis



Virtual Universe Pro- stop - unstacker#8.vu *

CHA_7-vérin_tige-1

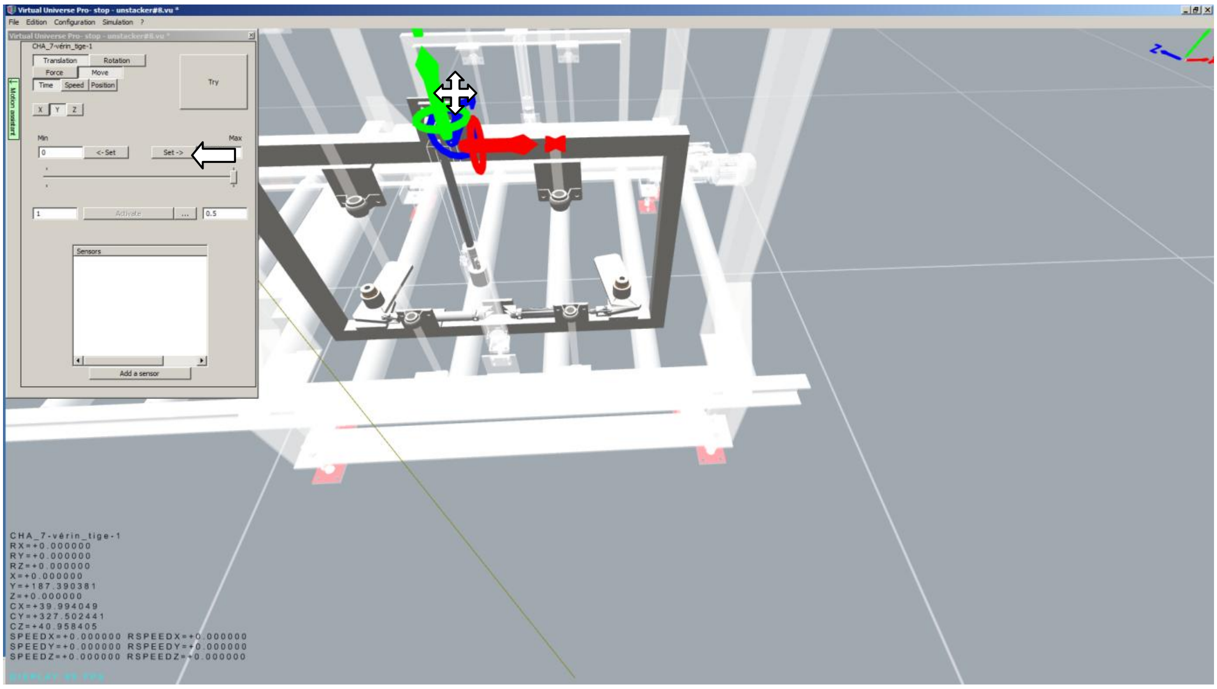
Min 0

Max 0

1

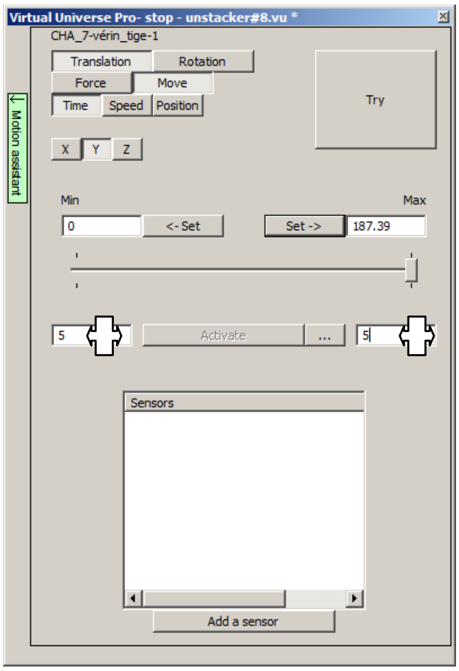
0.5

4.5.2.3- Define up position



```
CHA_7-vérin_tige-1
RX=+0.000000
RY=+0.000000
RZ=+0.000000
X=+0.000000
Y=+187.390381
Z=+0.000000
CX=+39.994049
CY=+327.502441
CZ=+40.958405
SPEEDX=+0.000000 RSPEEDX=+0.000000
SPEEDY=+0.000000 RSPEEDY=+0.000000
SPEEDZ=+0.000000 RSPEEDZ=+0.000000
```

4.5.2.4- Define times for move



Min 0

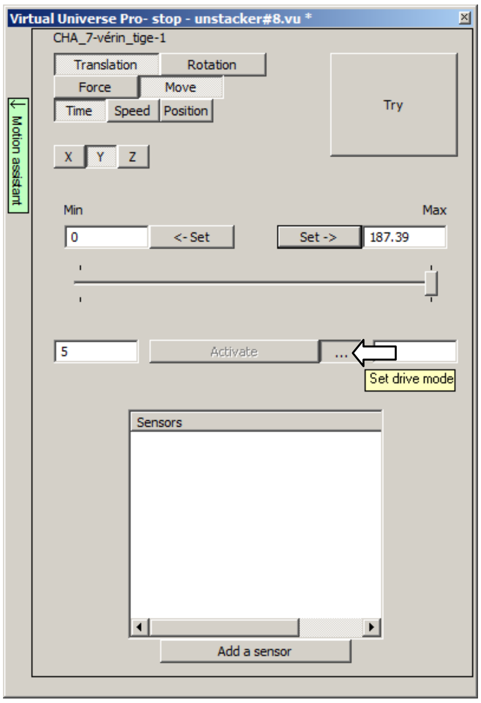
Max 187.39

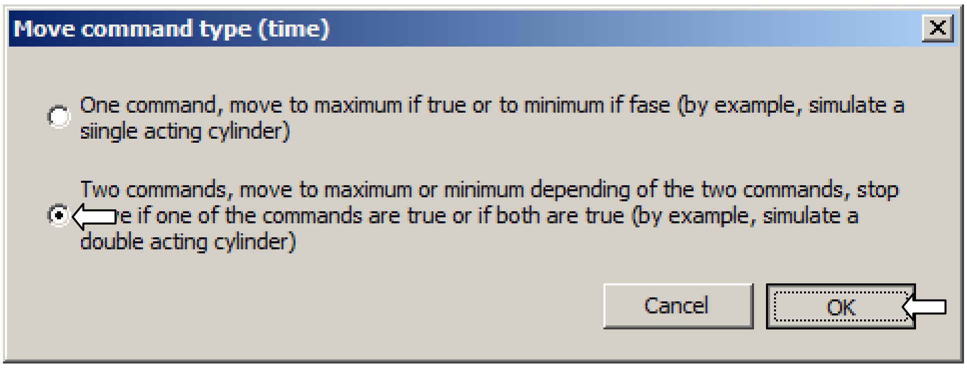
5

5

4.5.2.5- Define a bistable move mode

The rise and fall of the subset must be stopped at an intermediate position (position where fingers can get among the palette).



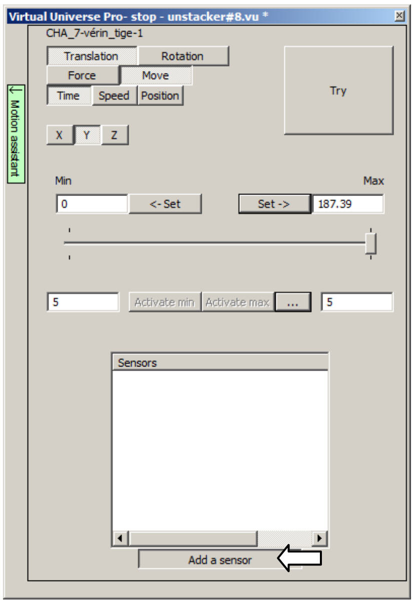


○ One command, move to maximum if true or to minimum if fase (by example, simulate a siingle acting cylinder)

● Two commands, move to maximum or minimum depending of the two commands, stop ~~~e if one of the commands are true or if both are true (by example, simulate a double acting cylinder)

4.5.2.6- Set a mini sensor

4.5.2.6.1- Add a sensor


Virtual Universe Pro- stop - unstacker#8.vu *

CHA_7-vérin_tige-1

Min 0

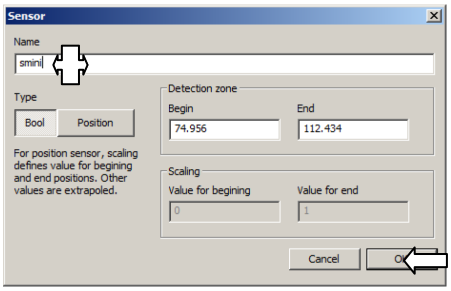
Max 187.39

5

5

Sensors

4.5.2.6.2- Identify the sensor


Sensor

Name: smini

Type: Bool / Position

For position sensor, scaling defines value for begining and end positions. Other values are extrapoled.

Detection zone

Begin: 74.956

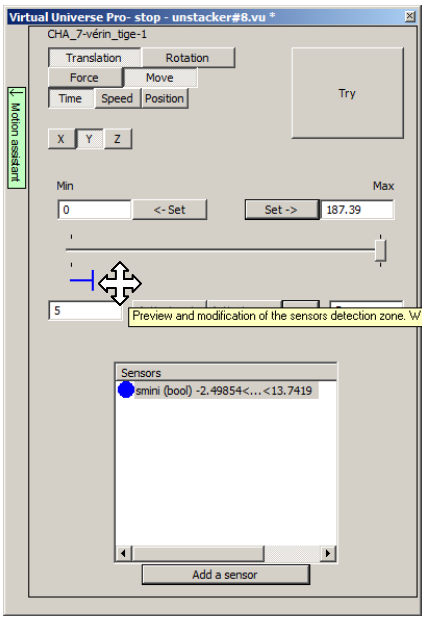
End: 112.434

Scaling

Value for begining: 0

Value for end: 1

4.5.2.6.3- Visually define the detection range



Min: 0

Max: 187.39

5

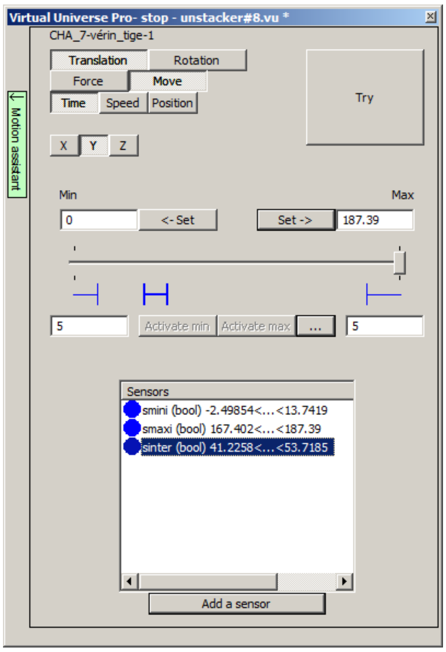
Preview and modification of the sensors detection zone. W

smini (bool) -2.49854<...<13.7419

Gripping and moving each end of the detection zone (blue lines).

4.5.2.7- Define the maximum sensor and a position sensor for the intermediate position

Similarly (4.5.2.6.1 4.5.2.6.3 to) a sensor is created for the maximum position and a sensor for the intermediate position (the exit of the fingers must be possible inside the pallet).



Min: 0

Max: 187.39

5

5

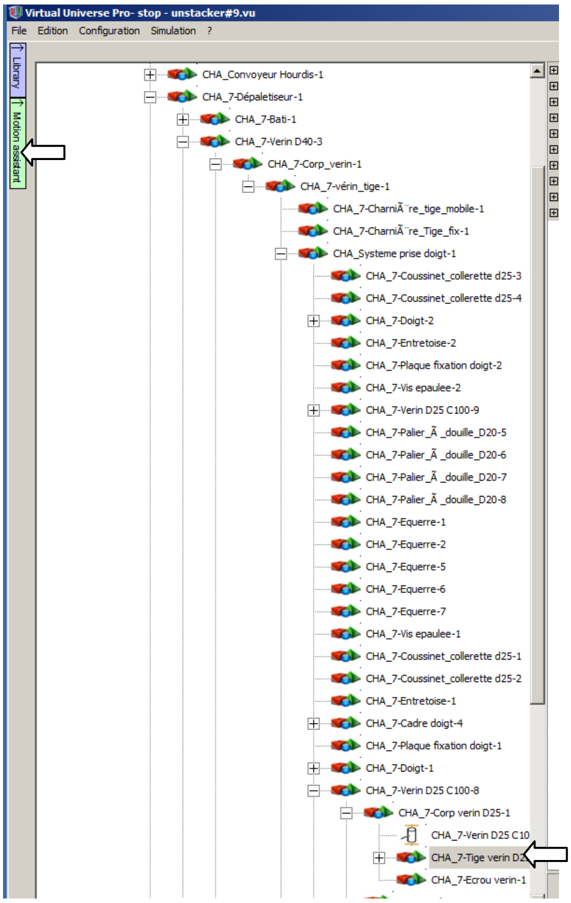
smini (bool) -2.49854<...<13.7419
smaxi (bool) 167.402<...<187.39
sinter (bool) 41.2258<...<53.7185

The "try" mode can be used to test this.

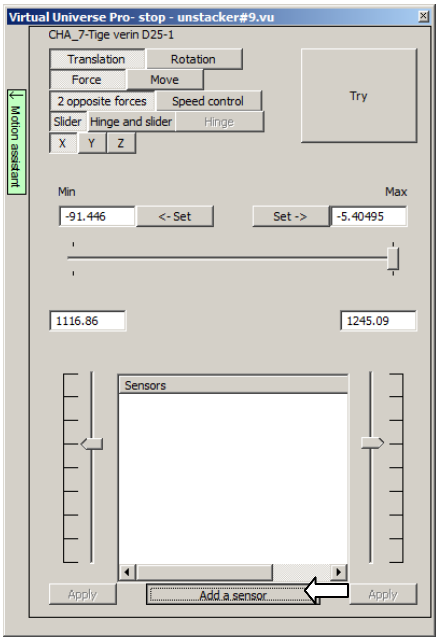
#9

4.6- Adding sensors to fingers actuators

4.6.1- Reopening of the wizard for the cylinder rod



4.6.1.1- Add a sensor



Virtual Universe Pro- stop - unstacker#9.vu

CHA_7-Tige verin D25-1

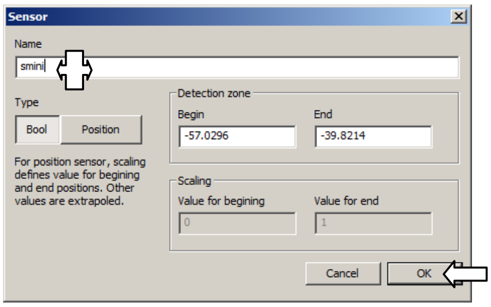
Min: -91.446

Max: -5.40495

1116.86

1245.09

4.6.1.2- Identify it



Sensor

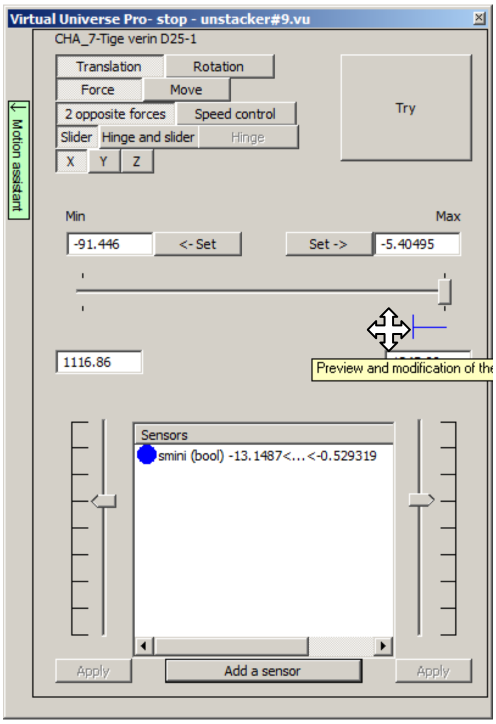
Name: smini

For position sensor, scaling defines value for begining and end positions. Other values are extrapoled.

