

实训项目四：实训知识点：

- 1、在 ROBOTSTUDIO 中进行机器人及周边设备的合理布局。
- 2、Smart 组件的基本使用
- 3、机器人 IO 信号的设定与链接
- 4、机器人轨迹的创建
- 5、仿真的调试。

机器人工作站的布局

所有的部件已包含在打包文件中。双击打开打包文件后，请按照以下的图 1 中所示进行布局。

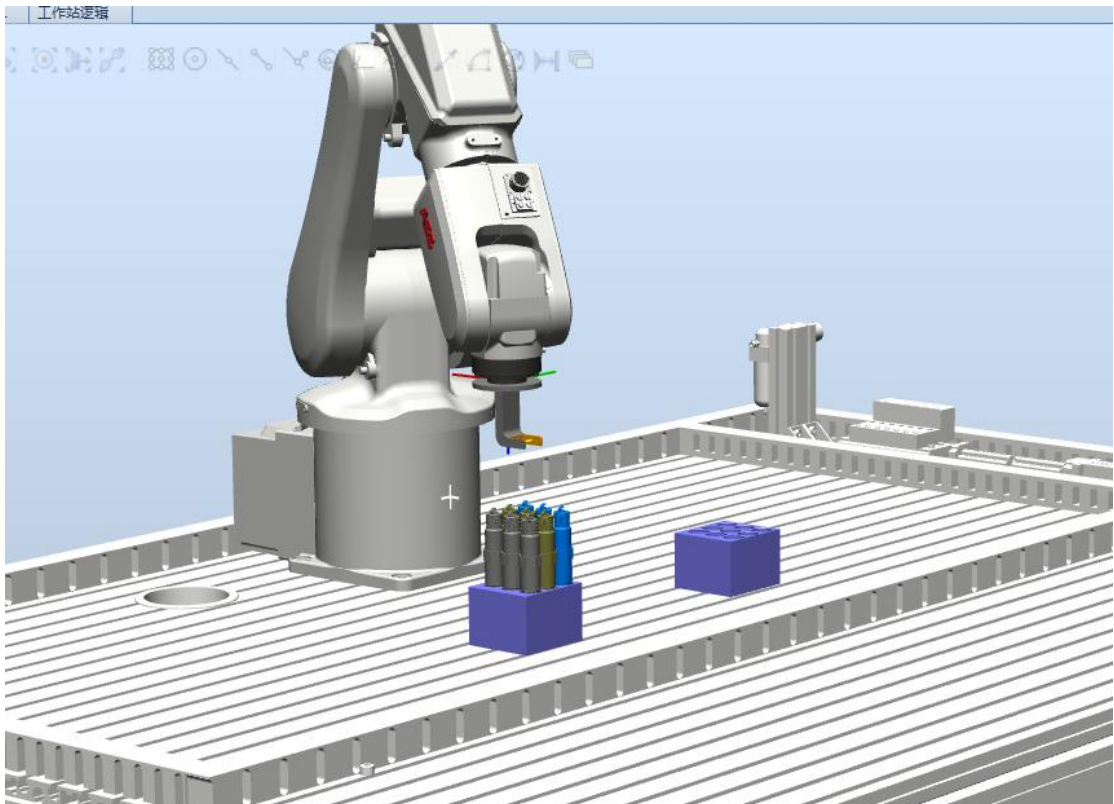


图 1 机器人工作站的布局示意

要注意的问题：

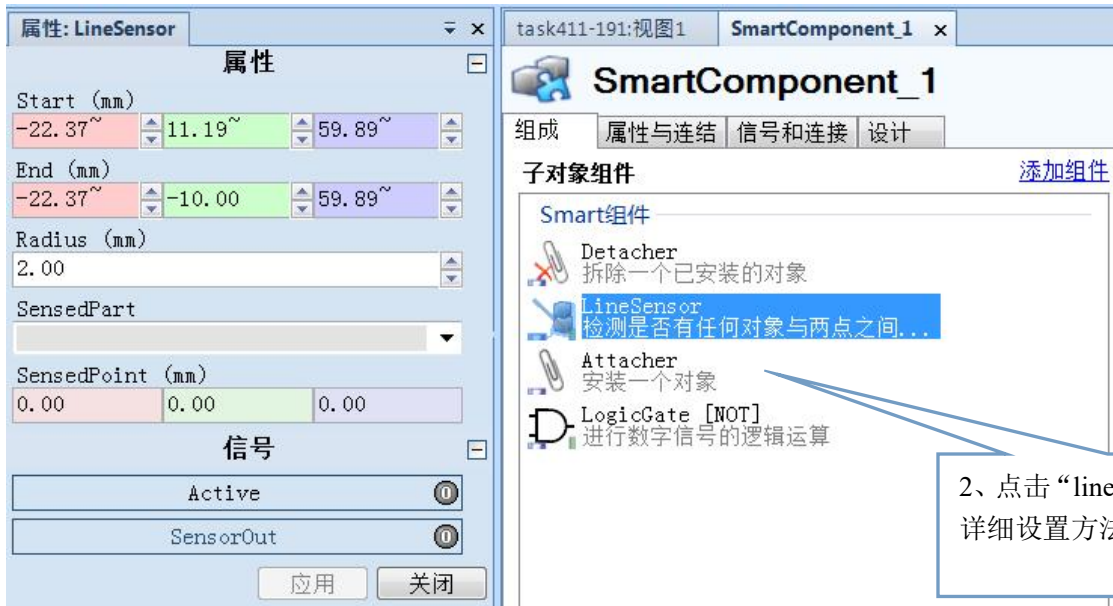
- 1、机器人与周边的部件的位置要合理，周边部件应在机器人的工作范围的中间位置为佳。
- 2、可以对机器人的操作，以确认机器人可以到达要取、放的最远端是可以顺利到达的，否则以后再调整就会很麻烦了。

