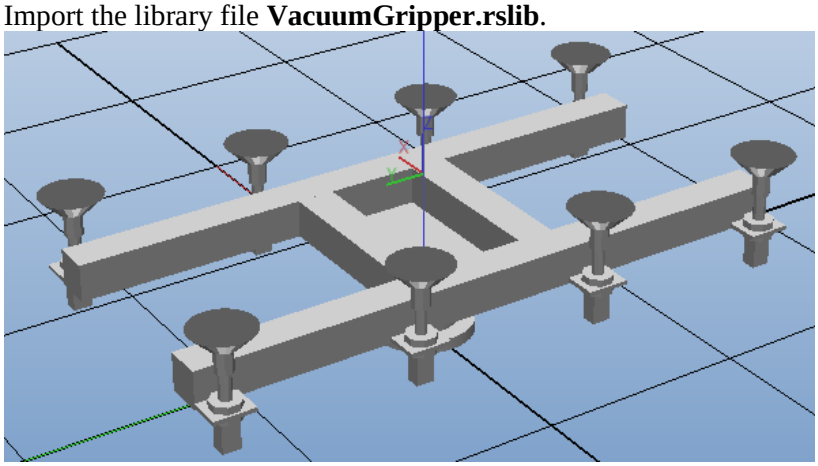
1.2. Create Smart Component - Vacuum Gripper

Overview

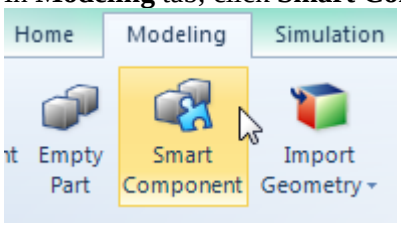
In this exercise we will learn how to create a Smart Component (SC) representing a vacuum gripper.

Preperation

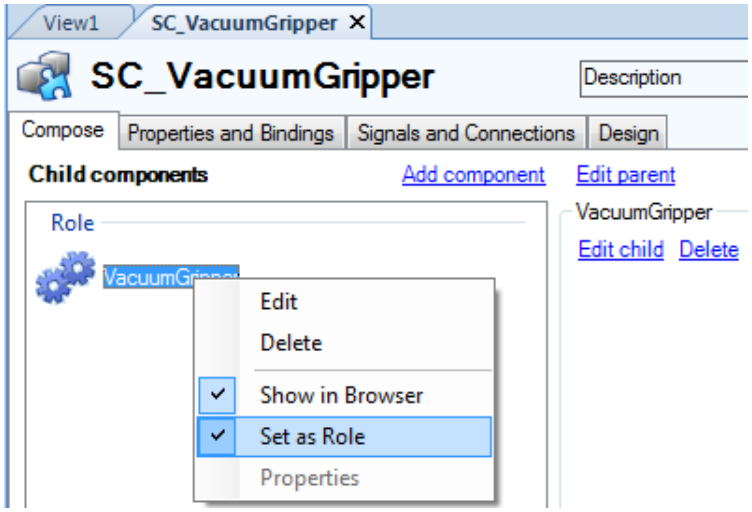
1. Create a new empty station.
2. Import the library file **VacuumGripper.rslib**.



3. As we will modify the library file we need to disconnect the library.
4. In the library context menu, click **Disconnect Library**.
5. In **Modeling** tab, click **Smart Component** to create a new empty SC.



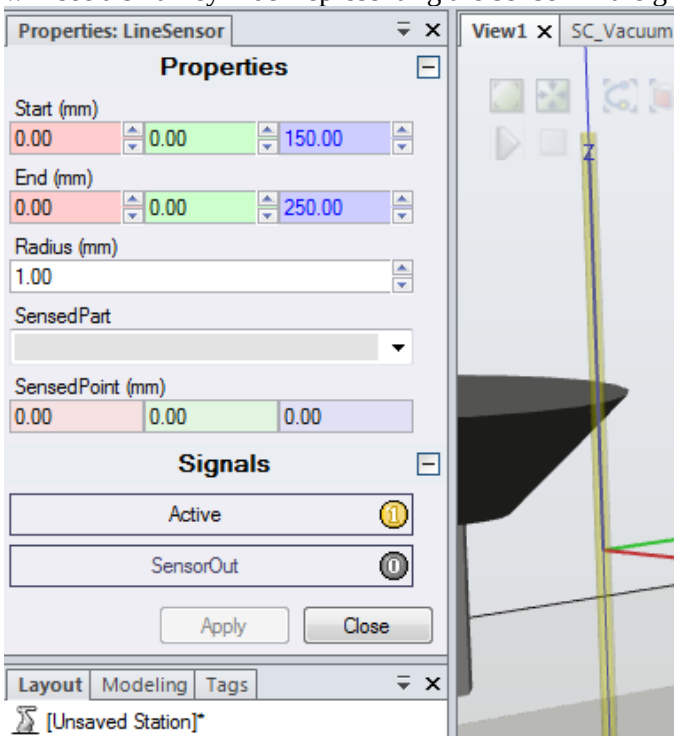
6. Rename the SC to **SC_VacuumGripper**.
7. In Layout browser, drag and drop the vacuum gripper to **SC_VacuumGripper**.
8. In order to get our new component to act as a tool, we need to set the **Vacuum_Gripper** as **role**. In this way the **tooldata** will be created when we attach our **SC gripper** to a robot. In the SC view, set the vacuum gripper as **role** from the conontext menu.