Detection zone
Begin: -57.0296
End: -39.8214

Scaling
Value for begining: 0
Value for end: 1

4.6.1.3- Definition of the detection zone



Min -91.446

Max -5.40495

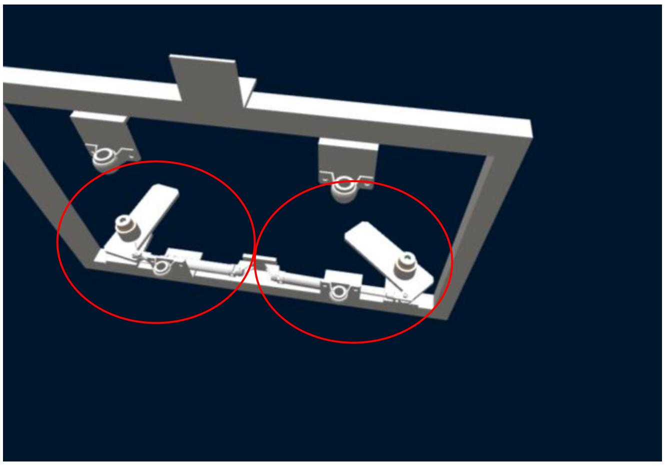
1116.86

Sensors

● smini (bool) -13.1487<...<-0.529319

4.6.2- Creation of other sensors on the actuators associated with fingers

In the same way, create the maximum sensor for the same cylinder and the minimum and maximum sensors for actuator of the opposite finger.

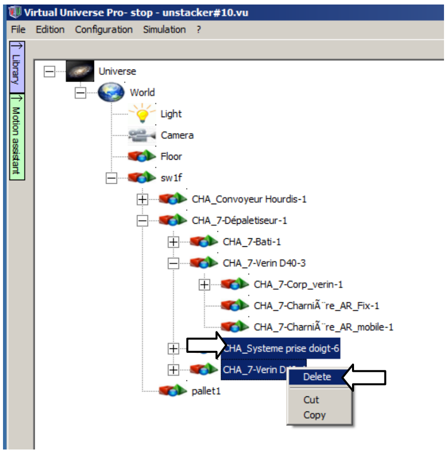


#10

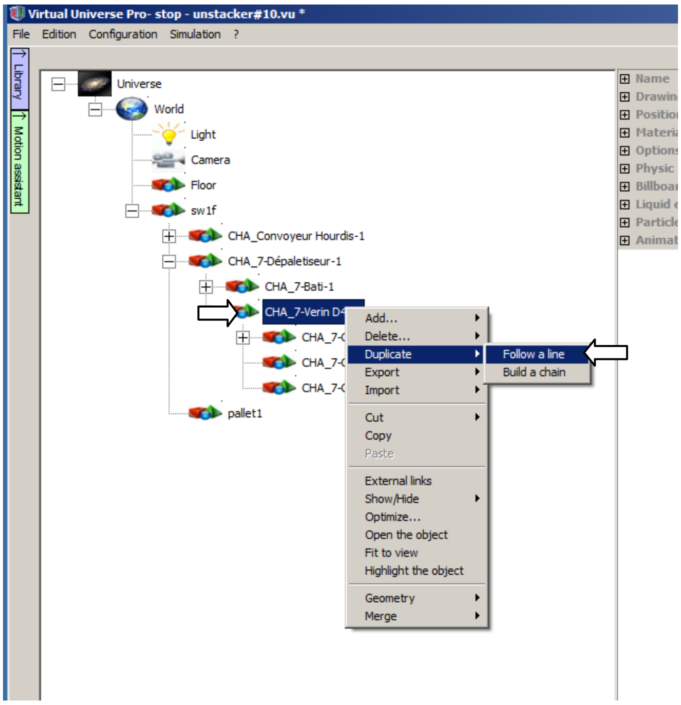
4.7- Duplication of the subsystem up / down and fingers

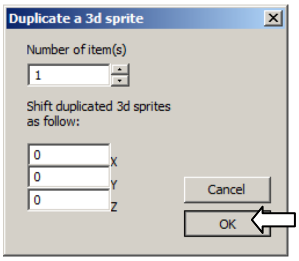
The subset being the same, we shall replace the subset not set by a copy of the subset set.

4.7.1- Removal of the subassembly not set



4.7.2- Duplication subset set




Duplicate a 3d sprite

Number of item(s)

1

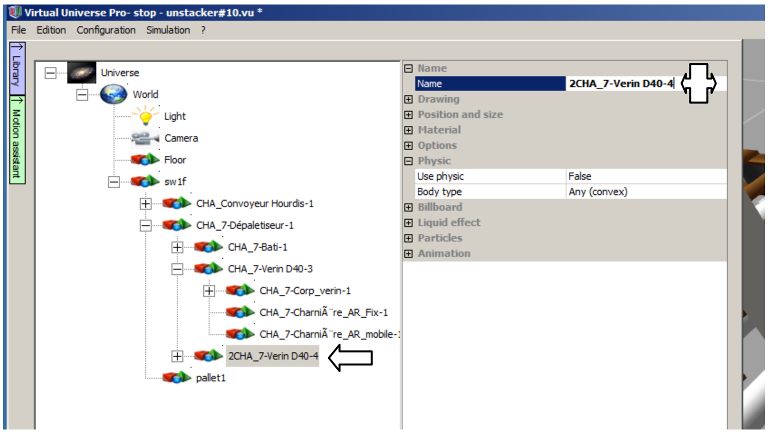
Shift duplicated 3d sprites as follow:

0 X

0 Y

0 Z

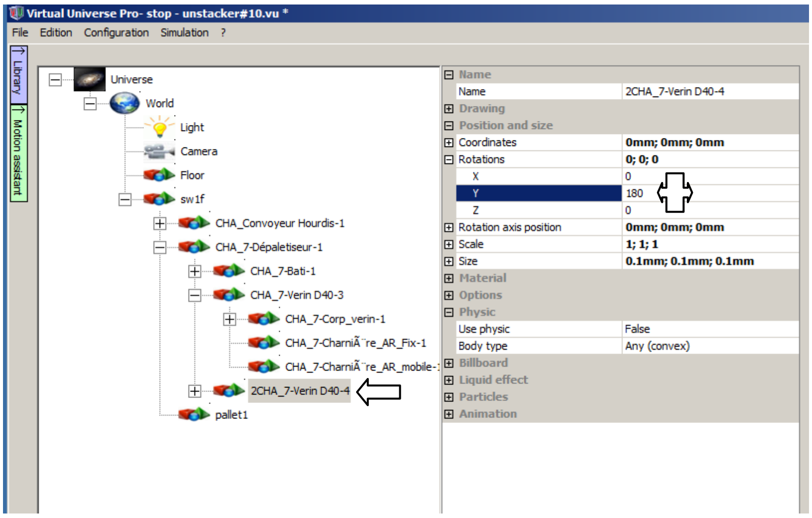
4.7.3- Rename the new subset


Virtual Universe Pro- stop - unstacker#10.vu *

Universe
World
Light
Camera
Floor
sw1f
CHA_Convoyeur Hourdis-1
CHA_7-Dépaletiseur-1
CHA_7-Bati-1
CHA_7-Verin D40-3
CHA_7-Corp_verin-1
CHA_7-CharniÃ¨re_AR_Fix-1
CHA_7-CharniÃ¨re_AR_mobile-
2CHA_7-Verin D40-4
pallet1

Name
Name: 2CHA_7-Verin D40-4
Drawing
Position and size
Material
Options
Physic
Use physic: False
Body type: Any (convex)
Billboard
Liquid effect
Particles
Animation

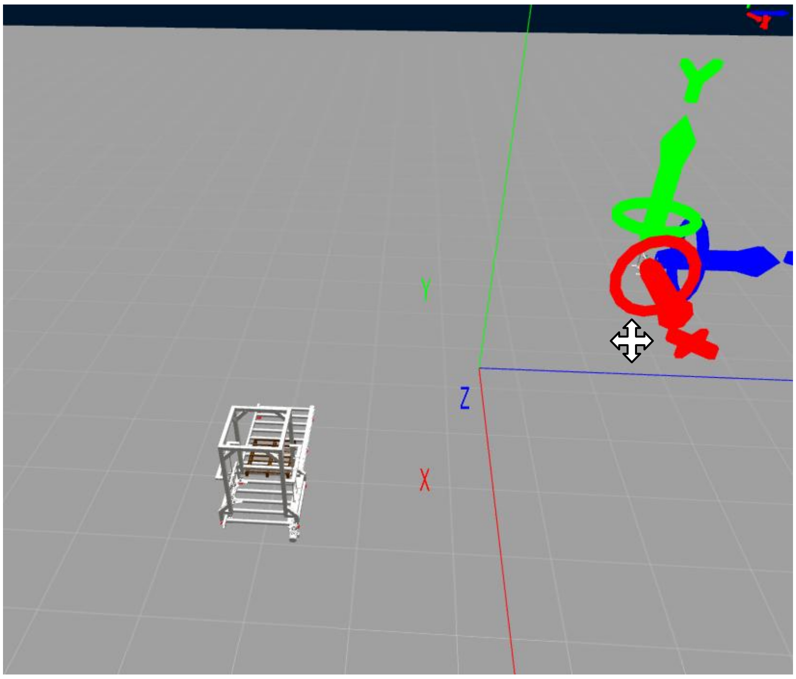
4.7.4- Rotate 180 degrees the duplicated subset


Virtual Universe Pro- stop - unstacker#10.vu *

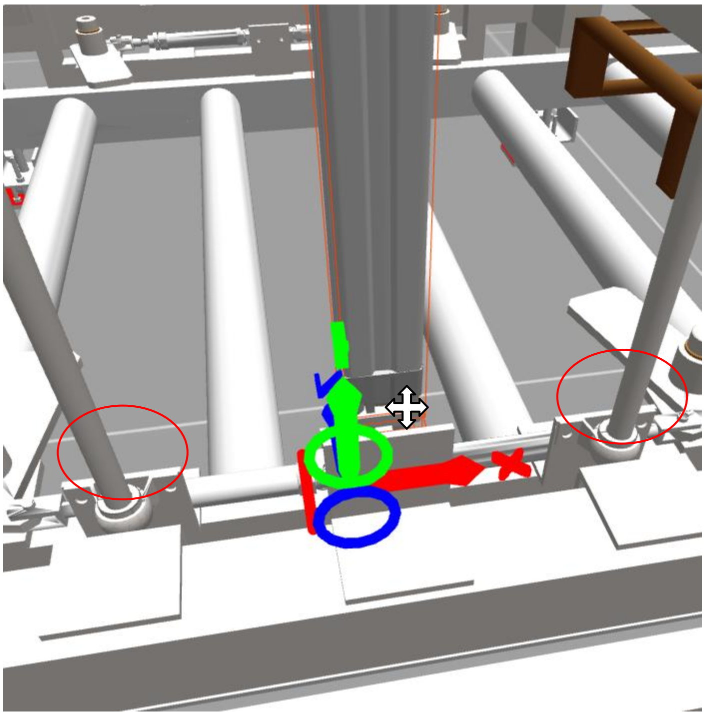
Universe
World
Light
Camera
Floor
sw1f
CHA_Convoyeur Hourdis-1
CHA_7-Dépaletiseur-1
CHA_7-Bati-1
CHA_7-Verin D40-3
CHA_7-Corp_verin-1
CHA_7-CharniÃ¨re_AR_Fix-1
CHA_7-CharniÃ¨re_AR_mobile-
2CHA_7-Verin D40-4
pallet1

Name
Name: 2CHA_7-Verin D40-4
Drawing
Position and size
Coordinates: 0mm; 0mm; 0mm
Rotations: 0; 0; 0
X: 0
Y: 180
Z: 0
Rotation axis position: 0mm; 0mm; 0mm
Scale: 1; 1; 1
Size: 0.1mm; 0.1mm; 0.1mm
Material
Options
Physic
Use physic: False
Body type: Any (convex)
Billboard
Liquid effect
Particles
Animation

4.7.5- Set the position of the duplicated subset



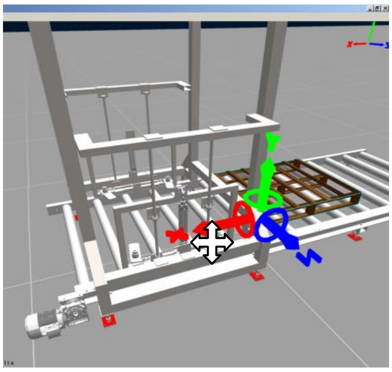
Move the red and blue arrows to return the subset near the unstacker.

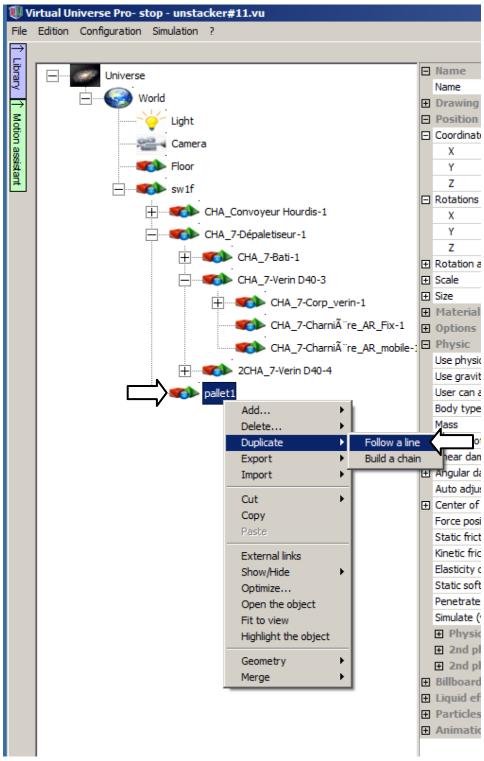


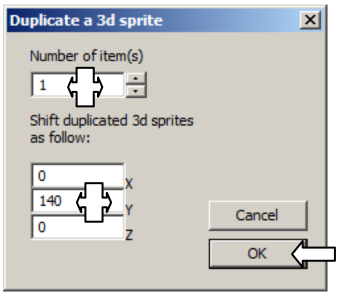
Refine placement, the visual cue of vertical rods can help to do this.

#11

4.8- Setting up the pallet and duplication







Duplicate a 3d sprite

Number of item(s): 1

Shift duplicated 3d sprites as follow:

X: 0
Y: 140
Z: 0

#12

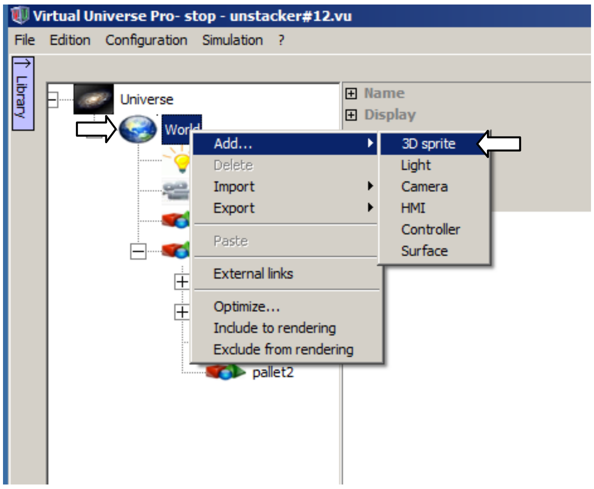
We go from here develop three variants of the project, the first (A) with HMI elements to test the machine, the second (B) using a virtual controller to control the machine, and the third (C) using a M340 Schneider Electric to achieve control.