Smart 组件的基本使用

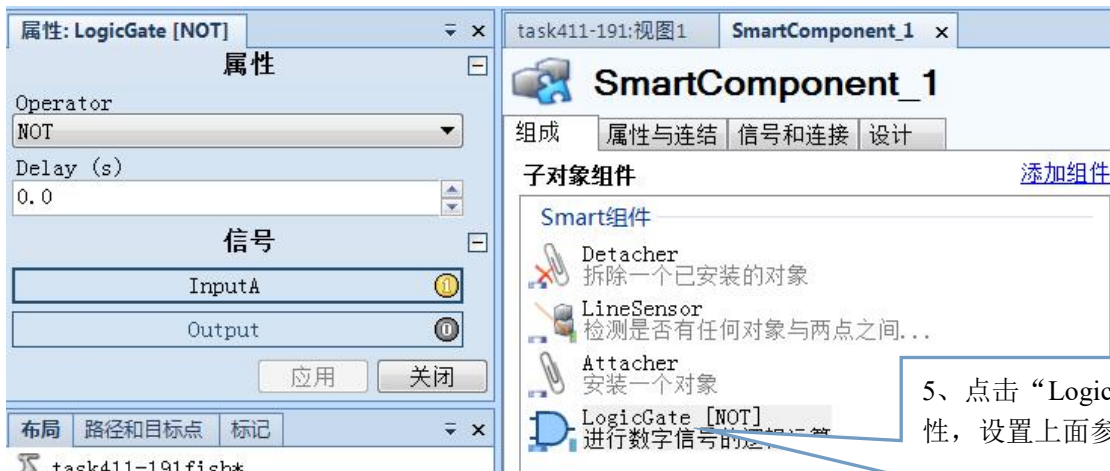
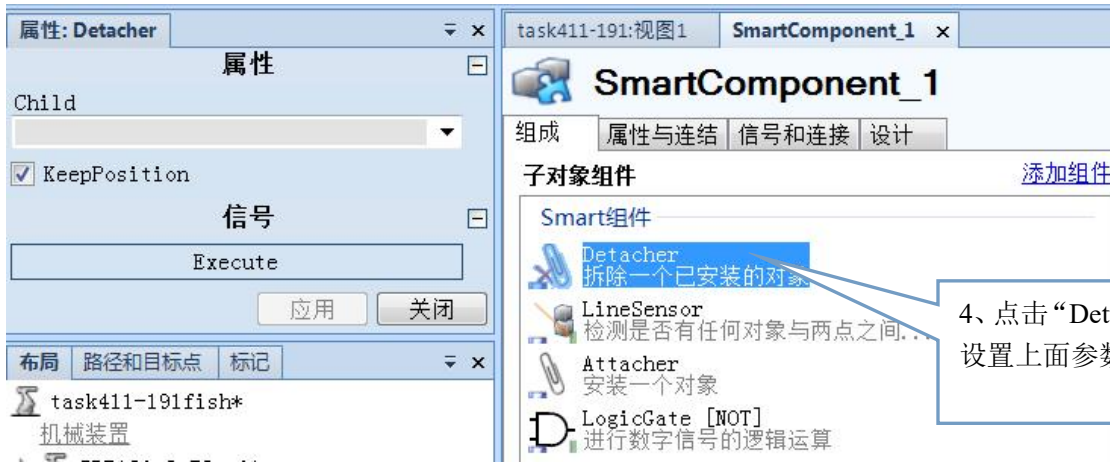
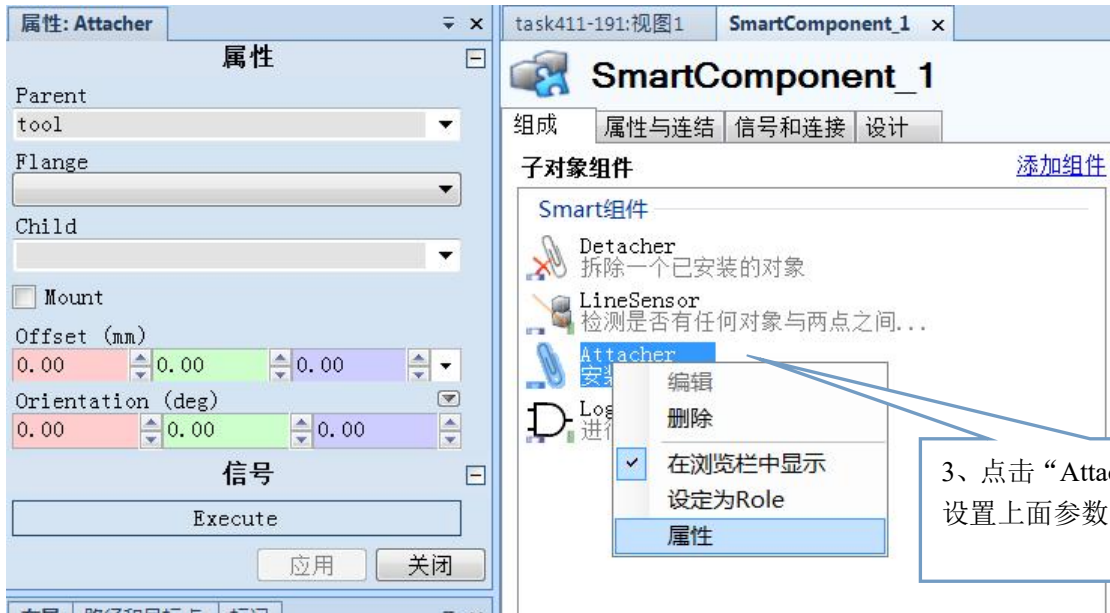
smart 组件创建操作：建模---smart 组件---添加组件，建立如下表组件，详情看视频。



1、点击“添加组件”添加以下组件



2、点击“linesenor”设置属性，详细设置方法看视频教程



名称	信号类型	值
di	DigitalInput	0

7、建立一个 smart 组件的输入

IO连接

源对象	源信号	目标对象	目标对象
SmartComponent_1	di	LineSensor	Active
LineSensor	SensorOut	Attacher	Execute
SmartComponent_1	di	LogicGate [NOT]	InputA
LogicGate [NOT]	Output	Detacher	Execute