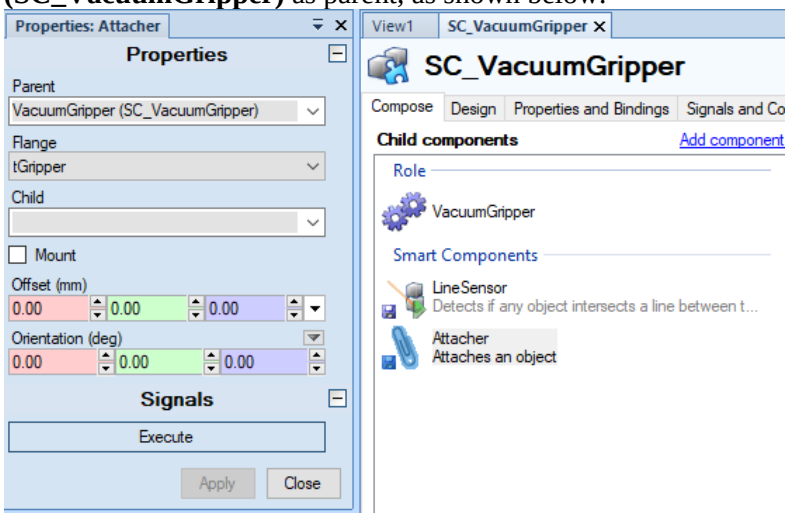
Add Base Components

Now we will start to add base components. We will start with a **sensor** that will react when an object hits the sensor beam.

1. Click **Add component** and then select the **LineSensor** from the **Sensors** gallery.
2. In the **LineSensor** properties window set values as below. After clicking **Apply,** you will see a small cylinder representing the **sensor** in the graphics view.

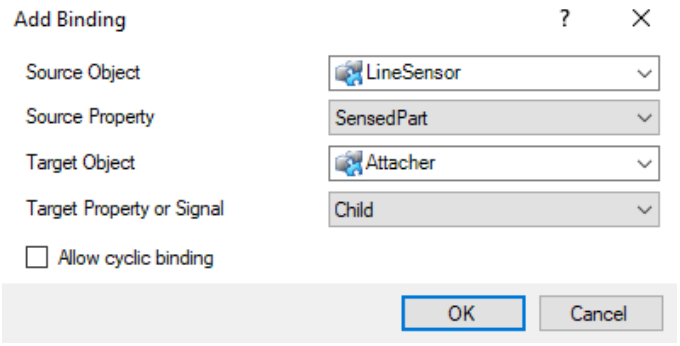


3. Next add an A**ttacher** base component from the **Actions** gallery. When trigged, this base component will attach a **child** component to a **parent** component. The **parent** in this example is represented by the vacuum gripper.
4. In the properties window of the **Attacher**, select the **VacuumGripper (SC_VacuumGripper)** as parent, as shown below.