A4.9- Control via HMI elements

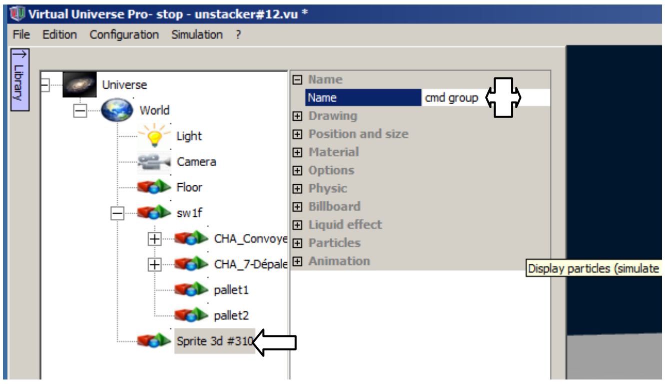
A4.9.1- Creation of variables grouped orders

The goal is to create a single variable to exit all fingers, one for return, one for the vertical cylinders out and one for return.

A4.9.1.1- Add a group

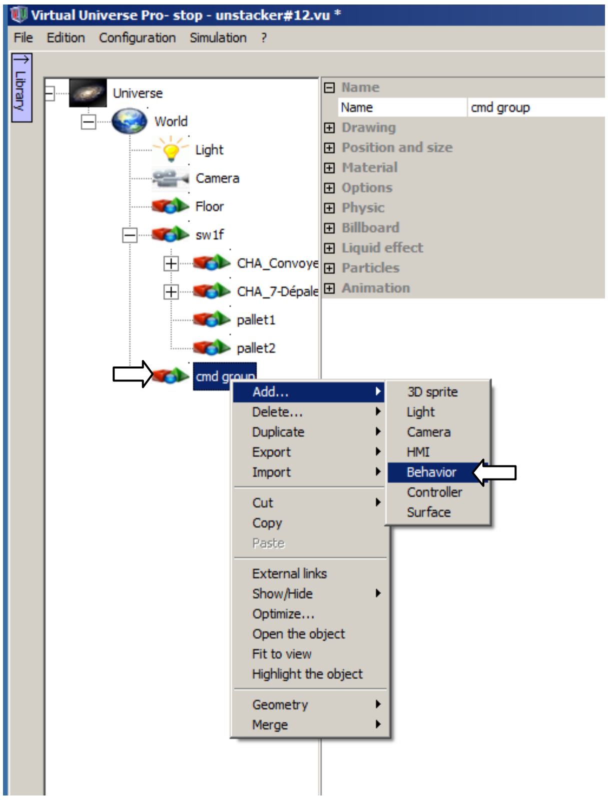


Objects "3d sprites" can also serve as structural elements



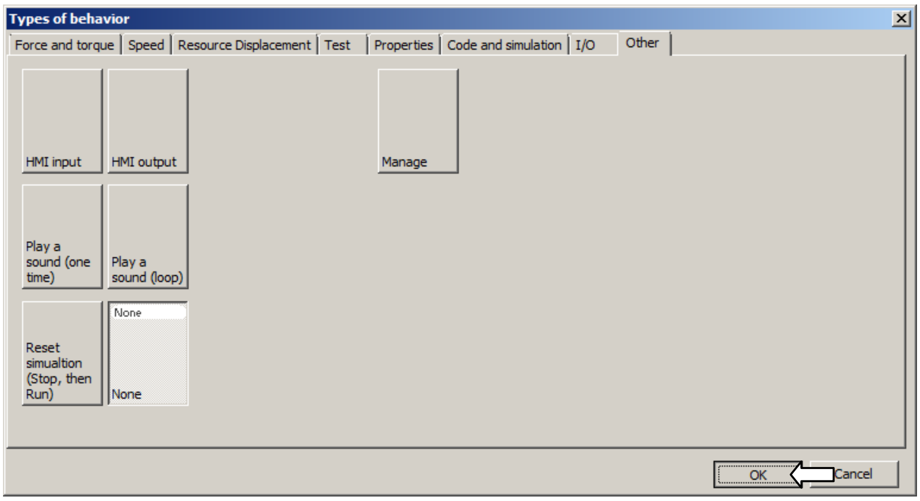
Name: cmd group

A4.9.1.2- Add behaviors

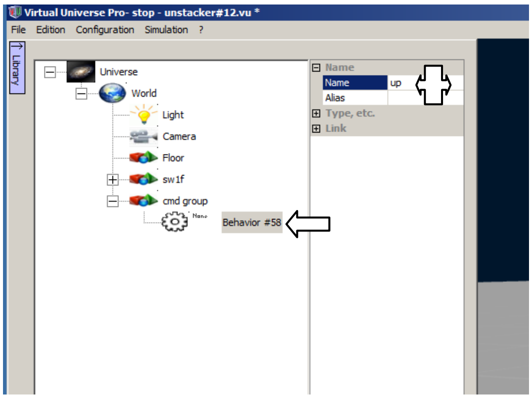


Virtual Universe Pro- stop - unstacker#12.vu *

Name: cmd group



Types of behavior

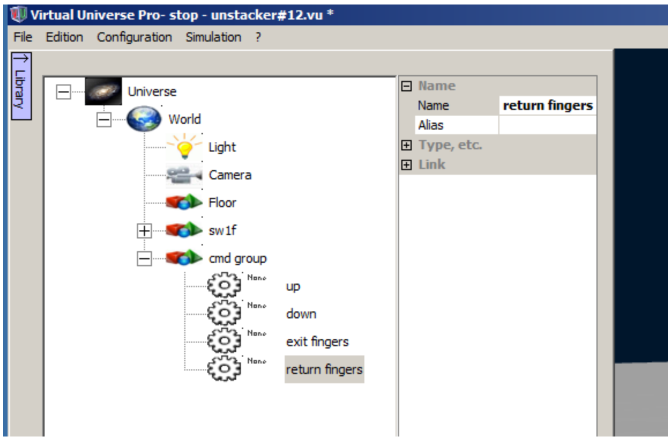


Virtual Universe Pro- stop - unstacker#12.vu *

Name: up

Alias:

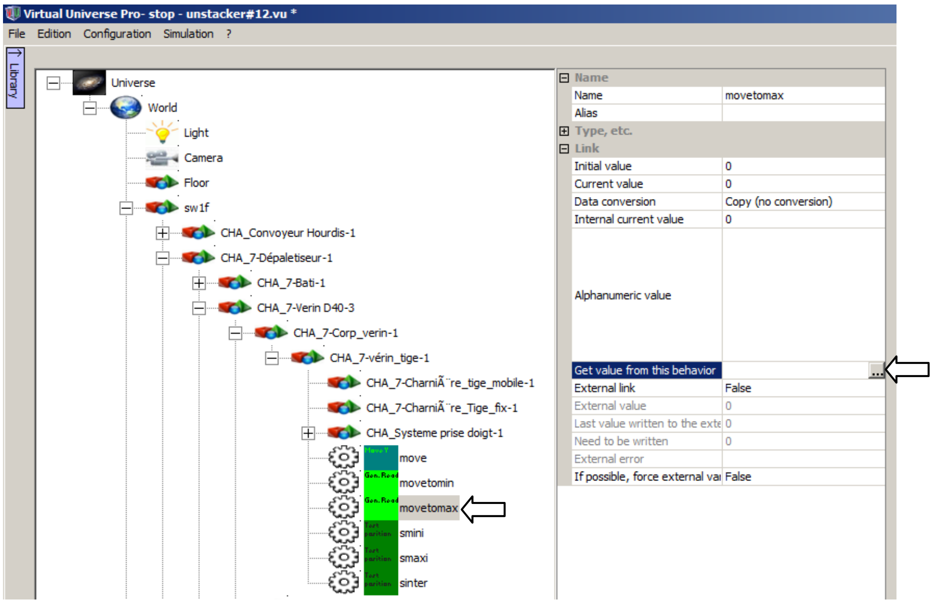
We create the other behaviors in the same way.



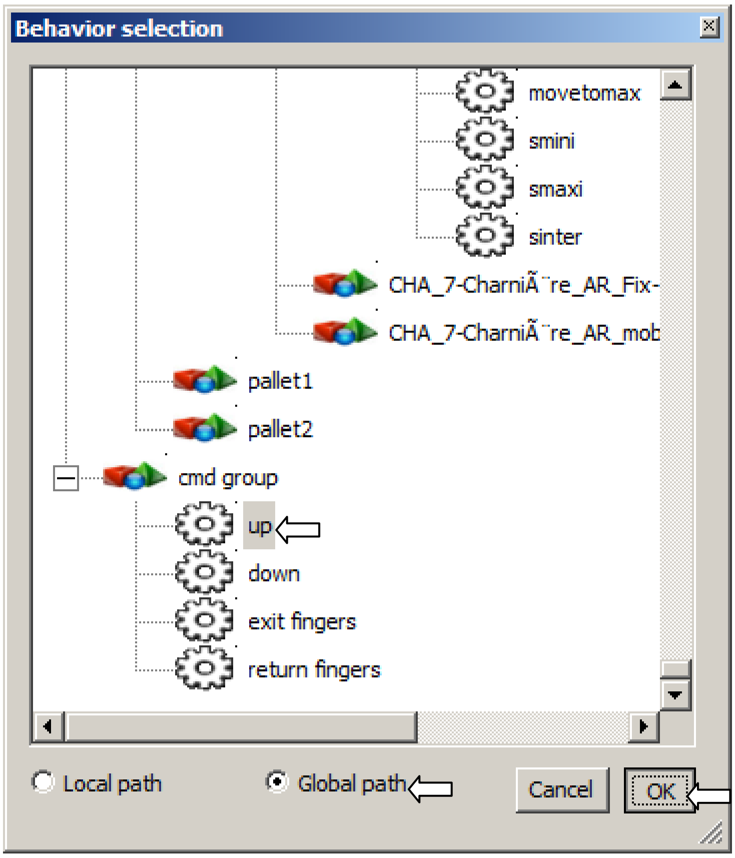
Name	return fingers
Alias	

A4.9.1.2- Create the links

A4.9.1.3.1- Vertical cylinders



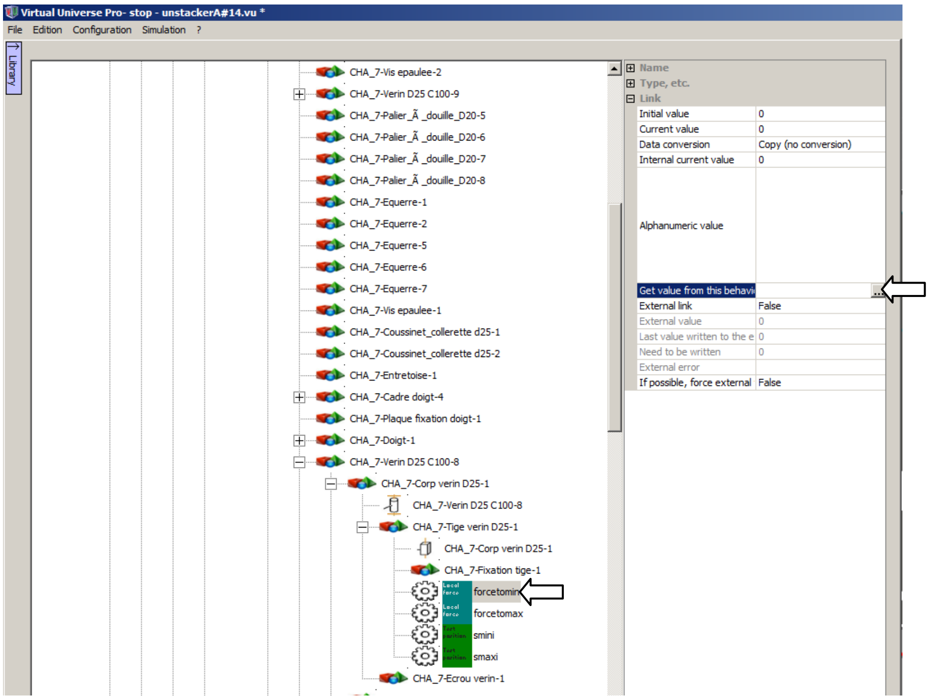
Name	movetomax
Alias	
Initial value	0
Current value	0
Data conversion	Copy (no conversion)
Internal current value	0
Alphanumeric value	
Get value from this behavior	
External link	False
External value	0
Last value written to the exte	0
Need to be written	0
External error	
If possible, force external vai	False



We do the same for down move and up and down moves of the other vertical cylinder.

A#13

A4.9.1.3.2- Cylinders associated to the fingers

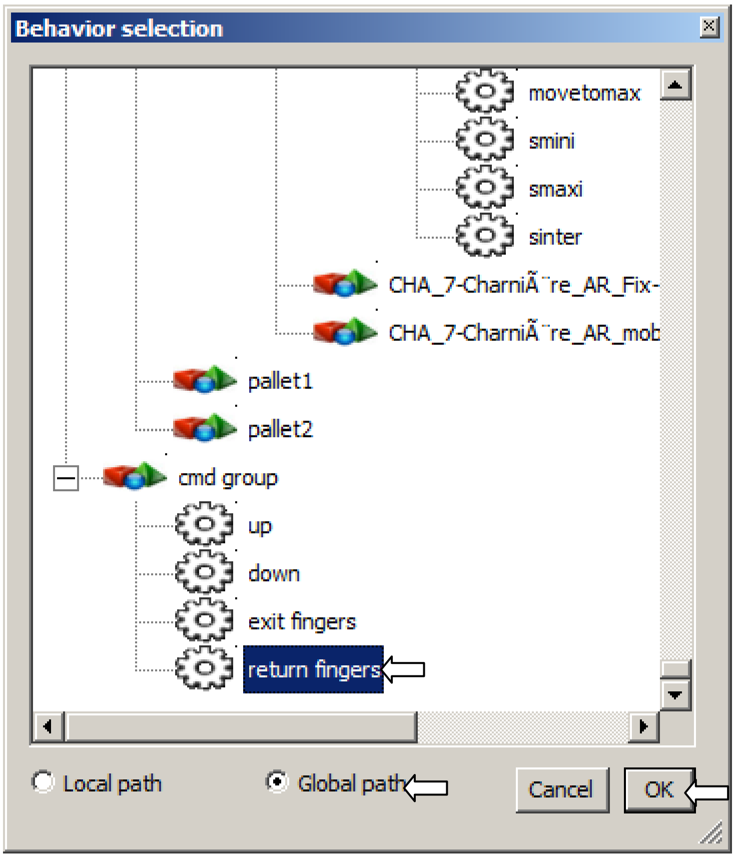


Virtual Universe Pro- stop - unstackerA#14.vu *

```
CHA_7-Vis epaulee-2
CHA_7-Verin D25 C100-9
CHA_7-Palier_Ã _douille_D20-5
CHA_7-Palier_Ã _douille_D20-6
CHA_7-Palier_Ã _douille_D20-7
CHA_7-Palier_Ã _douille_D20-8
CHA_7-Equerre-1
CHA_7-Equerre-2
CHA_7-Equerre-5
CHA_7-Equerre-6
CHA_7-Equerre-7
CHA_7-Vis epaulee-1
CHA_7-Coussinet_collerette d25-1
CHA_7-Coussinet_collerette d25-2
CHA_7-Entretoise-1
CHA_7-Cadre doigt-4
CHA_7-Plaque fixation doigt-1
CHA_7-Doigt-1
CHA_7-Verin D25 C100-8
    CHA_7-Corp verin D25-1
        CHA_7-Verin D25 C100-8
        CHA_7-Tige verin D25-1
            CHA_7-Corp verin D25-1
            CHA_7-Fixation tige-1
            forcetomin
            forcetomax
            smini
            smaxi
        CHA_7-Ecrou verin-1
```