8、建立以下信号关联

机器人 IO 的设定

为了实现真夹具动作的夹/放的动作控制，为了至少需要设定一个虚拟的数字输出信号，这个信号只用于虚拟仿真的作用，并没有与实际的总线或 IO 板进行关联。

数字输出信号的设定菜单操作为：控制器---配置编辑器---IO SYSTEM---SIGNAL。然后将信号设定为以下的表 1 的参数：

名称	值	信息
Name	do1	
Type of Signal	Digital Output	
Assigned to Device		
Signal Identification Label		
Category		
Access Level	Default	
Default Value	0	
Safe Level	DefaultSafeLevel	

机器人轨迹的创建

机器人的动作是从左侧的码垛盘存放处搬运到右边的的方形的码垛盘处。

具体的操作方法如下：

1、设置正确的工件坐标与工具，如下图所示：



2、根据具体的情况，设定正确的机器人运动指令的参数，如下图所示：



3、根据动作的要求通过示教指令的方法，创建对应的轨迹程序，程序样板如下图所示：

MODULE Module1

CONST robtarget

pi1:=[[302.163321784,-155.774933403,198.925909094],[0.002813608,0.000000298,

0.999996042,-0.000000194],[-1,0,-1,0],[9E9,9E9,9E9,9E9,9E9,9E9,9E9];

CONST robtarget

pick1:=[[302.163305516,-155.775077431,91.235647218],[0.002813346,0.000000191,0.999996043,0.000000248],[-1,0,-1,0],[9E9,9E9,9E9,9E9,9E9,9E9,9E9];

CONST robtarget

pp1:=[[38.208470014,13.843763029,102.38836453],[0.000000012,0.999996043,0.000000085,-0.002813189],[-1,0,-1,0],[9E9,9E9,9E9,9E9,9E9,9E9,9E9];

CONST robtarget

place1:=[[38.039813392,13.843816414,31.235369006],[-0.00000004,0.999996043,0.000000014,-0.002813018],[0,-1,0,0],[9E9,9E9,9E9,9E9,9E9,9E9,9E9];

CONST robtarget

pi2:=[[302.163722052,-179.628360656,203.745612579],[0.002813976,0.000000154,0.999996041,-0.000000126],[-1,0,-1,0],[9E9,9E9,9E9,9E9,9E9,9E9,9E9];

CONST robtarget

pick2:=[[302.163704614,-179.628390803,91.235841078],[0.002814148,0.000000107,0.99999604,0.000000129],[-1,0,-1,0],[9E9,9E9,9E9,9E9,9E9,9E9,9E9];

CONST robtarget

pp2:=[[38.208622483,37.94075665,99.309943226],[0.000000035,0.999996044,-0.000000308,-0.002812706],[-1,0,-1,0],[9E9,9E9,9E9,9E9,9E9,9E9,9E9];

CONST robtarget

place2:=[[38.03980646,37.940720429,31.235231671],[0.000000089,0.999996044,-0.000000452,-0.002812899],[0,-1,0,0],[9E9,9E9,9E9,9E9,9E9,9E9,9E9];

CONST robtarget

pi3:=[[302.163681624,-203.930398037,202.393621629],[0.002813999,-0.000000025,0.999996041,-0.000000245],[-1,0,-1,0],[9E9,9E9,9E9,9E9,9E9,9E9,9E9];

CONST robtarget

pick3:=[[302.163744244,-203.930509204,91.23586784],[0.00281421,0.000000226,0.99999604,0.000000158],[-1,0,-1,0],[9E9,9E9,9E9,9E9,9E9,9E9,9E9];

CONST robtarget

pp3:=[[38.208403612,62.306782802,96.18335228],[-0.000000252,0.999996043,-0.000000613,-0.002813084],[-1,0,-1,0],[9E9,9E9,9E9,9E9,9E9,9E9,9E9];