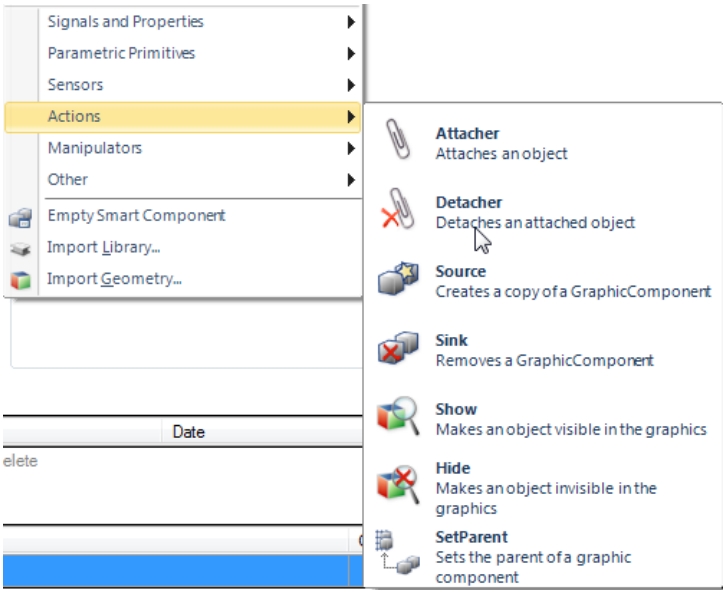
At this point we cannot state which object should represent the child in the **Attacher.** This depends upon the object that is intersected by the sensor in the simulation. Therefore a binding needs to be made between the object sensed by the **LineSensor** we created earlier.

5. Click **Add Binding** in the **Properties and Bindings** tab of the **SC** view. Create the binding as below:

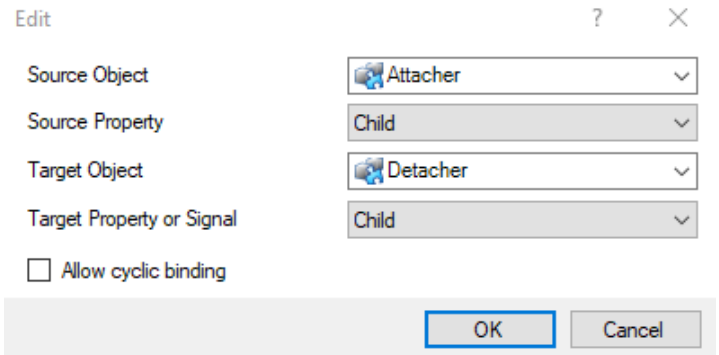


As we also want to be able to detach the attached object we need to add a **Detacher** and a binding between the attached part and the part that will be detached.

6. From the **Compose** tab and add a **Detacher** base component.



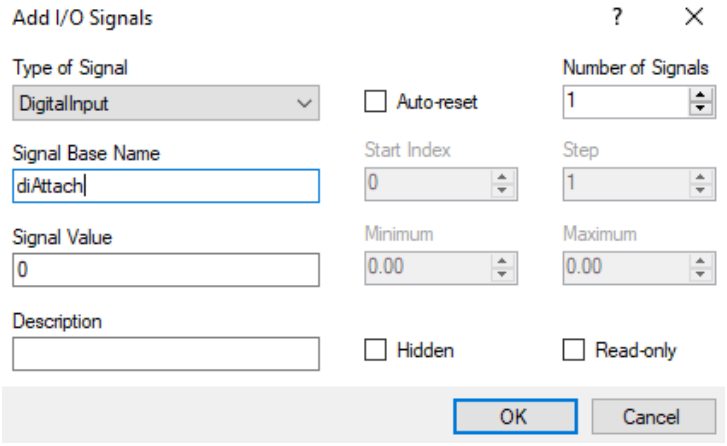
7. Click **Add binding** in the **Properties and Bindings** tab of the SC view again and create the binding as below:



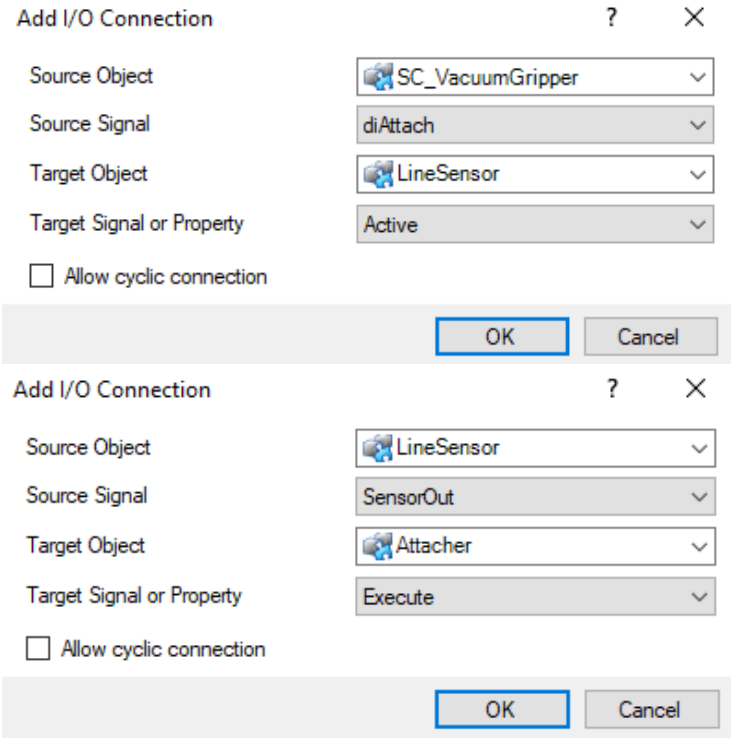
Internal Signals

Next we will define internal signals in our component that later will be cross connected with the **I/O** signals in the Virtual Controller. To define the actions in our **SC**, we also need to define some **I/O** connections.

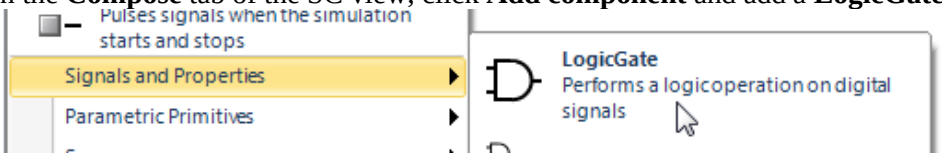
1. In the **Signals and connections** tab of the SC view, click **Add I/O Signals** and add a digital input signal, **diAttach**.



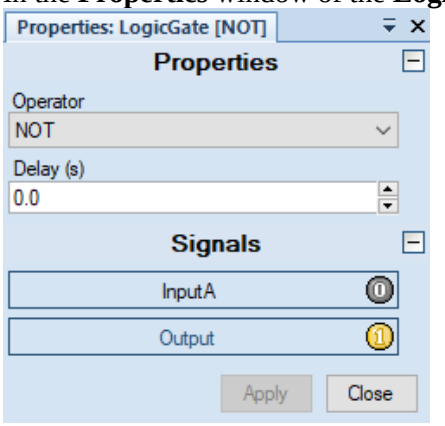
2. Create the first two **I/O connections** with the following input. When the signal is set, the sensor will become active and attach any object breaking the sensor beam.



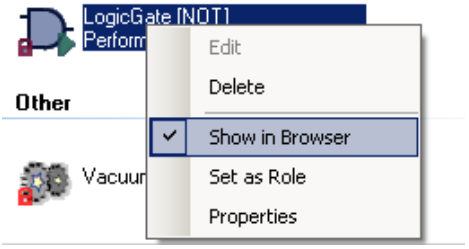
3. When the signal **diAttach** is set low, we want the **Detacher** to execute. Instead of creating a new **I/O** signal we will add a new base component, **LogicGate (NOT).** This will trigger the **Detacher** when the signal is low (**NOT** high).
4. In the **Compose** tab of the SC view, click **Add component** and add a **LogicGate**.



5. In the **Properties** window of the **LogicGate**, change the **Operator** to **NOT**.



6. If you want the component visible in the **Layout** browser, select **Show in Browser** from the context menu.

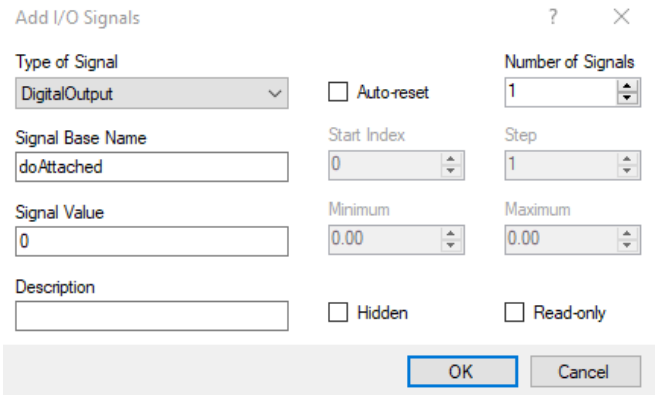


7. Add two more **I/O connections** according to the list below. (Ensure you understand the steps here as this represents the logic discussed in step 3.)