Name
Type, etc.
Link

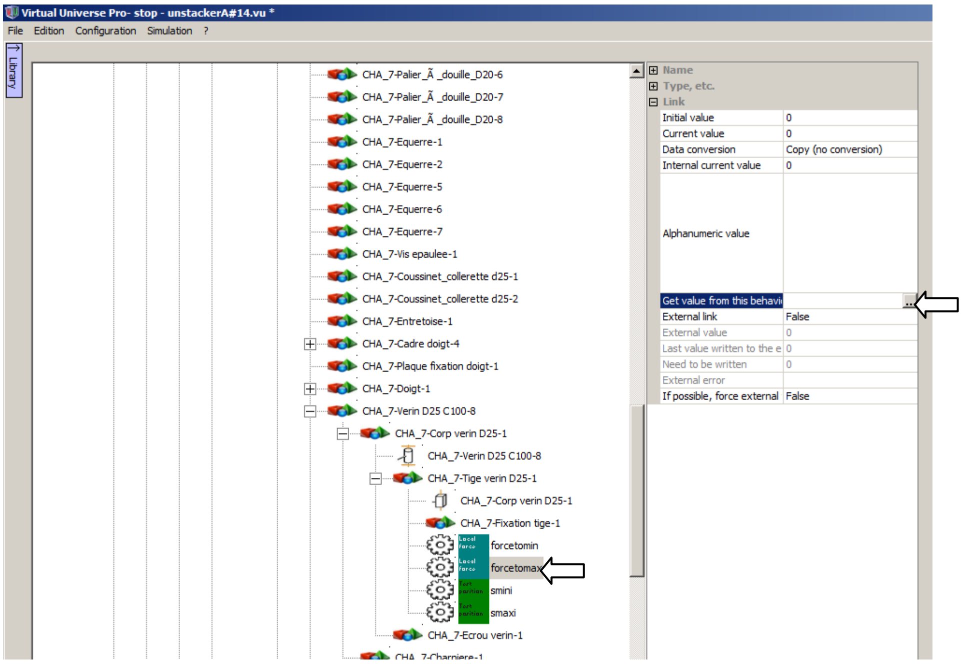
Initial value	0
Current value	0
Data conversion	Copy (no conversion)
Internal current value	0
Alphanumeric value	
Get value from this behavi	...
External link	False
External value	0
Last value written to the e	0
Need to be written	0
External error	
If possible, force external	False



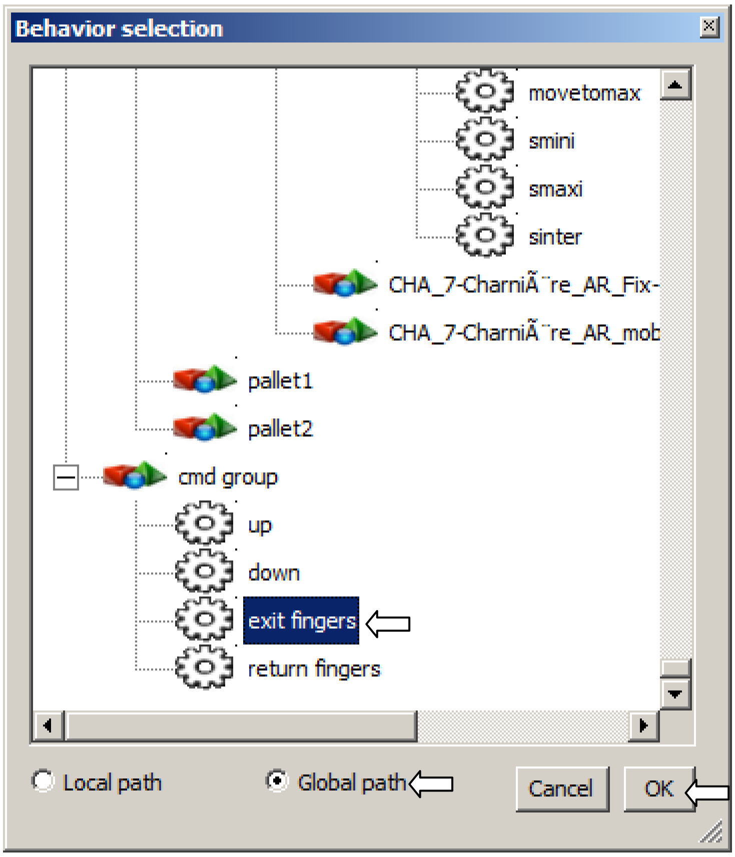
Behavior selection

```
            movetomax
            smini
            smaxi
            sinter
        CHA_7-CharniÃ¨re_AR_Fix-
        CHA_7-CharniÃ¨re_AR_mob
    pallet1
    pallet2
cmd group
    up
    down
    exit fingers
    return fingers
```

○ Local path ● Global path



Initial value	0
Current value	0
Data conversion	Copy (no conversion)
Internal current value	0
Alphanumeric value	
Get value from this behavi	
External link	False
External value	0
Last value written to the e	0
Need to be written	0
External error	
If possible, force external	False

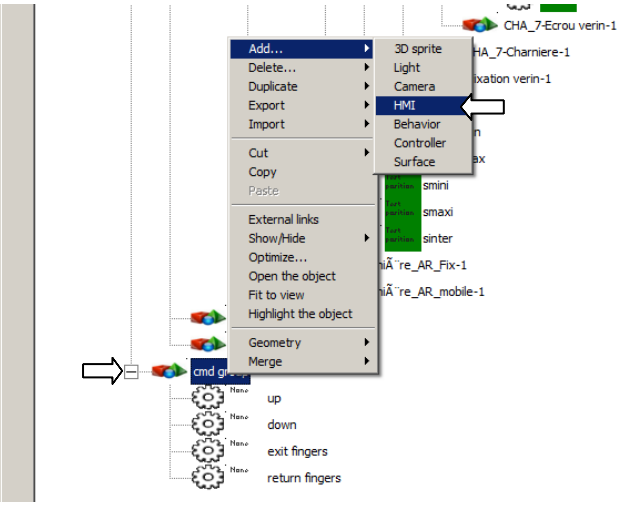


Repeat for the other three fingers. Warning, the link forcemin / forcemax with in / out fingers must be reversed for two of the four fingers (symmetrical cylinders).