CONST robtarget

place3:=[[38.039634267,62.306820282,31.235341815],[0.000000224,0.999996043,-0.000000394,-0.002813174],[0,-1,0,0],[9E9,9E9,9E9,9E9,9E9,9E9,9E9];

CONST robtarget

pi4:=[[326.344568435,-155.775276197,204.065123457],[0.002814047,0.000000796,0.999996041,0.000000188],[-1,0,-1,0],[9E9,9E9,9E9,9E9,9E9,9E9,9E9];

CONST robtarget

pick4:=[[326.344437092,-155.775183472,91.235603874],[0.002813722,0.000000652,0.999996041,-0.00000008],[9E9,9E9,9E9,9E9,9E9,9E9,9E9];

CONST robtarget

pp4:=[[63.234104527,13.858599483,124.165600059],[-0.000000238,0.999996043,-0.00000071,-0.002813049],[-1,0,-1,0],[9E9,9E9,9E9,9E9,9E9,9E9,9E9];

CONST robtarget

place4:=[[63.065258484,13.858581163,31.235059853],[0.000000103,0.999996044,-0.000000685,-0.002812835],[0,-1,0,0],[9E9,9E9,9E9,9E9,9E9,9E9]];

CONST robtarget

pi5:=[[326.344612866,-179.862544055,204.651735724],[0.002813807,0.000000584,0.999996041,-0.000000251],[-1,0,-1,0],[9E9,9E9,9E9,9E9,9E9,9E9]];

CONST robtarget

pick5:=[[326.344661668,-179.86260979,91.235746417],[0.002814035,0.000000671,0.999996041,0.000000021],[-1,0,-1,0],[9E9,9E9,9E9,9E9,9E9,9E9]];

CONST robtarget

pp5:=[[63.233860633,37.817324191,106.112197018],[-0.000000282,0.999996043,-0.000001464,-0.002813003],[-1,0,-1,0],[9E9,9E9,9E9,9E9,9E9,9E9]];

CONST robtarget

place5:=[[63.065166768,37.817406564,31.235121425],[0.000000097,0.999996044,-0.000001181,-0.002812805],[0,-1,0,0],[9E9,9E9,9E9,9E9,9E9,9E9]];

CONST robtarget

pi6:=[[326.344652417,-203.832045605,203.361990431],[0.002813988,0.00000108,0.999996041,-0.000000023],[-1,0,-1,0],[9E9,9E9,9E9,9E9,9E9,9E9]];

CONST robtarget

pick6:=[[326.344598822,-203.83204631,91.235594249],[0.002813914,0.000000676,0.999996041,0.00000006],[9E9,9E9,9E9,9E9,9E9,9E9]];

CONST robtarget

pp6:=[[63.233804476,61.855284292,100.780155099],[-0.000000076,0.999996044,-0.000001166,-0.002812826],[-1,0,-1,0],[9E9,9E9,9E9,9E9,9E9,9E9]];

CONST robtarget

place6:=[[63.065089486,61.855302245,31.235159882],[0.000000104,0.999996044,-0.000001192,-0.002812809],[0,-1,0,0],[9E9,9E9,9E9,9E9,9E9,9E9]];

CONST robtarget

pi7:=[[350.303430293,-155.775096911,203.361215217],[0.002813434,0.000000515,0.999996042,0.00000011],[-1,0,-1,0],[9E9,9E9,9E9,9E9,9E9,9E9]];

CONST robtarget

pick7:=[[350.303373409,-155.775037766,91.235348611],[0.002813455,0.000000756,0.999996042,-0.000000008],[-1,0,-1,0],[9E9,9E9,9E9,9E9,9E9,9E9]];

CONST robtarget

pp7:=[[85.639451589,13.858668743,96.279383026],[0.000000071,0.999996044,-0.00000376,-0.002812653],[-1,0,-1,0],[9E9,9E9,9E9,9E9,9E9,9E9]];

