PONTIFÍCIA UNIVERSIDADE CATÓLICA DE GOIÁS
ESCOLA POLITÉCNICA
ENGENHARIA DA COMPUTAÇÃO

Célula Robótica

Alunos: Bruno Emilio Luiz Silva
Daniel Figueiredo Pereira
Victor Hugo Brito da Silva Miranda

Goiânia
2022

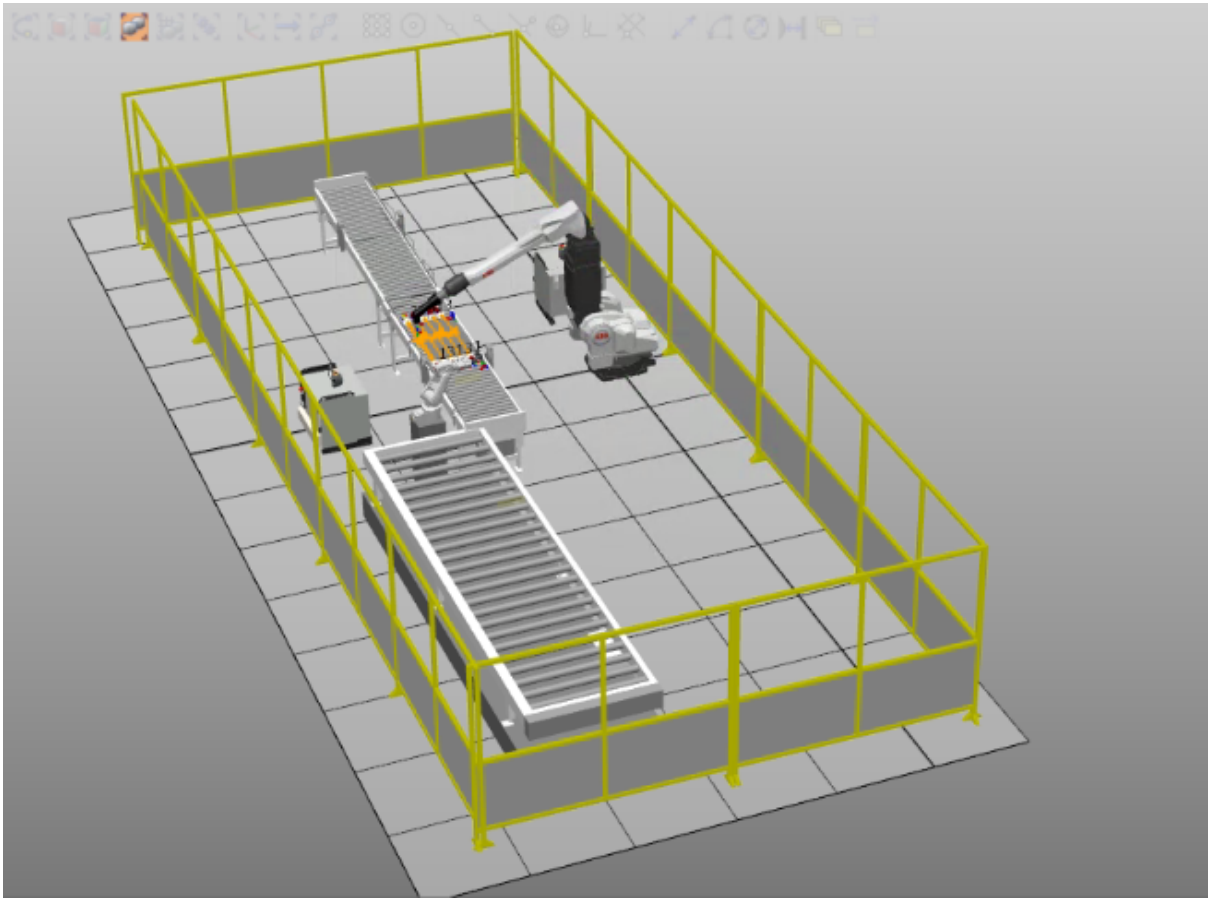
Célula Robótica

1 . Nome dos alunos: Bruno Emilio Luiz Silva, Daniel Figueiredo Pereira e Victor Hugo Brito da Silva Miranda