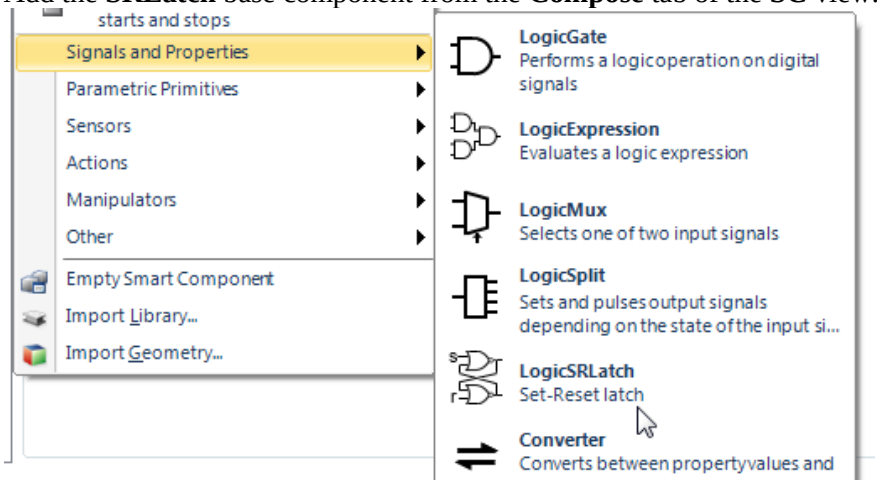
SC_VacuumGripper	diAttach	LogicGate [NOT]	InputA
LogicGate [NOT]	Output	Detacher	Execute

The next step is to create a handshake output signal (SC internal), **doAttached** from our **SC.** This will later be connected to a digital input signal in the robot controller confirming whether something is attached or not. This signal will be controlled by a **SRLatch** (Set-Reset latch) which will be set by the **Attacher** and reset by the **Detacher.**

8. In the **Signals and connections** tab of the **SC** view**,** add a digital output signal, **doAttached.**



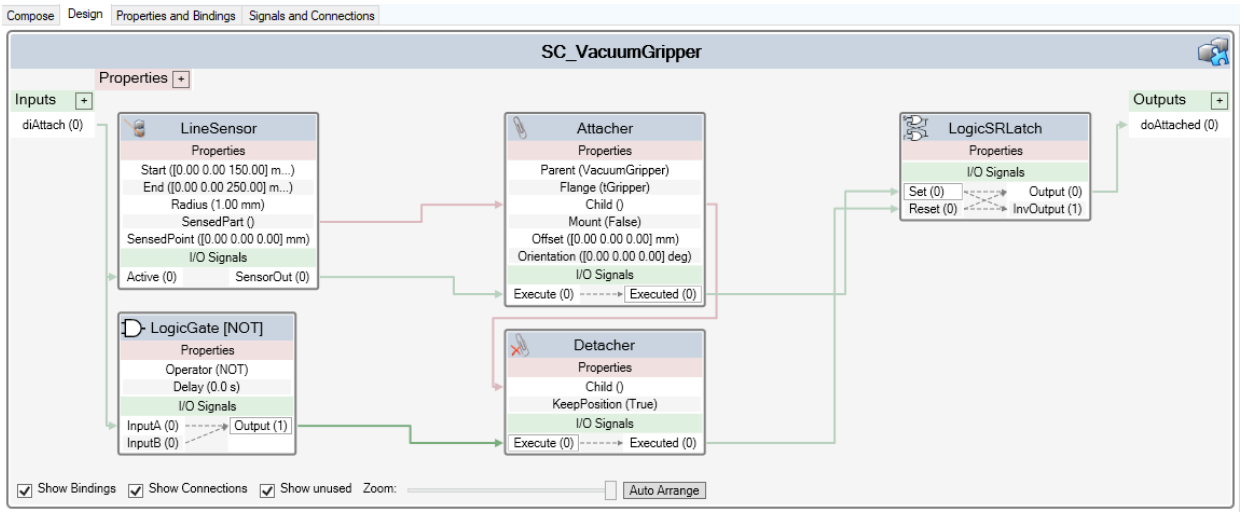
9. Add the **SRLatch** base component from the **Compose** tab of the **SC** view.



10. Then continue adding **I/O connections** according to the list below. Make sure you go through and understand each step. (This represents the logic discussed in step 7.)

Attacher	Executed	LogicSRLatch	Set
Detacher	Executed	LogicSRLatch	Reset
LogicSRLatch	Output	SC_VacuumGripper	doAttached

11. To get an overview of the completed **SC**, click the **Design** tab of the **SC** view. To get a better view click on **Auto Arrange**. Note that you can also drag the various compnents around to arrange them according to your preference. You can also make **I/O connections** and **Bindings** directly in the **Design** tab.



12. Save the **SC_VacuumGripper** as *... Libraries \SC_VacuumGripper.rslib.*