CONST robtarget

place7:=[[85.47064178,13.858637199,31.234946062],[-0.000000033,0.999996044,-0.000000439,-0.00281274],[0,-1,0,0],[9E9,9E9,9E9,9E9,9E9,9E9]];

CONST robtarget

pi8:=[[350.303366726,-180.990875366,206.557695015],[0.002813689,0.000001006,0.999996042,-0.000000145],[-1,0,-1,0],[9E9,9E9,9E9,9E9,9E9,9E9]];

CONST robtarget

pick8:=[[350.303485255,-180.991003497,91.235371448],[0.002813792,0.000000771,0.999996041,0.000000161],[-1,0,-1,0],[9E9,9E9,9E9,9E9,9E9,9E9]];

CONST robtarget

pp8:=[[85.639600193,37.756962655,107.571459951],[0.000000399,0.999996046,-0.000000351,-0.002812199],[-1,0,-1,0],[9E9,9E9,9E9,9E9,9E9,9E9]];

CONST robtarget

place8:=[[85.470685556,37.756836822,31.23493577],[-0.000000177,0.999996045,-0.000000345,-0.002812583],[0,-1,0,0],[9E9,9E9,9E9,9E9,9E9,9E9]];

CONST robtarget

pi9:=[[350.303427634,-204.002442645,207.31122055],[0.002813432,0.000000872,0.999996042,-0.000000267],[-1,0,-1,0],[9E9,9E9,9E9,9E9,9E9,9E9]];

CONST robtarget

pick9:=[[350.303443847,-204.002527983,91.235311112],[0.002813633,0.000001022,0.999996042,0.000000137],[-1,0,-1,0],[9E9,9E9,9E9,9E9,9E9,9E9]];

CONST robtarget

pp9:=[[85.63969059,61.580770648,100.443121306],[0.000000213,0.999996045,-0.000000662,-0.00281232],[-1,0,-1,0],[9E9,9E9,9E9,9E9,9E9,9E9]];

CONST robtarget

place9:=[[85.47086733,61.580736877,31.234945227],[-0.000000253,0.999996045,-0.000000354,-0.002812375],[0,-1,0,0],[9E9,9E9,9E9,9E9,9E9,9E9]];

CONST robtarget

phome:=[[-36.539731822,193.292982785,503.708106333],[0,0.866025467,0,-0.49999989],[0,-1,0,0],[9E9,9E9,9E9,9E9,9E9,9E9]];

CONST robtarget

phome1:=[[85.470952057,61.58075798,70.443595855],[-0.000000213,0.999996045,-0.000000662,-0.00281232],[0,-1,0,0],[9E9,9E9,9E9,9E9,9E9,9E9]];

PROC Path_10()

MoveJ phome,v1000,fine,Tooldata_1\WObj:=Workobject_2;

MoveJ pi1,v1000,z100,Tooldata_1\WObj:=wobj0;

MoveL pick1,v1000,fine,Tooldata_1\WObj:=wobj0;

WaitTime 0.3;

Set do1;

MoveJ pi1,v1000,z100,Tooldata_1\WObj:=wobj0;

MoveJ pp1,v1000,z100,Tooldata_1\WObj:=Workobject_2;

MoveL place1,v1000,fine,Tooldata_1\WObj:=Workobject_2;

Reset do1;

WaitTime 0.3;

MoveJ pp1,v1000,z100,Tooldata_1\WObj:=Workobject_2;

MoveJ pi2,v1000,z100,Tooldata_1\WObj:=wobj0;

MoveL pick2,v1000,fine,Tooldata_1\WObj:=wobj0;

Set do1;

WaitTime 0.3;

MoveJ pi2,v1000,z100,Tooldata_1\WObj:=wobj0;

MoveJ pp2,v1000,z100,Tooldata_1\WObj:=Workobject_2;

MoveL place2,v1000,fine,Tooldata_1\WObj:=Workobject_2;

Reset do1;