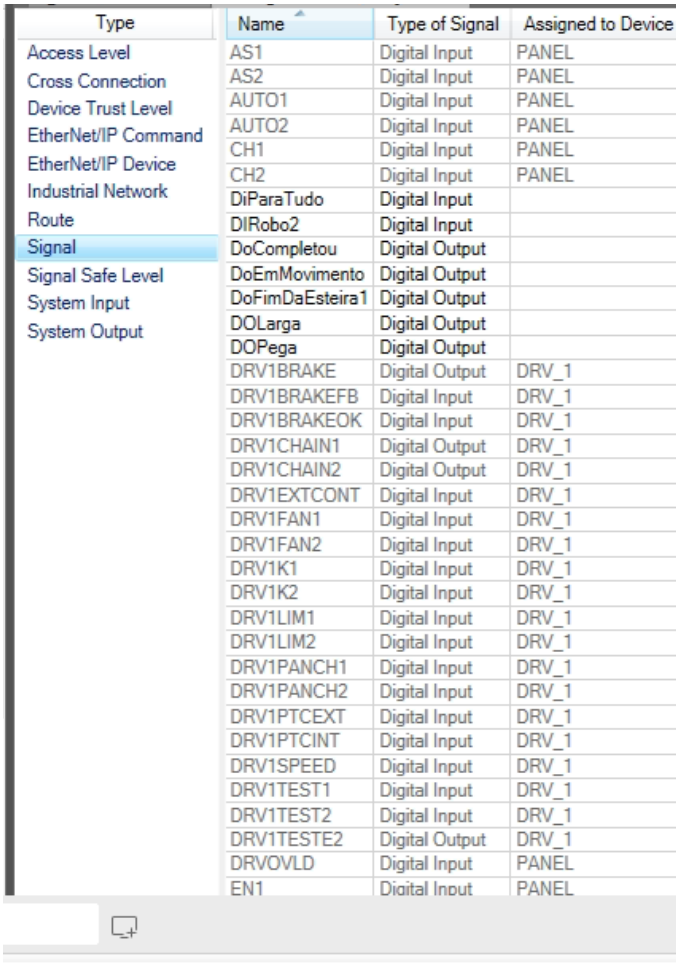
2. Aplicação industrial: Pintura de peças.

3. Componentes na célula: Robô IRB 120 3k e o IRB 5400, esteira, efetuador de pintura Robobel 926, efetuador MyTool, cerca de segurança, controlador de robôs, sensores e I/O.

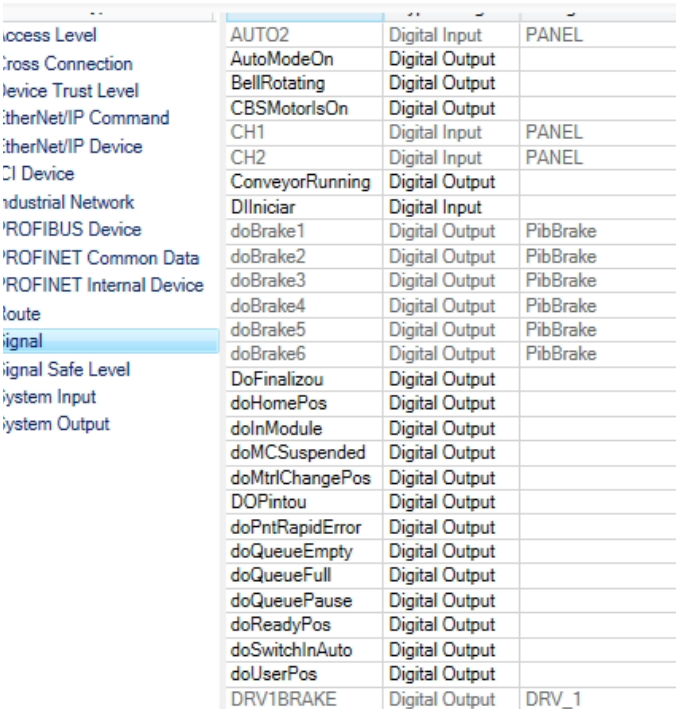
4. Área de trabalho:



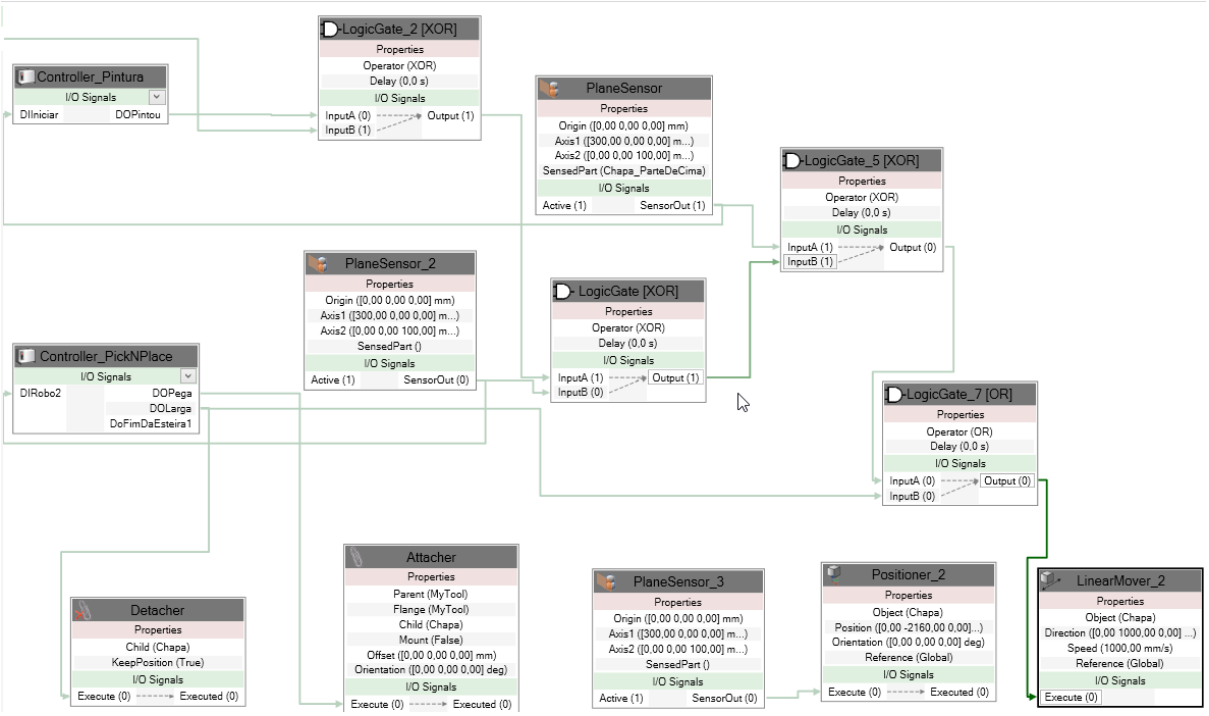
5. Relação de interlogs:



Type	Name	Type of Signal	Assigned to Device
Access Level	AS1	Digital Input	PANEL
Cross Connection	AS2	Digital Input	PANEL
Device Trust Level	AUTO1	Digital Input	PANEL
EtherNet/IP Command	AUTO2	Digital Input	PANEL
EtherNet/IP Device	CH1	Digital Input	PANEL
Industrial Network	CH2	Digital Input	PANEL
Route	DiParaTudo	Digital Input	
Signal	DIRobo2	Digital Input	
Signal Safe Level	DoCompletou	Digital Output	
System Input	DoEmMovimento	Digital Output	
System Output	DoFimDaEsteira1	Digital Output	
	DOLarga	Digital Output	
	DOPega	Digital Output	
	DRV1BRAKE	Digital Output	DRV_1
	DRV1BRAKEFB	Digital Input	DRV_1
	DRV1BRAKEOK	Digital Input	DRV_1
	DRV1CHAIN1	Digital Output	DRV_1
	DRV1CHAIN2	Digital Output	DRV_1
	DRV1EXTCONT	Digital Input	DRV_1
	DRV1FAN1	Digital Input	DRV_1
	DRV1FAN2	Digital Input	DRV_1
	DRV1K1	Digital Input	DRV_1
	DRV1K2	Digital Input	DRV_1
	DRV1LIM1	Digital Input	DRV_1
	DRV1LIM2	Digital Input	DRV_1
	DRV1PANCH1	Digital Input	DRV_1
	DRV1PANCH2	Digital Input	DRV_1
	DRV1PTCEXT	Digital Input	DRV_1
	DRV1PTCINT	Digital Input	DRV_1
	DRV1SPEED	Digital Input	DRV_1
	DRV1TEST1	Digital Input	DRV_1
	DRV1TEST2	Digital Input	DRV_1
	DRV1TESTE2	Digital Output	DRV_1
	DRVOVLD	Digital Input	PANEL
	EN1	Digital Input	PANEL