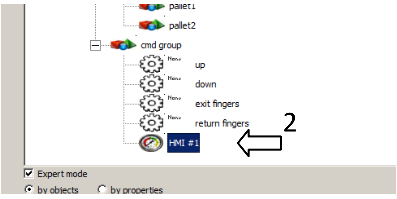
A#14

A4.9.2- Create HMI

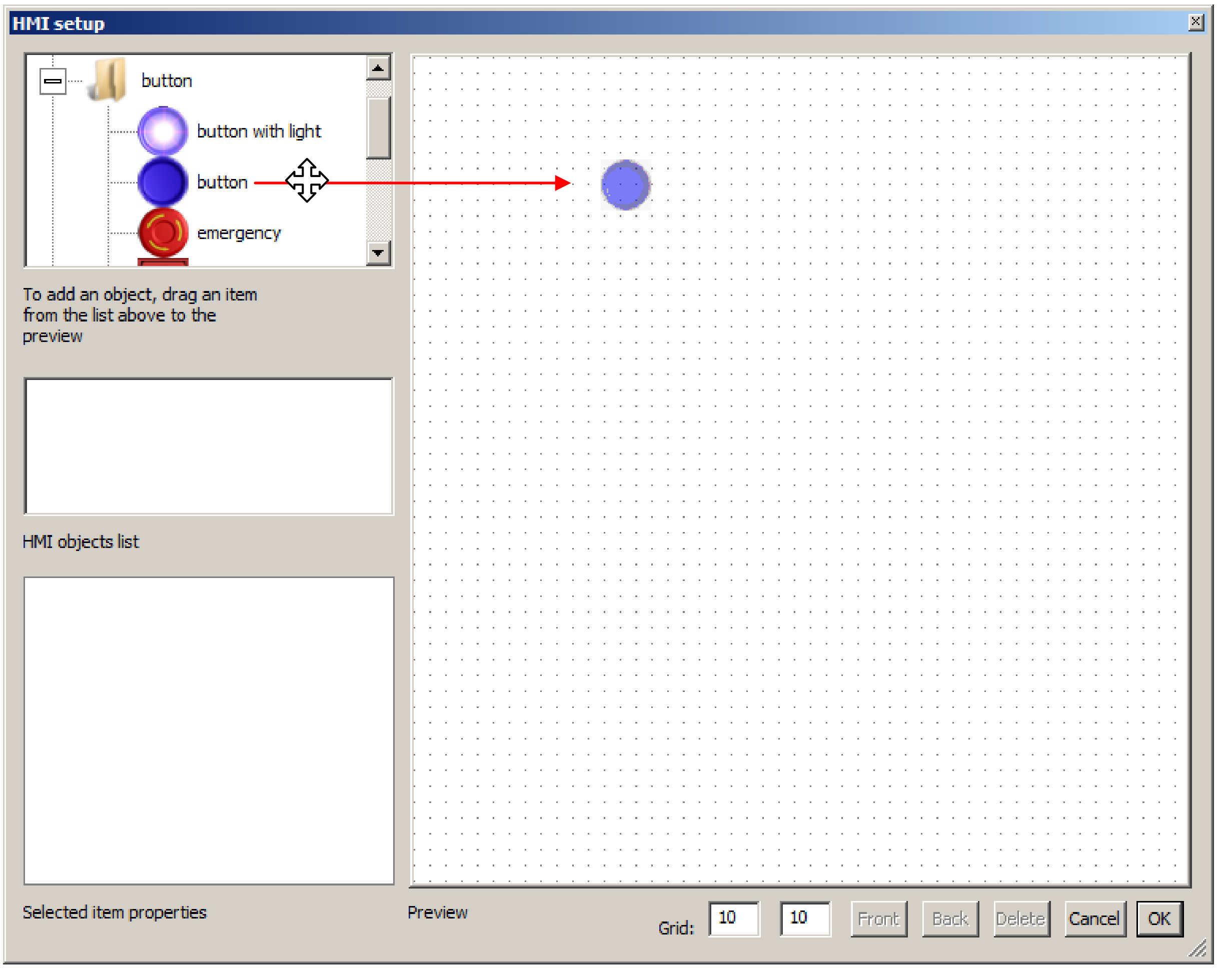
A4.9.2.1- Add



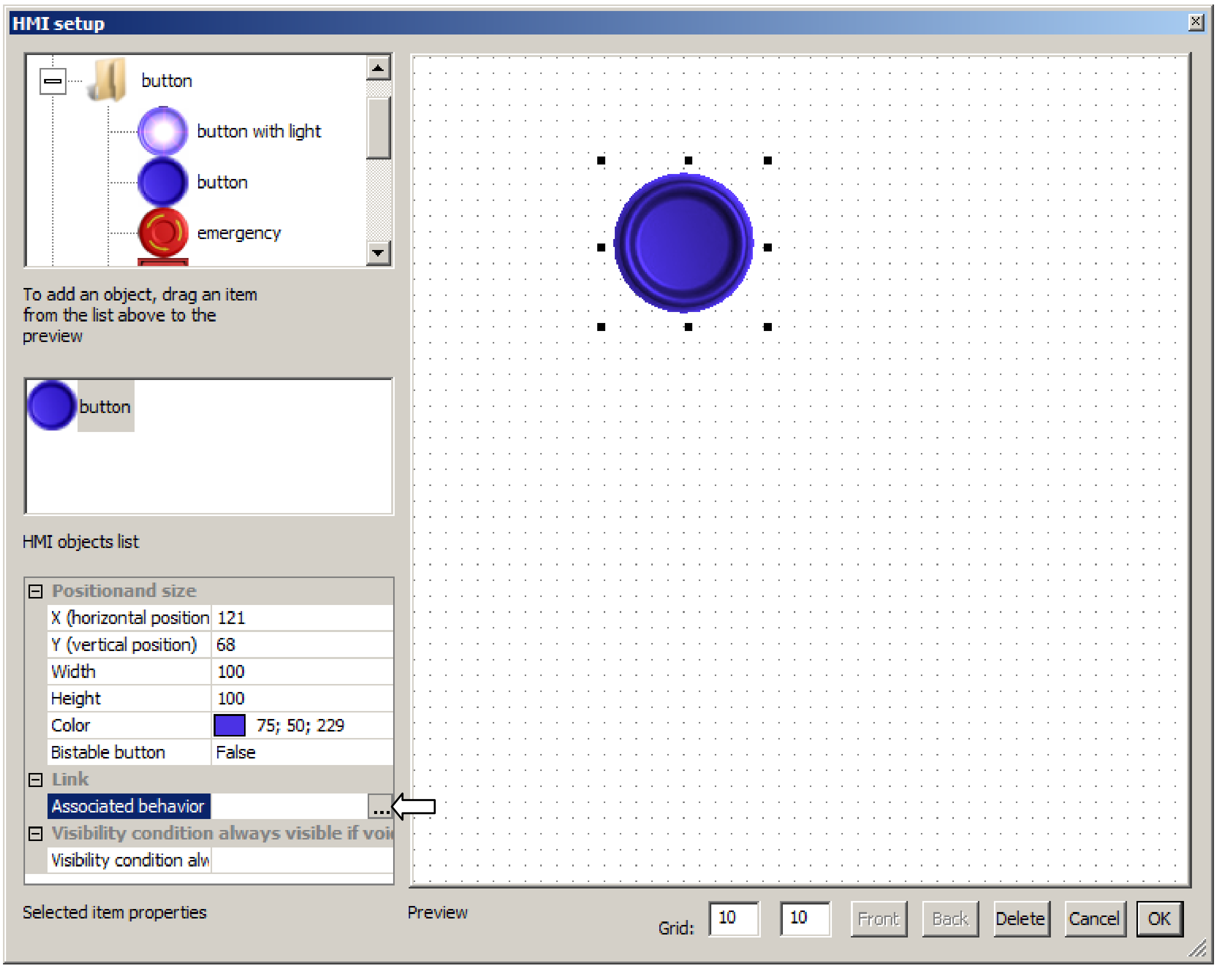
A4.9.2.2- Modification



A4.9.2.3- Add a button

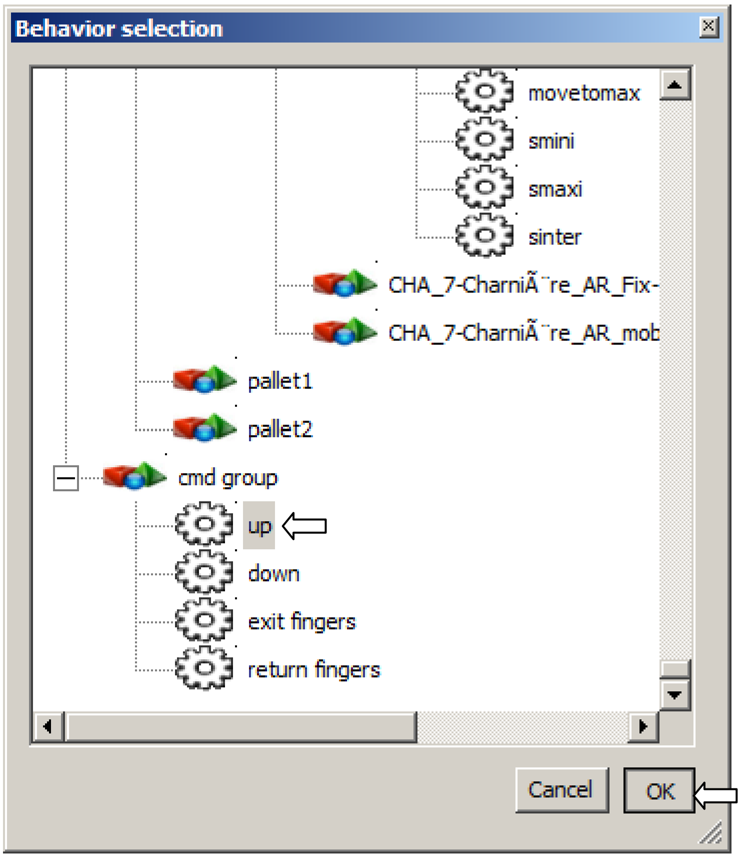


A4.9.2.4- Associate a button to the behavior

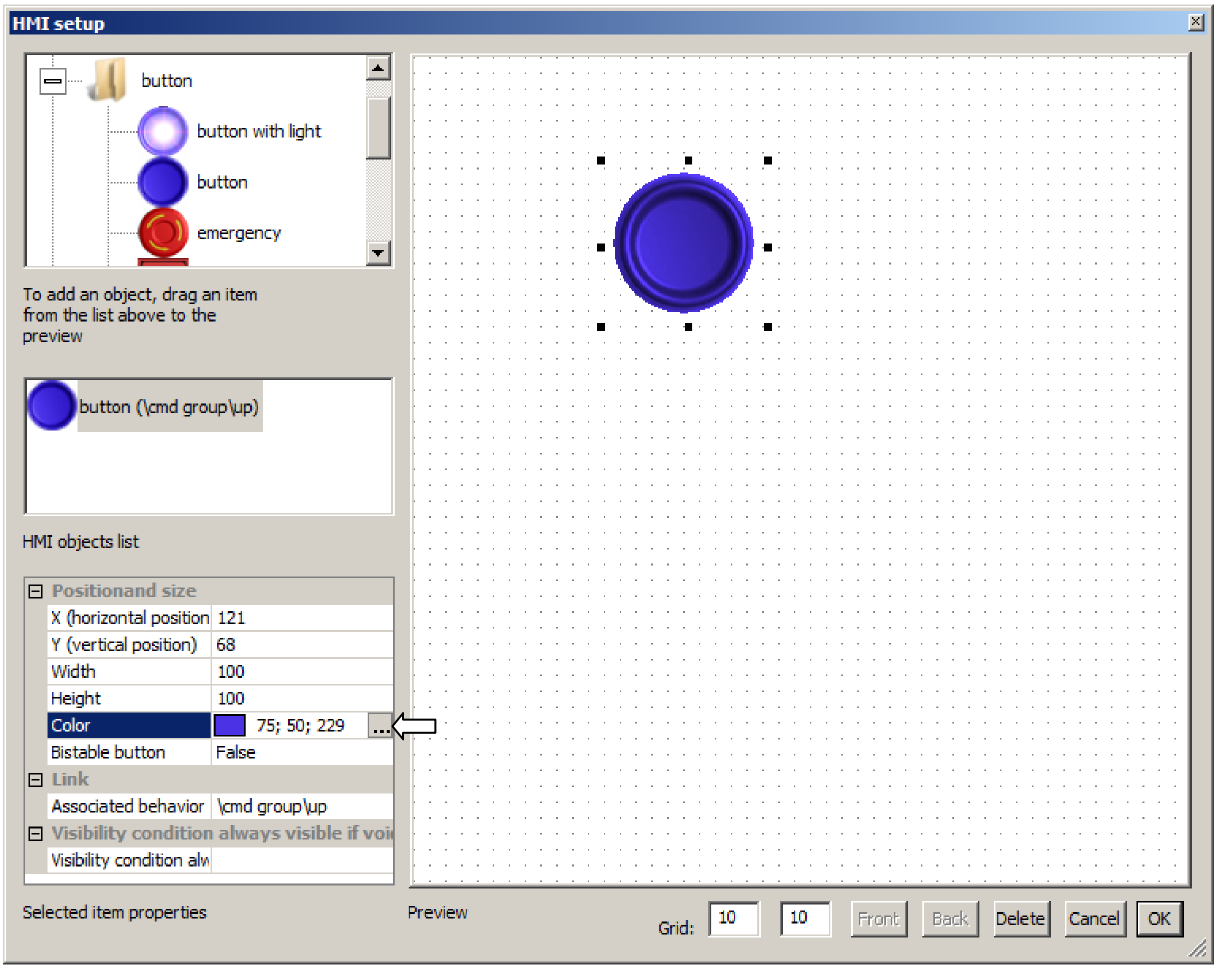


To add an object, drag an item from the list above to the preview

⊟ Positionand size	
X (horizontal position	121
Y (vertical position)	68
Width	100
Height	100
Color	🟦 75; 50; 229
Bistable button	False
⊟ Link	
Associated behavior	...
⊟ Visibility condition always visible if voi	
Visibility condition alw	

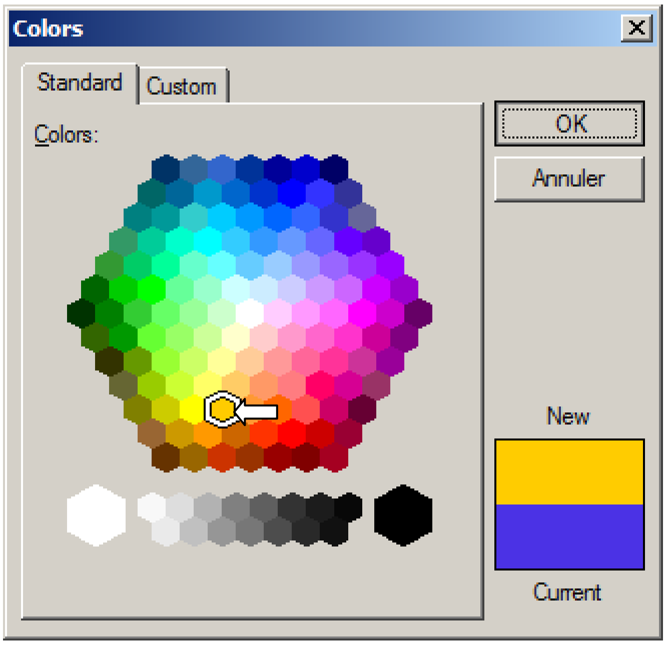

Behavior selection
movetomax
smini
smaxi
sinter
CHA_7-CharniÃ¨re_AR_Fix-
CHA_7-CharniÃ¨re_AR_mob
pallet1
pallet2
cmd group
up
down
exit fingers
return fingers
Cancel
OK

A4.9.2.5- Define the color of the button

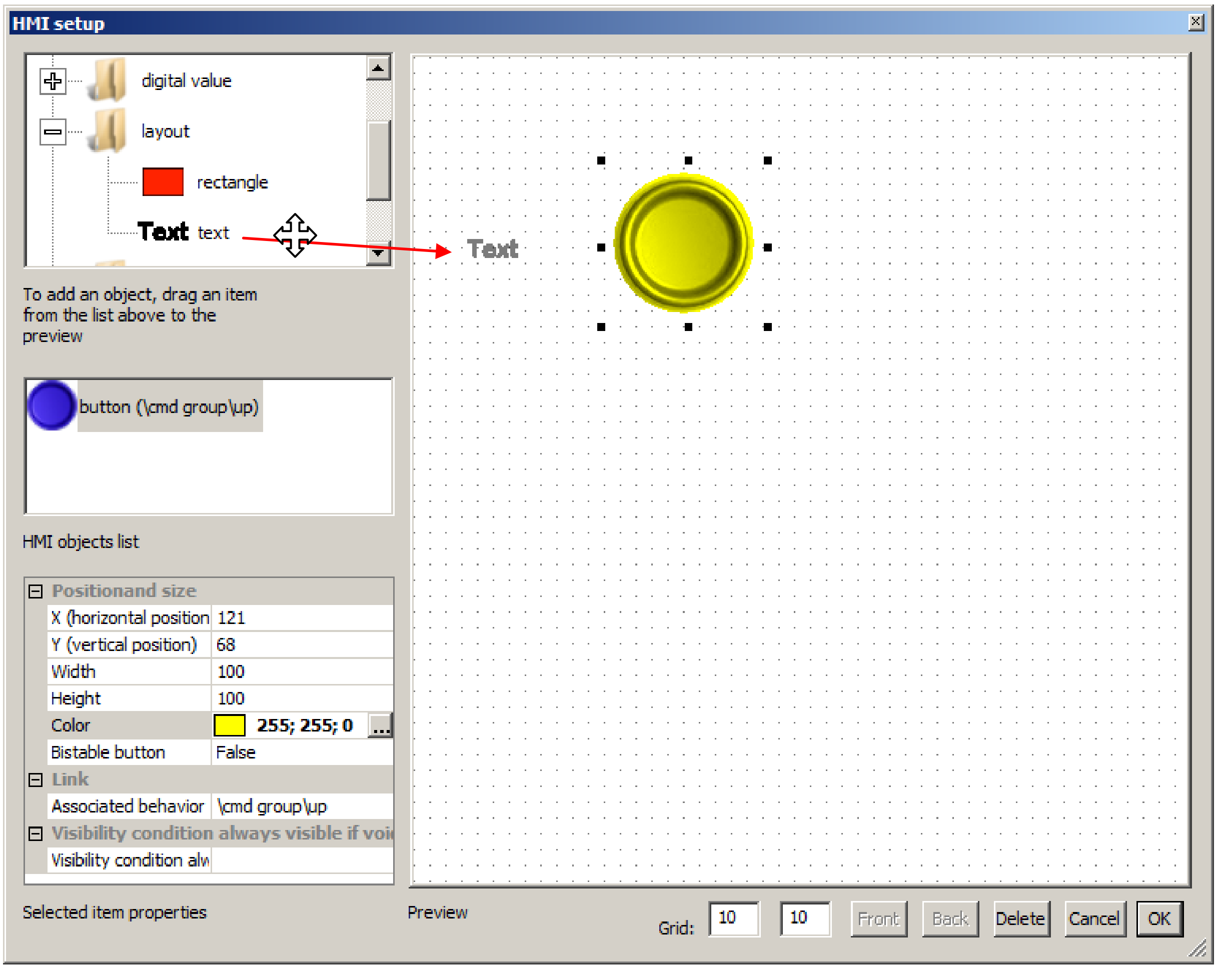


Grid: 10 10

Positionand size	
X (horizontal position	121
Y (vertical position)	68
Width	100
Height	100
Color	75; 50; 229
Bistable button	False
Link	
Associated behavior	\cmd group\up
Visibility condition always visible if voi	
Visibility condition alw	



A4.9.2.6- Add a text



To add an object, drag an item from the list above to the preview

HMI objects list

Positionand size

X (horizontal position	121
Y (vertical position)	68
Width	100
Height	100
Color	🟨 255; 255; 0
Bistable button	False

Link

Associated behavior	\cmd group\up

Visibility condition always visible if voi

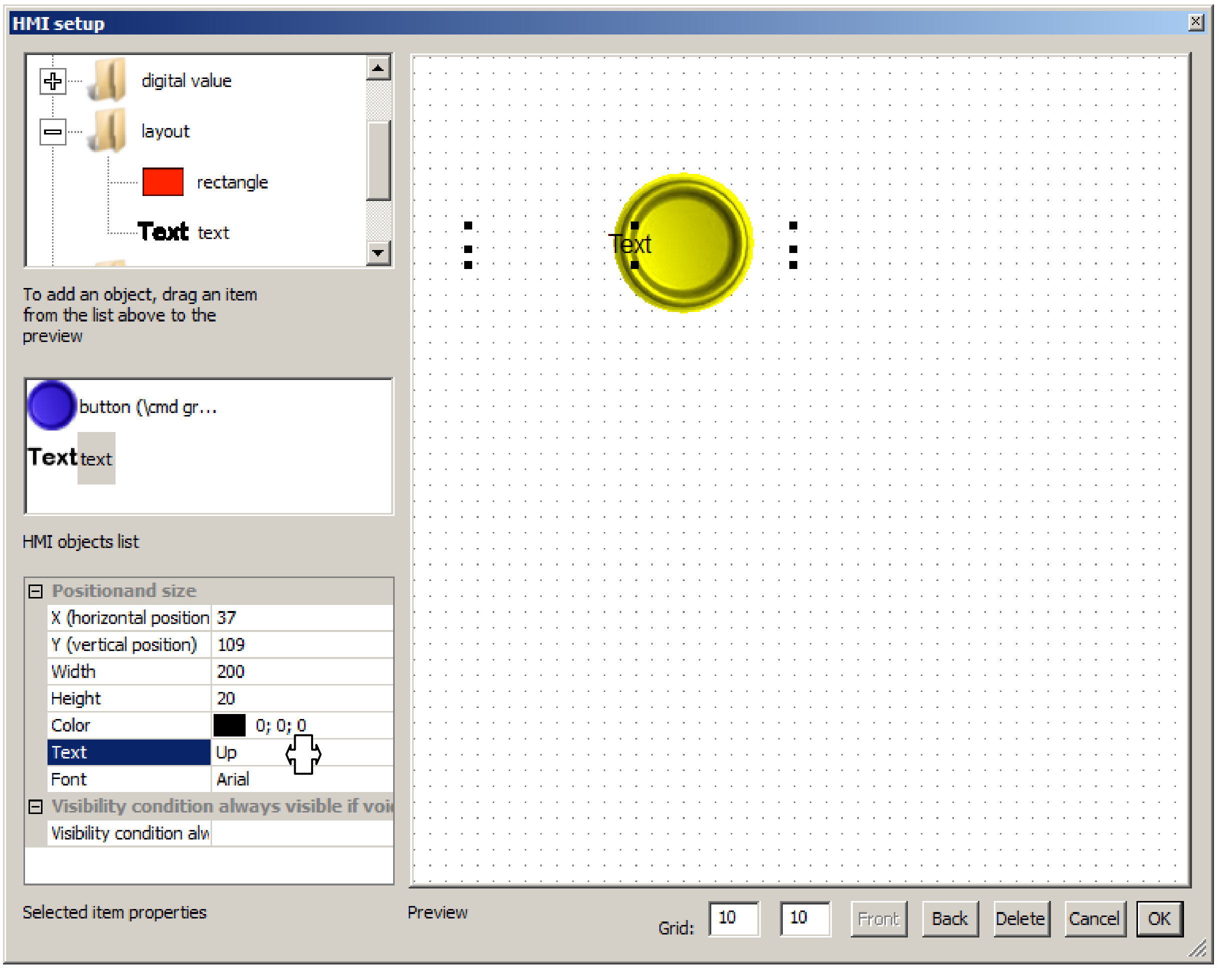
Visibility condition alw	

Selected item properties

Preview

Grid: 10 10

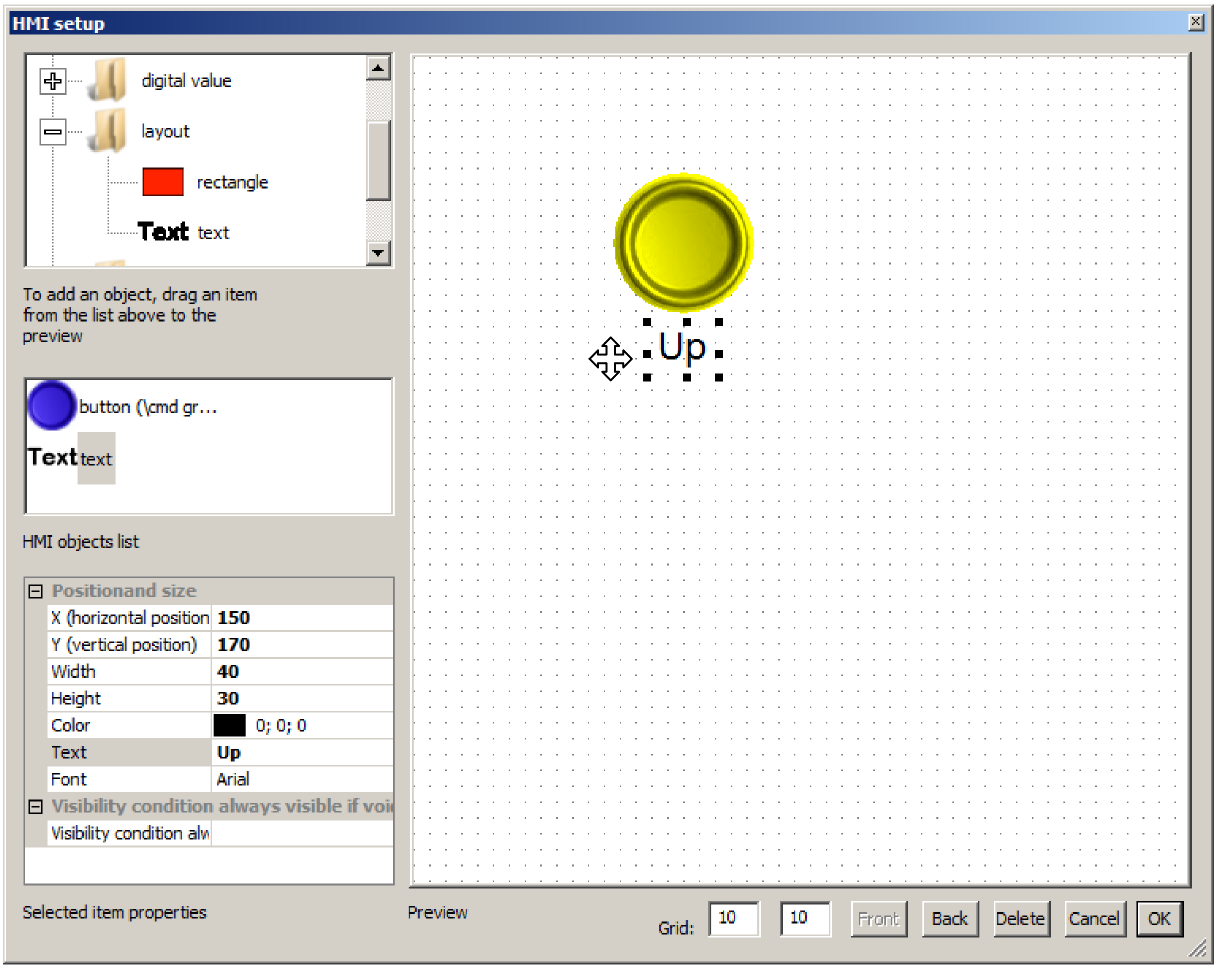
A4.9.2.7- Define the text



To add an object, drag an item from the list above to the preview

Positionand size	
X (horizontal position	37
Y (vertical position)	109
Width	200
Height	20
Color	■ 0; 0; 0
Text	Up
Font	Arial
Visibility condition always visible if voi	
Visibility condition alw	