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WaitTime 0.3;
MoveJ pp2,v1000,z100,Tooldata_1\WObj:=Workobject_2;
MoveJ pi3,v1000,z100,Tooldata_1\WObj:=wobj0;
MoveL pick3,v1000,fine,Tooldata_1\WObj:=wobj0;
Set do1;
WaitTime 0.3;
MoveJ pi3,v1000,z100,Tooldata_1\WObj:=wobj0;
MoveJ pp3,v1000,z100,Tooldata_1\WObj:=Workobject_2;
MoveL place3,v1000,fine,Tooldata_1\WObj:=Workobject_2;
Reset do1;
WaitTime 0.3;
MoveJ pp3,v1000,z100,Tooldata_1\WObj:=Workobject_2;
MoveJ pi4,v1000,z100,Tooldata_1\WObj:=wobj0;
MoveL pick4,v1000,fine,Tooldata_1\WObj:=wobj0;
Set do1;
WaitTime 0.3;
MoveJ pi4,v1000,z100,Tooldata_1\WObj:=wobj0;
MoveJ pp4,v1000,z100,Tooldata_1\WObj:=Workobject_2;
MoveL place4,v1000,fine,Tooldata_1\WObj:=Workobject_2;
Reset do1;
WaitTime 0.3;
MoveJ pp4,v1000,z100,Tooldata_1\WObj:=Workobject_2;
MoveJ pi5,v1000,z100,Tooldata_1\WObj:=wobj0;
MoveL pick5,v1000,fine,Tooldata_1\WObj:=wobj0;
Set do1;
WaitTime 0.3;
MoveJ pi5,v1000,z100,Tooldata_1\WObj:=wobj0;
MoveJ pp5,v1000,z100,Tooldata_1\WObj:=Workobject_2;
MoveL place5,v1000,fine,Tooldata_1\WObj:=Workobject_2;
Reset do1;
WaitTime 0.3;
MoveJ pp5,v1000,z100,Tooldata_1\WObj:=Workobject_2;
MoveJ pi6,v1000,z100,Tooldata_1\WObj:=wobj0;
MoveL pick6,v1000,fine,Tooldata_1\WObj:=wobj0;
Set do1;
WaitTime 0.3;
MoveJ pi6,v1000,z100,Tooldata_1\WObj:=wobj0;
MoveJ pp6,v1000,z100,Tooldata_1\WObj:=Workobject_2;
MoveL place6,v1000,fine,Tooldata_1\WObj:=Workobject_2;
Reset do1;
WaitTime 0.3;
MoveJ pp6,v1000,z100,Tooldata_1\WObj:=Workobject_2;
MoveJ pi7,v1000,z100,Tooldata_1\WObj:=wobj0;