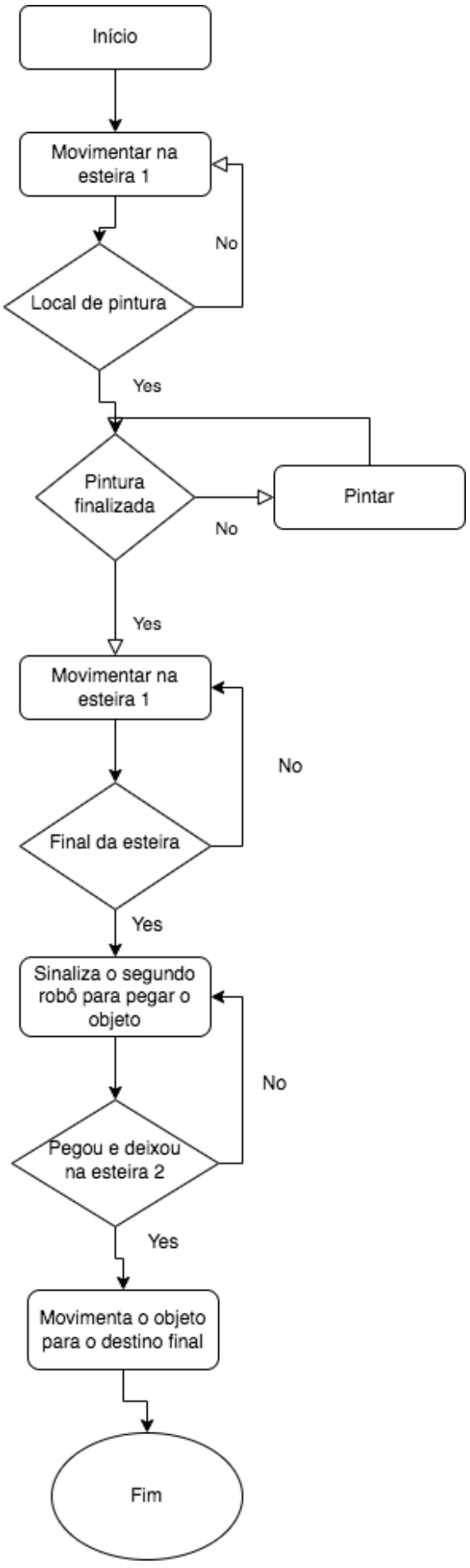


ccess Level	AUTO2	Digital Input	PANEL
ross Connection	AutoModeOn	Digital Output	
evice Trust Level	BellRotating	Digital Output	
therNet/IP Command	CBSMotorIsOn	Digital Output	
therNet/IP Device	CH1	Digital Input	PANEL
I Device	CH2	Digital Input	PANEL
ndustrial Network	ConveyorRunning	Digital Output	
ROFIBUS Device	DIIniciar	Digital Input	
ROFINET Common Data	doBrake1	Digital Output	PibBrake
ROFINET Internal Device	doBrake2	Digital Output	PibBrake
oute	doBrake3	Digital Output	PibBrake
ignal	doBrake4	Digital Output	PibBrake
ignal Safe Level	doBrake5	Digital Output	PibBrake
ystem Input	doBrake6	Digital Output	PibBrake
ystem Output	DoFinalizou	Digital Output	
	doHomePos	Digital Output	
	doInModule	Digital Output	
	doMCSuspended	Digital Output	
	doMtrlChangePos	Digital Output	
	DOPintou	Digital Output	
	doPntRapidError	Digital Output	
	doQueueEmpty	Digital Output	
	doQueueFull	Digital Output	
	doQueuePause	Digital Output	
	doReadyPos	Digital Output	
	doSwitchInAuto	Digital Output	
	doUserPos	Digital Output	
	DRV1BRAKE	Digital Output	DRV_1



6. Descrição da aplicação: os objetos serão movimentados através da esteira, nesta aplicação temos duas esteiras, a primeira esteira levará o objeto até o robô que realizará a pintura do objeto, a esteira para o objeto, ao ser identificado pelo sensor que o objeto já alcançou o local desejado para a pintura, e logo após, ao finalizar a pintura, o objeto seguirá na primeira esteira, até o final, onde será identificado pelo próximo robô, que irá pegar o objeto e deixá-lo na segunda esteira, que levará o objeto para o seu destino final.

7. Fluxograma:


Início
Movimentar na esteira 1
No
Local de pintura
Yes
Pintura finalizada
Pintar
No
Yes
Movimentar na esteira 1
No
Final da esteira
Yes
Sinaliza o segundo robô para pegar o objeto
No
Pegou e deixou na esteira 2
Yes
Movimenta o objeto para o destino final
Fim

8. Código Rapid.

```
MODULE Module1
    CONST robtarget PontoDeSeg:=[[508.77,132.09,531.52],[0.542983,-0.16391,0.815099,0.117972],[0,0,-1,0]
    ,[9E+9,9E+9,9E+9,9E+9,9E+9,9E+9]];
    CONST robtarget PontoEmCimaPega:=[[478.37,115.95,462.24],[0.239299,-0.305009,0.921792,0.00209509]
    ,[0,0,-1,0],[9E+9,9E+9,9E+9,9E+9,9E+9,9E+9]];
    CONST robtarget PontoPega:=[[475.54,-150.89,276.19],[0.239299,-0.305009,0.921792,0.00209511],[-1,0,-1,0]
    ,[9E+9,9E+9,9E+9,9E+9,9E+9,9E+9]];
    CONST robtarget PontoDeixa:=[[-251.95,-456.15,249.96],[0.166053,0.435105,0.869081,-0.166757],[-2,0,-2,0]
    ,[9E+9,9E+9,9E+9,9E+9,9E+9,9E+9]];
    CONST robtarget PontoPega10:=[[475.54,-150.89,276.19],[0.239299,-0.305009,0.921792,0.00209511],[-1,0,-1,0]
    ,[9E+9,9E+9,9E+9,9E+9,9E+9,9E+9]];

    !***********************************************************
    ! Module:  Module1
    ! Description:
    ! Author: Daniel
    ! Author: Victor Hugo
    ! Author: Bruno Emílio
    ! Version: 1.0
    !***********************************************************

    PROC main()
        !Add your code here
        MoveJ PontoDeSeg, v1000, z50, tool0;
        Loop:
        Reset DOLarga;
        Reset DOPega;
        Reset DoEmMovimento;
        Reset DoCompletou;
        IF TestDI(DIRobo2) THEN
            WaitTime 1;
            MoveL PontoPega, v1000, z50, tool0;
            WaitTime 1;
            Set DOPega;
            Set DoEmMovimento;
            MoveL PontoEmCimaPega, v1000, z50, tool0;
            MoveL PontoDeixa, v1000, z50, tool0;
            WaitTime 1;
            Set DOLarga;
            MoveL PontoEmCimaPega, v1000, z50, tool0;
            WaitTime 2;
            Set DoCompletou;
        ENDIF
        GOTO Loop;
    ENDPROC
ENDMODULE
```