A4.9.2.8- Move the text

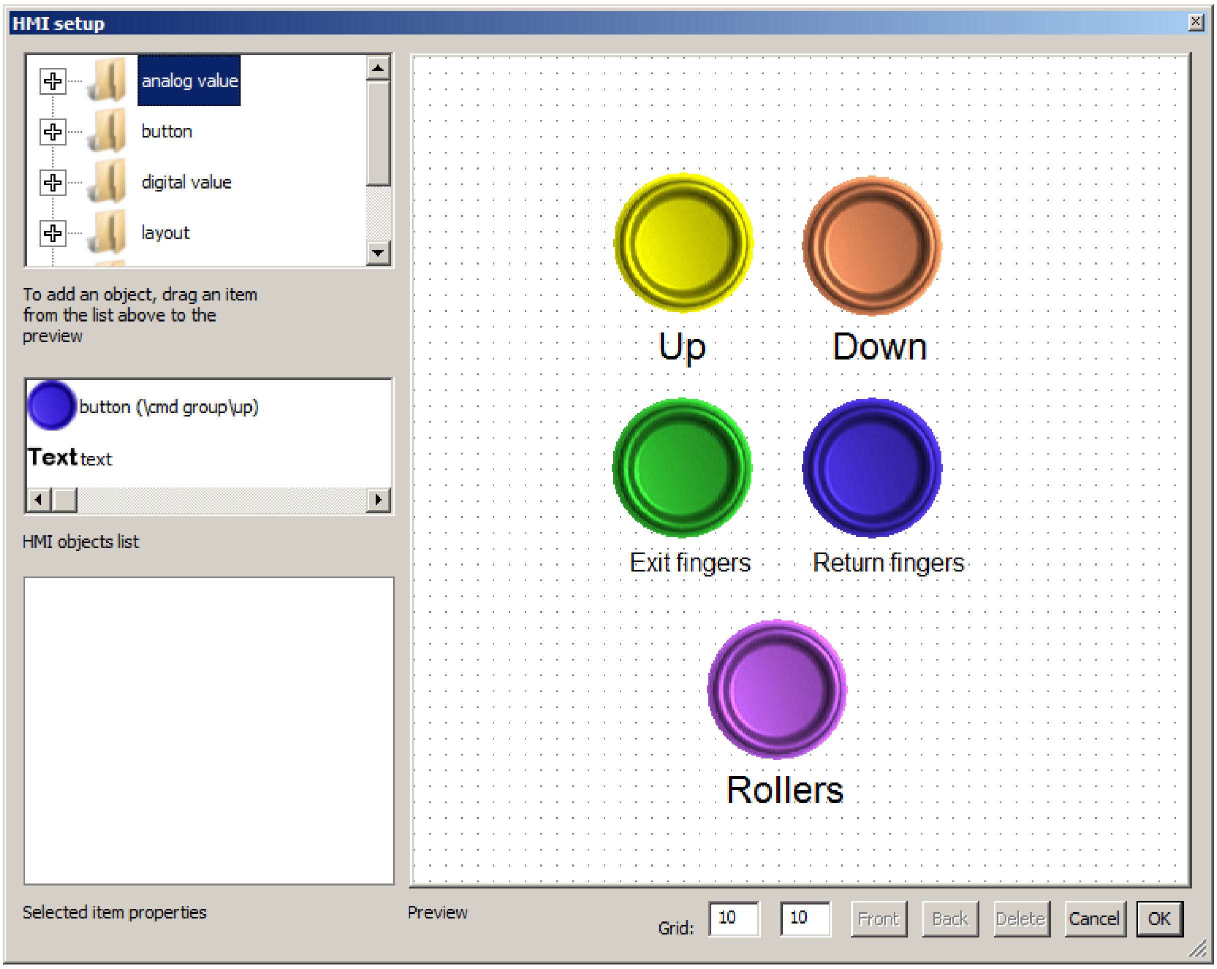


Positionand size	
X (horizontal position	150
Y (vertical position)	170
Width	40
Height	30
Color	■ 0; 0; 0
Text	Up
Font	Arial
Visibility condition always visible if voi	
Visibility condition alw	

Grid: 10 10

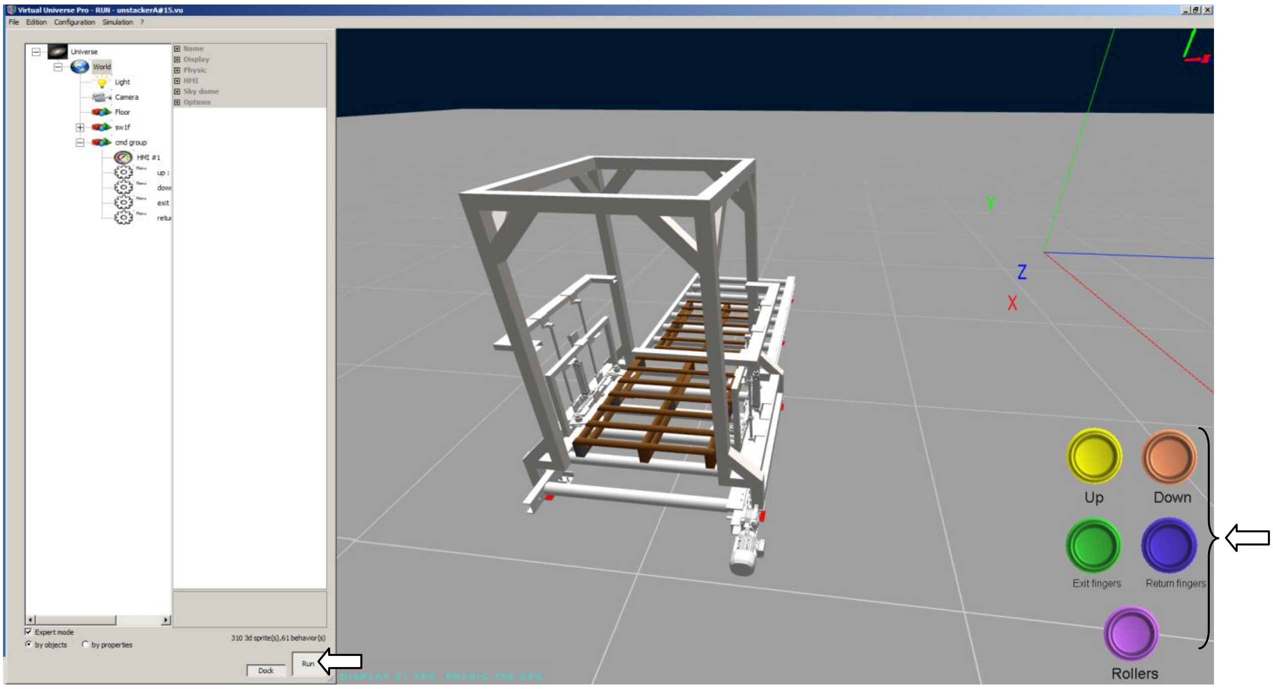
The same operation is performed for commands "down", "finger out", "fingers back" and "forward".

A#15



To add an object, drag an item from the list above to the preview

Grid: 10 10



☑ Expert mode

● by objects ○ by properties

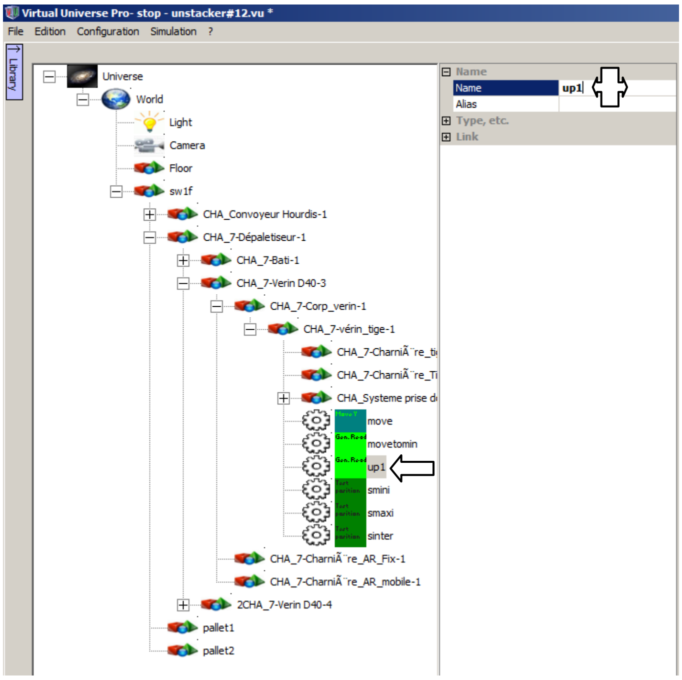
310 3d sprite(s),61 behavior(s)

In RUN mode, the buttons allow you to manually create a cycle of the machine using the buttons on the HMI.

B4.9- Control with a virtual controller

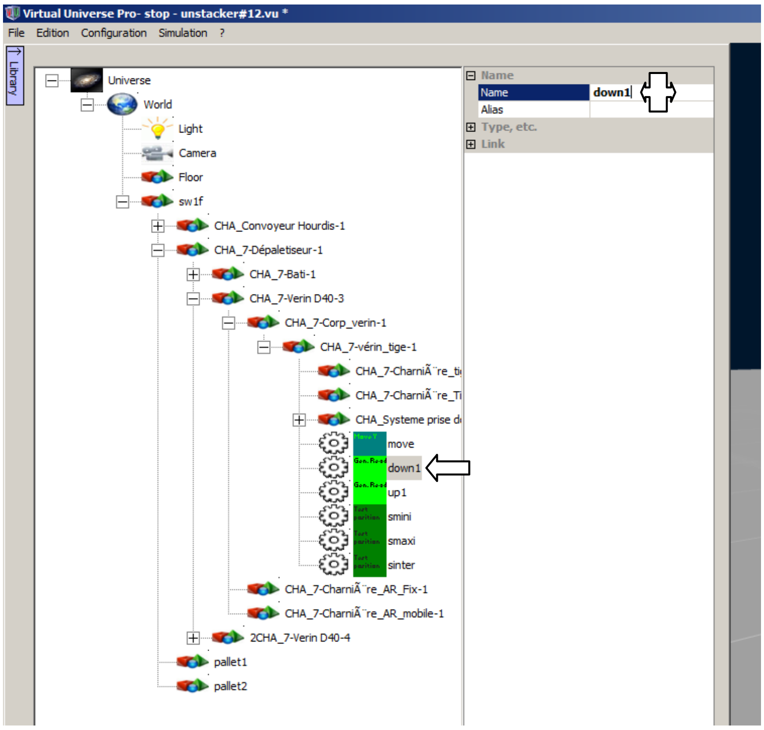
We restart from backup #12

B.4.9.1- Associating "speaking" names for sensors and actuators



Name

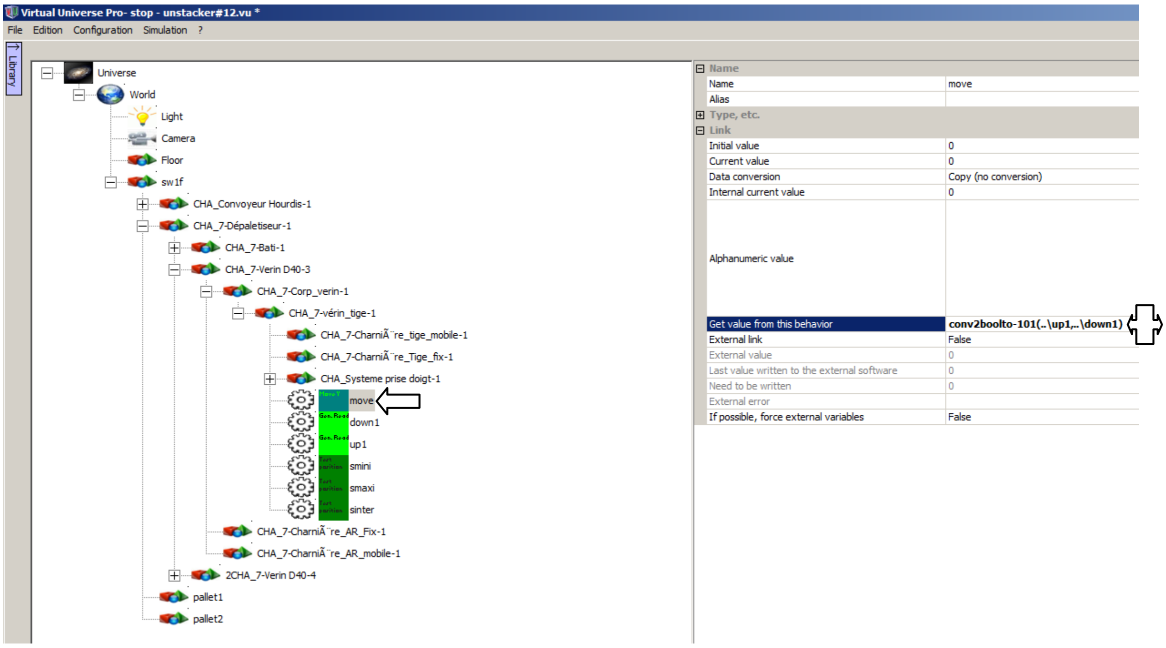
Name	up1
Alias	



Name

Name	down1
Alias	

The move behavior must be updated because it is linked with two behaviors that we have to change:



⊟ Name	
Name	move
Alias	
⊞ Type, etc.	
⊟ Link	
Initial value	0
Current value	0
Data conversion	Copy (no conversion)
Internal current value	0
Alphanumeric value	
Get value from this behavior	**conv2boolto-101(..\up1,..\down1)**
External link	False
External value	0
Last value written to the external software	0
Need to be written	0
External error	
If possible, force external variables	False

The procedure is the same for all actuators:

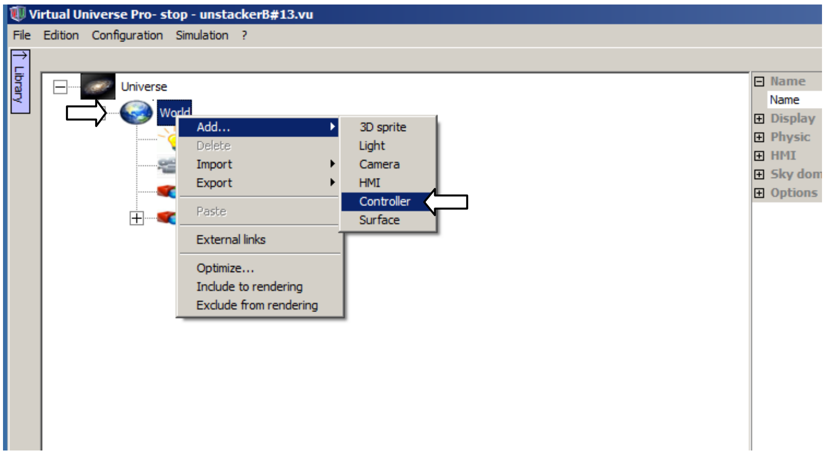
Actuators	Names
Vertical cylinder 1 up	up1
Vertical cylinder 1 down	down1
Vertical cylinder 2 up	up2
Vertical cylinder 2 down	down2
Exit finger 1	exit1
Return finger 1	return1
Exit finger 2	exit2
Return finger 2	return2
Exit finger 3	exit3
Return finger 3	return3
Exit finger 4	exit4
Return finger 4	return4
Rotate rollers	Driver rollers (already set)

and the sensors

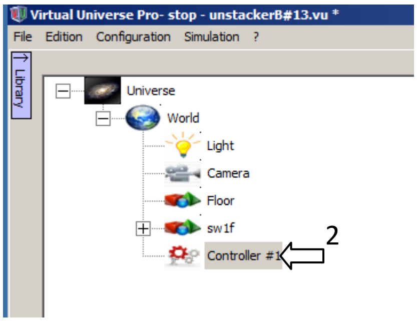
Sensors	Names
Vertical cylinder 1 bottom	bottom1
Vertical cylinder 1 top	top1
Vertical cylinder 1 intermediate	inter1
Vertical cylinder 2 bottom	bottom2
Vertical cylinder 2 top	top2
Vertical cylinder 2 intermediate	inter2
Finger 1 in	in1
Finger 1 out	out1
Finger 2 in	in2
Finger 2 out	out2
Finger 3 in	in3
Finger 3 out	out3
Finger 4 in	in4
Finger 4 out	out4

B#13

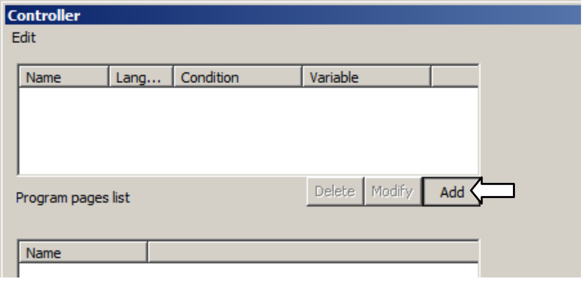
B.4.9.2- Add a virtual controller



B.4.9.3- Modification



B.4.9.4- Add a SFC:DFB program



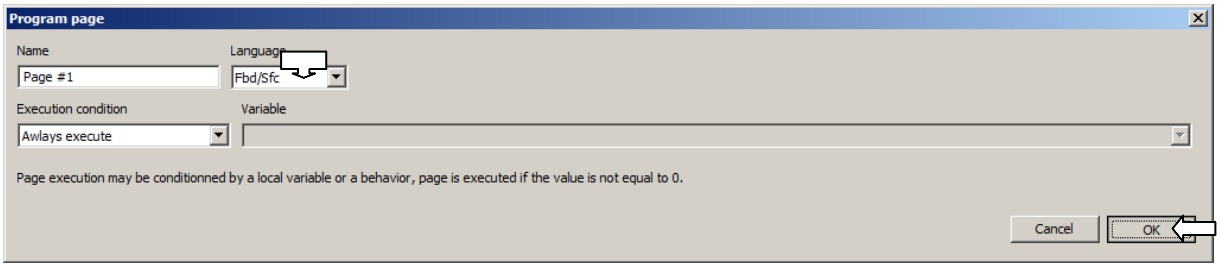
Controller

Edit

Name	Lang...	Condition	Variable

Program pages list

Name	



Program page

Name: Page #1

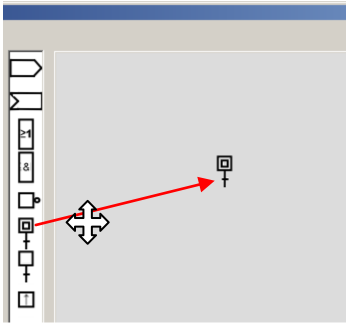
Language: Fbd/Sfc

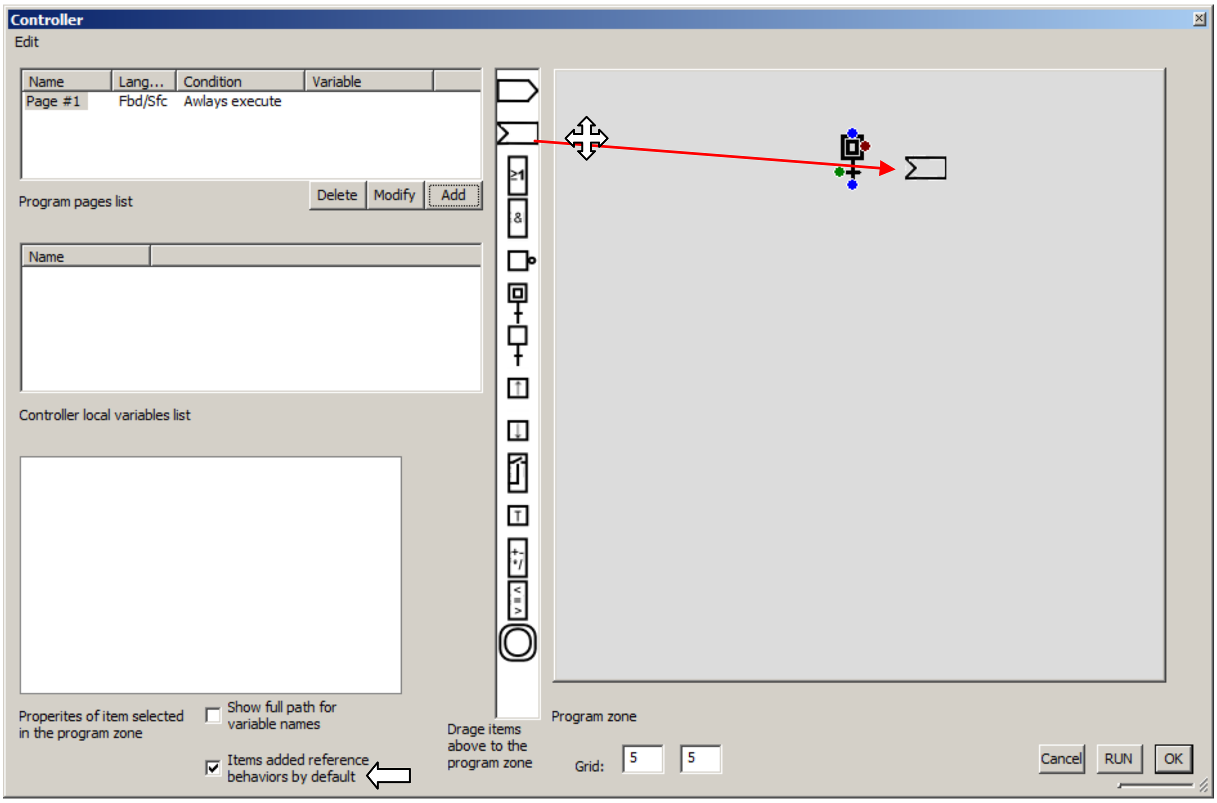
Execution condition: Awlays execute

Variable

Page execution may be conditionned by a local variable or a behavior, page is executed if the value is not equal to 0.

B.4.9.5- Create the program





Controller

Edit

Name	Lang...	Condition	Variable
Page #1	Fbd/Sfc	Awlays execute	

Program pages list

Name

Controller local variables list

Properites of item selected in the program zone

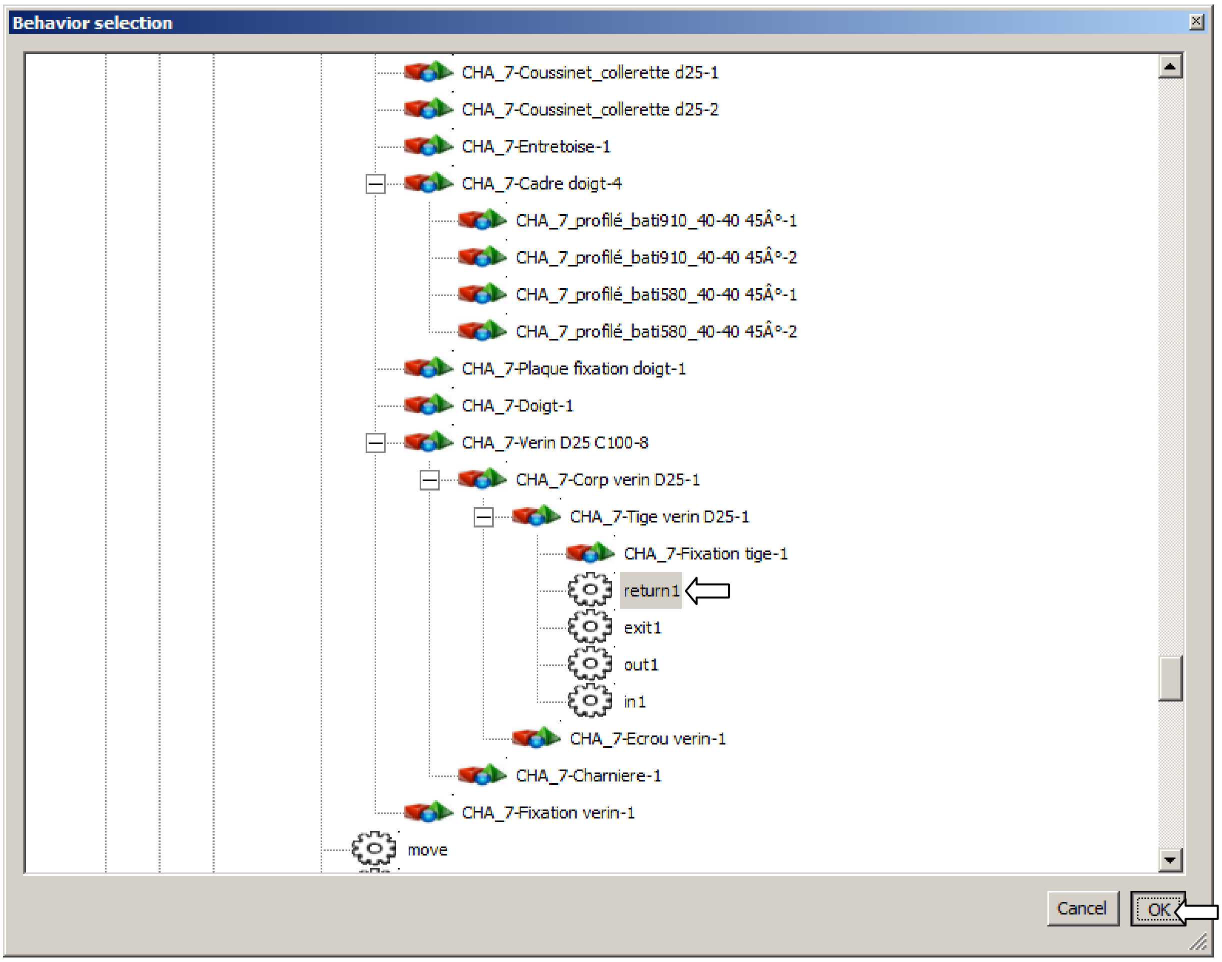
☐ Show full path for variable names

☑ Items added reference behaviors by default

Drage items above to the program zone

Program zone

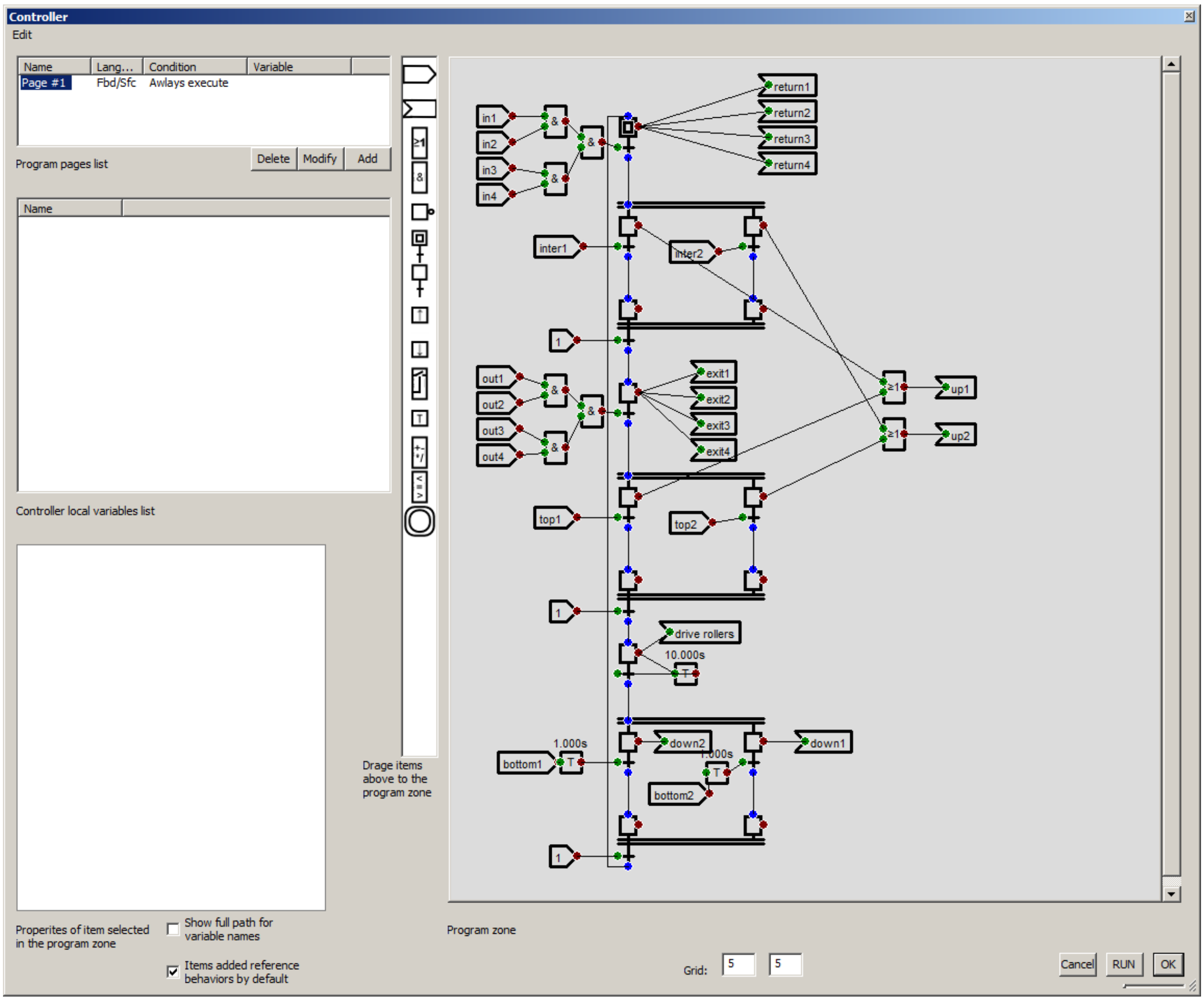
Grid: 5 5



Behavior selection

- CHA_7-Coussinet_collerette d25-1
- CHA_7-Coussinet_collerette d25-2
- CHA_7-Entretoise-1
- CHA_7-Cadre doigt-4
  - CHA_7_profilé_bati910_40-40 45Â°-1
  - CHA_7_profilé_bati910_40-40 45Â°-2
  - CHA_7_profilé_bati580_40-40 45Â°-1
  - CHA_7_profilé_bati580_40-40 45Â°-2
- CHA_7-Plaque fixation doigt-1
- CHA_7-Doigt-1
- CHA_7-Verin D25 C100-8
  - CHA_7-Corp verin D25-1
    - CHA_7-Tige verin D25-1
      - CHA_7-Fixation tige-1
      - return1
      - exit1
      - out1
      - in1
    - CHA_7-Ecrou verin-1
  - CHA_7-Charniere-1
- CHA_7-Fixation verin-1
- move

In the same way, create the whole program.