MoveL pick7,v1000,fine,Tooldata_1\WObj:=wobj0;

```



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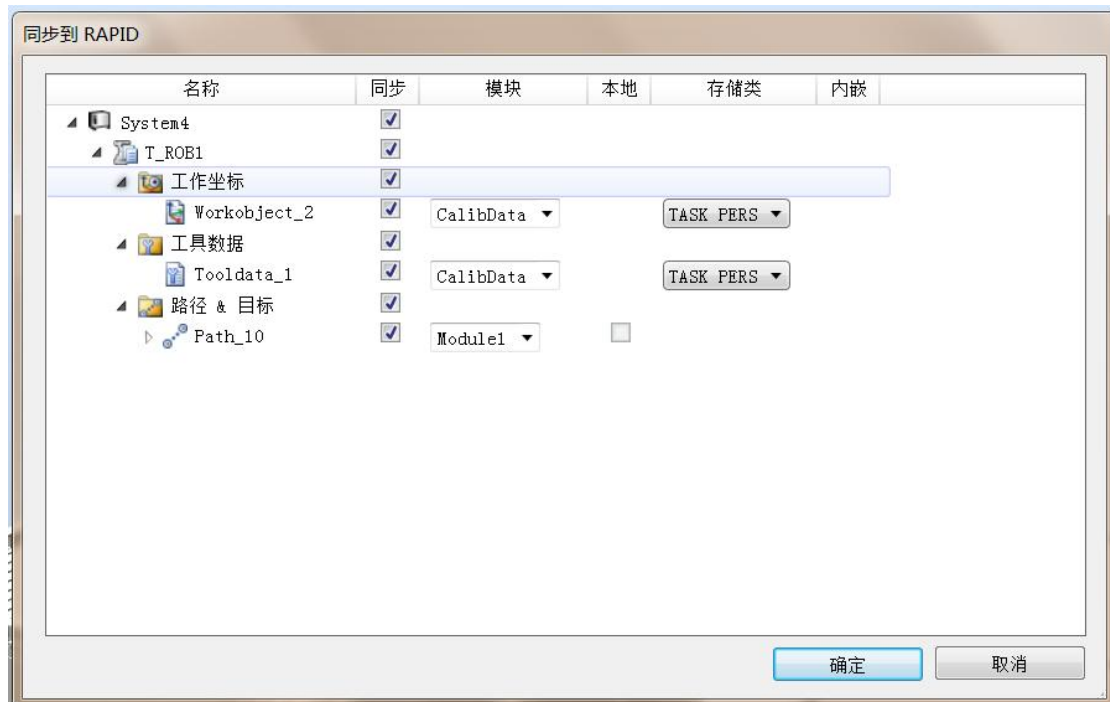
Set dol;
WaitTime 0.3;
MoveJ pi7,v1000,z100,Tooldata_1\WObj:=wobj0;
MoveJ pp7,v1000,z100,Tooldata_1\WObj:=Workobject_2;
MoveL place7,v1000,fine,Tooldata_1\WObj:=Workobject_2;
Reset dol;
WaitTime 0.3;
MoveJ pp7,v1000,z100,Tooldata_1\WObj:=Workobject_2;
MoveJ pi8,v1000,z100,Tooldata_1\WObj:=wobj0;
MoveL pick8,v1000,fine,Tooldata_1\WObj:=wobj0;
Set dol;
WaitTime 0.3;
MoveJ pi8,v1000,z100,Tooldata_1\WObj:=wobj0;
MoveJ pp8,v1000,z100,Tooldata_1\WObj:=Workobject_2;
MoveL place8,v1000,fine,Tooldata_1\WObj:=Workobject_2;
Reset dol;
WaitTime 0.3;
MoveJ pp8,v1000,z100,Tooldata_1\WObj:=Workobject_2;
MoveJ pi9,v1000,z100,Tooldata_1\WObj:=wobj0;
MoveL pick9,v1000,fine,Tooldata_1\WObj:=wobj0;
Set dol;
WaitTime 0.3;
MoveJ pi9,v1000,z100,Tooldata_1\WObj:=wobj0;
MoveJ pp9,v1000,z100,Tooldata_1\WObj:=Workobject_2;
MoveJ pp9,v1000,z100,Tooldata_1\WObj:=Workobject_2;
MoveJ pp9,v1000,z100,Tooldata_1\WObj:=Workobject_2;
MoveL place9,v1000,fine,Tooldata_1\WObj:=Workobject_2;
Reset dol;
WaitTime 0.3;
MoveJ pp9,v1000,z100,Tooldata_1\WObj:=Workobject_2;
MoveJ phome,v1000,fine,Tooldata_1\WObj:=Workobject_2;

```

ENDPROC

ENDMODULE

将写好的程序同步到RAPID，菜单操作：基本---同步---同步到RAPID，如下图所示：



仿真的调试

在完成了设置与编程以后，先保存初始状态，接着下来就是要验证一下仿真动画的结果了，具体的操作如下：

- 1、设定要运行的 RAPID 子程序，在本项目中是 PATH10，菜单操作如下：仿真---仿真设定---指定 PATH10，如下图所示：



2、点击仿真菜单中的“播放”就可以看到动画效果了。动画结束后，点击“重置”，恢复到原来的状态。