Name	Lang...	Condition	Variable
Page #1	Fbd/Sfc	Awlays execute	

☐ Show full path for variable names

☑ Items added reference behaviors by default

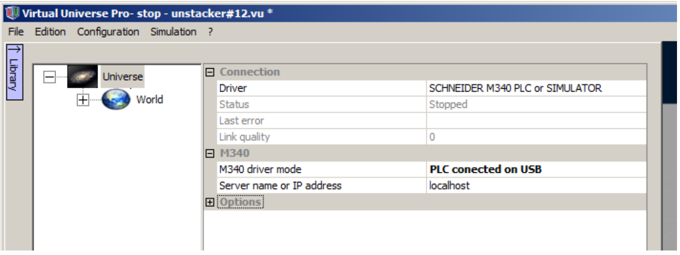
Grid: 5 5

B#14

C4.9- Control with a Schneider Electric M340 PLC

We restart with the #12 backup

C.4.9.1- Select the M340 driver



Connection	
Driver	SCHNEIDER M340 PLC or SIMULATOR
Status	Stopped
Last error	
Link quality	0
M340	
M340 driver mode	**PLC conected on USB**
Server name or IP address	localhost
Options	

In our case, the M340 PLC is connected to the USB port of the PC.

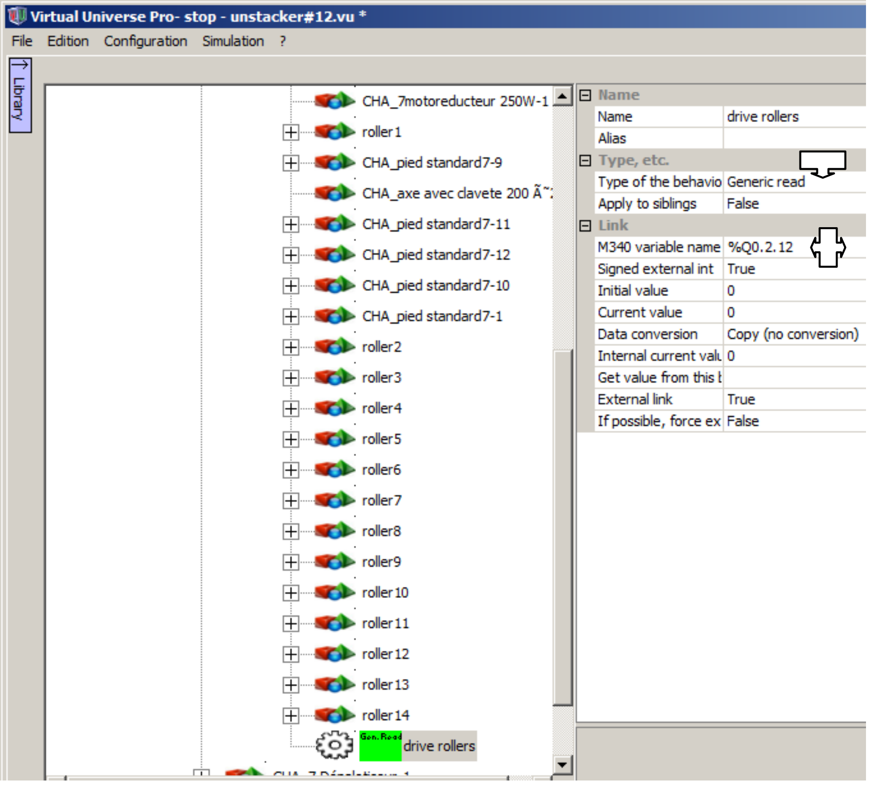
C.4.9.2- Define of the PLC variables

Actuators	PLC variable
Vertical cylinder 1 up	%Q0.2.0
Vertical cylinder 1 down	%Q0.2.1
Vertical cylinder 2 up	%Q0.2.2
Vertical cylinder 2 down	%Q0.2.3
Exit finger 1	%Q0.2.4
Return finger 1	%Q0.2.5
Exit finger 2	%Q0.2.6
Return finger 2	%Q0.2.7
Exit finger 3	%Q0.2.8
Return finger 3	%Q0.2.9
Exit finger 4	%Q0.2.10
Return finger 4	%Q0.2.11
Rotate rollers	%Q0.2.12

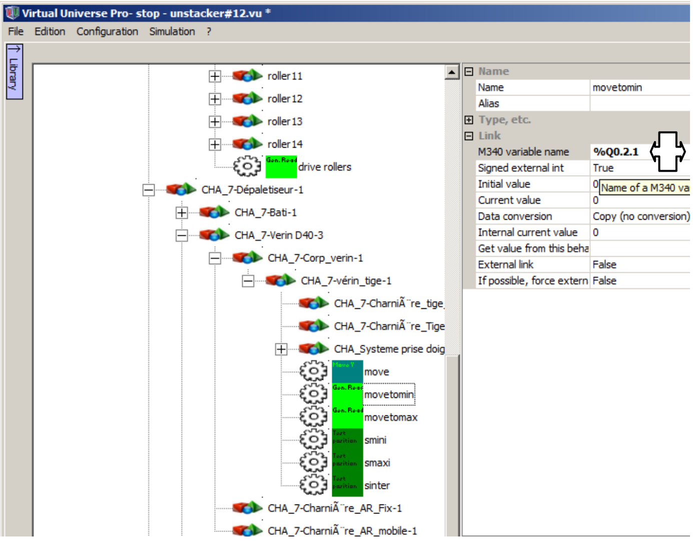
Sensors	PLC variable
Vertical cylinder 1 bottom	%I0.1.0
Vertical cylinder 1 top	%I0.1.1
Vertical cylinder 1 intermediate	%I0.1.2
Vertical cylinder 2 bottom	%I0.1.3
Vertical cylinder 2 top	%I0.1.4
Vertical cylinder 2 intermediate	%I0.1.5
Finger 1 in	%I0.1.6
Finger 1 out	%I0.1.7
Finger 2 in	%I0.1.8
Finger 2 out	%I0.1.9
Finger 3 in	%I0.1.10
Finger 3 out	%I0.1.11
Finger 4 in	%I0.1.12
Finger 4 out	%I0.1.13

C#13

C.4.9.3- Associating PLC variables to behaviors

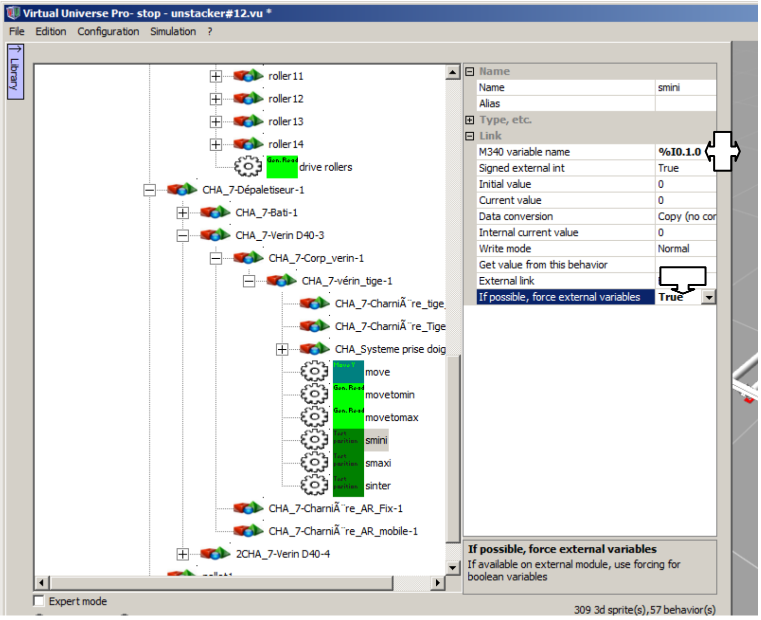


⊟ Name	
Name	drive rollers
Alias	
⊟ Type, etc.	
Type of the behavio	Generic read
Apply to siblings	False
⊟ Link	
M340 variable name	%Q0.2.12
Signed external int	True
Initial value	0
Current value	0
Data conversion	Copy (no conversion)
Internal current valu	0
Get value from this b	
External link	True
If possible, force ex	False



⊟ Name	
Name	movetomin
Alias	
⊞ Type, etc.	
⊟ Link	
M340 variable name	**%Q0.2.1**
Signed external int	True
Initial value	0
Current value	0
Data conversion	Copy (no conversion)
Internal current value	0
Get value from this beha	
External link	False
If possible, force extern	False

Name of a M340 va



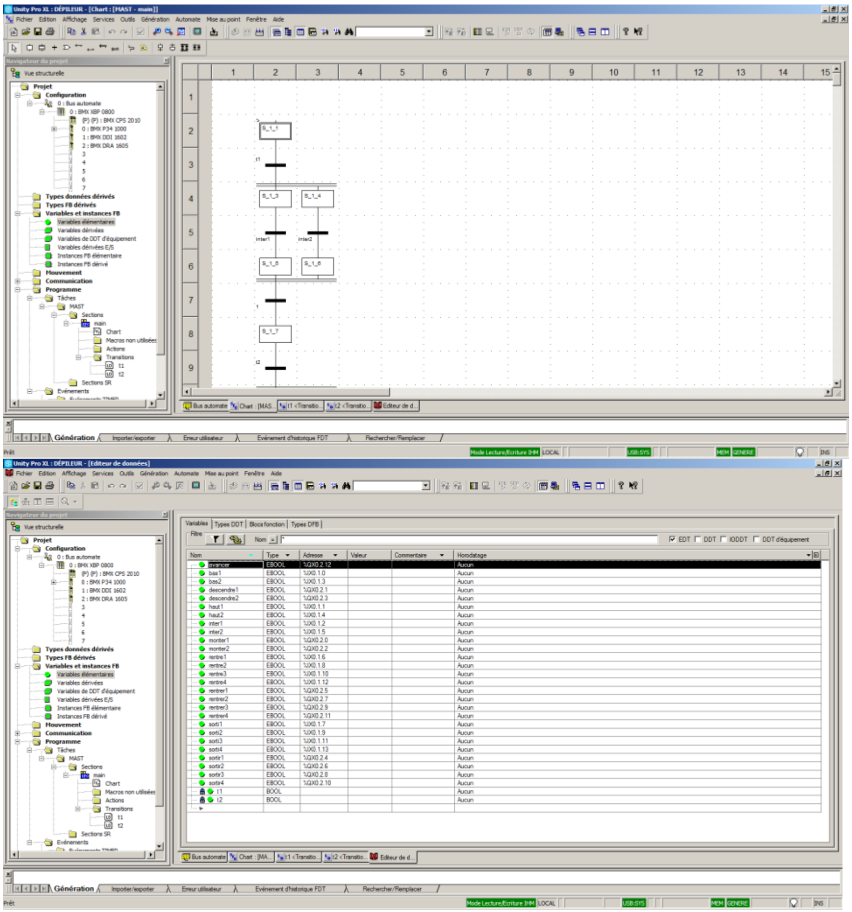
Name	
Name	smini
Alias	
Type, etc.	
Link	
M340 variable name	%I0.1.0
Signed external int	True
Initial value	0
Current value	0
Data conversion	Copy (no cor
Internal current value	0
Write mode	Normal
Get value from this behavior	
External link	
If possible, force external variables	True

If possible, force external variables
If available on external module, use forcing for boolean variables

Do the same for all the behaviors which are associated to sensors and actuators.

#C14

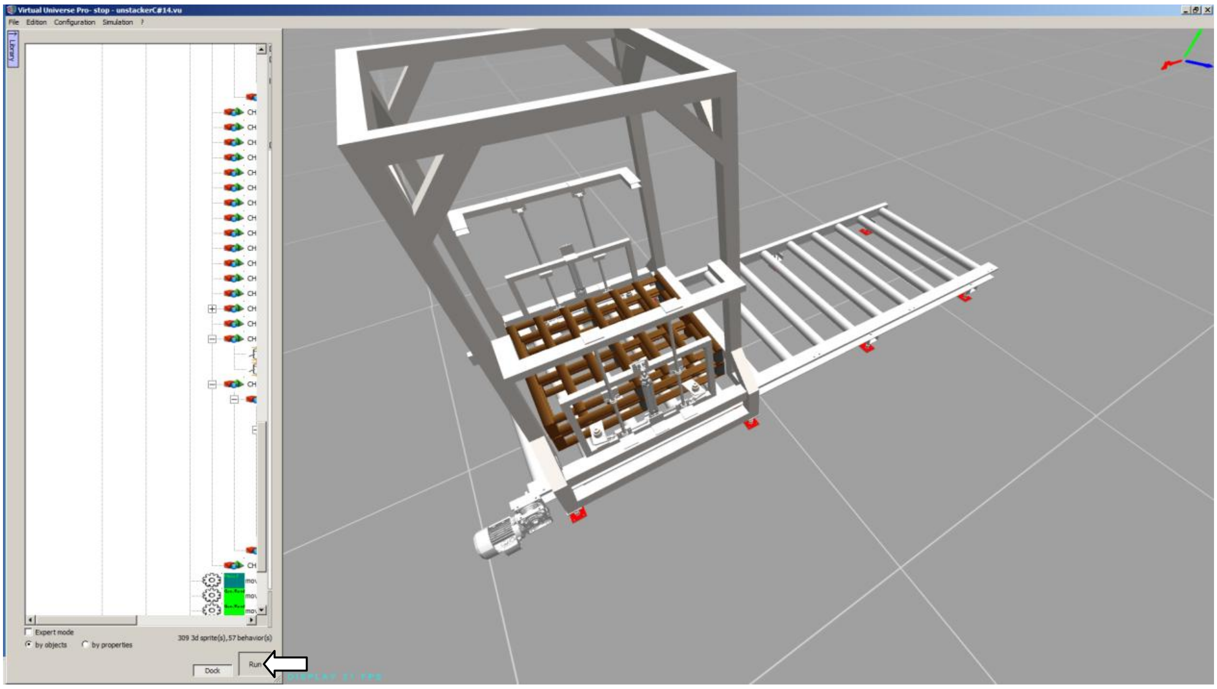
C.4.9.4- Write the program in Schneider Electric Unity Pro software.



Nom	Type	Adresse	Valeur	Commentaire	Horodatage
avancer	EBOOL	%QX0.2.12			Aucun
bas1	EBOOL	%IX0.1.0			Aucun
bas2	EBOOL	%IX0.1.3			Aucun
descendre1	EBOOL	%QX0.2.1			Aucun
descendre2	EBOOL	%QX0.2.3			Aucun
haut1	EBOOL	%IX0.1.1			Aucun
haut2	EBOOL	%IX0.1.4			Aucun
inter1	EBOOL	%IX0.1.2			Aucun
inter2	EBOOL	%IX0.1.5			Aucun
monter1	EBOOL	%QX0.2.0			Aucun
monter2	EBOOL	%QX0.2.2			Aucun
rentre1	EBOOL	%IX0.1.6			Aucun
rentre2	EBOOL	%IX0.1.8			Aucun
rentre3	EBOOL	%IX0.1.10			Aucun
rentre4	EBOOL	%IX0.1.12			Aucun
rentrer1	EBOOL	%QX0.2.5			Aucun
rentrer2	EBOOL	%QX0.2.7			Aucun
rentrer3	EBOOL	%QX0.2.9			Aucun
rentrer4	EBOOL	%QX0.2.11			Aucun
sorti1	EBOOL	%IX0.1.7			Aucun
sorti2	EBOOL	%IX0.1.9			Aucun
sorti3	EBOOL	%IX0.1.11			Aucun
sorti4	EBOOL	%IX0.1.13			Aucun
sortir1	EBOOL	%QX0.2.4			Aucun
sortir2	EBOOL	%QX0.2.6			Aucun
sortir3	EBOOL	%QX0.2.8			Aucun
sortir4	EBOOL	%QX0.2.10			Aucun
t1	BOOL				Aucun
t2	BOOL				Aucun

C.4.9.5- Launch the simulation

Upload the program to the PLC and run it.



309 3d sprite(s),57 behavior(s)