MODULE Module1

CONST robtarget PontoDeSeg:=[[508.77,132.09,531.52],[0.542983,-0.16391,0.815099,0.117972],[0,0,-1,0]
,[9E+9,9E+9,9E+9,9E+9,9E+9,9E+9]];

CONST robtarget PontoEmCimaPega:=[[478.37,115.95,462.24],[0.239299,-0.305009,0.921792,0.00209509]
,[0,0,-1,0],[9E+9,9E+9,9E+9,9E+9,9E+9,9E+9]];

CONST robtarget PontoPega:=[[475.54,-150.89,276.19],[0.239299,-0.305009,0.921792,0.00209511],[-1,0,-1,0]

```
   ,[9E+9,9E+9,9E+9,9E+9,9E+9,9E+9]];
        CONST robtarget
PontoDeixa:=[[-251.95,-456.15,249.96],[0.166053,0.435105,0.869081,-0.166757],[-2,0,-2,0]
   ,[9E+9,9E+9,9E+9,9E+9,9E+9,9E+9]];
        CONST robtarget
PontoPega10:=[[475.54,-150.89,276.19],[0.239299,-0.305009,0.921792,0.00209511],[-1,0,-1,0]
   ,[9E+9,9E+9,9E+9,9E+9,9E+9,9E+9]];

   !***********************************************************
   ! Module:  Module1
   ! Description:
   ! Author: Daniel
   ! Author: Victor Hugo
   ! Author: Bruno Emílio
   ! Version: 1.0
   !***********************************************************
   PROC main()
      !Add your code here
      MoveJ PontoDeSeg, v1000, z50, tool0;
      Loop:
      Reset DOLarga;
      Reset DOPega;
      Reset DoEmMovimento;
      Reset DoCompletou;
      IF TestDI(DIRobo2) THEN
         WaitTime 1;
         MoveL PontoPega, v1000, z50, tool0;
         WaitTime 1;
         Set DOPega;
         Set DoEmMovimento;
         MoveL PontoEmCimaPega, v1000, z50, tool0;
         MoveL PontoDeixa, v1000, z50, tool0;
         WaitTime 1;
         Set DOLarga;
         MoveL PontoEmCimaPega, v1000, z50, tool0;
         WaitTime 2;
         Set DoCompletou;
      ENDIF
      GOTO Loop;
   ENDPROC
```

ENDMODULE

```
MODULE m4
    LOCAL CONST robtarget Paint_10:=[[498.743494875,-249.999639638,-0.000355856],[0,0.000512373,0.999999869,0
    ],[-1,1,-2,0],[9E+09,9E+09,9E+09,9E+09,9E+09,9E+09]];
    LOCAL CONST robtarget Paint_40:=[[500.075664199,1050.000097836,-0.000355856],[0,0.000512373,0.999999869,0
    ],[0,0,-1,0],[9E+09,9E+09,9E+09,9E+09,9E+09,9E+09]];
    LOCAL CONST robtarget Paint_50:=[[400.075559403,1050.000097836,-0.000355856],[0,0.000512373,0.999999869,0]
    ,[0,0,-1,0],[9E+09,9E+09,9E+09,9E+09,9E+09,9E+09]];
    LOCAL CONST robtarget Paint_80:=[[398.743390079,-249.999639638,-0.000355856],[0,0.000512373,0.999999869,0]
    ,[-1,1,-2,0],[9E+09,9E+09,9E+09,9E+09,9E+09,9E+09]];
    LOCAL CONST robtarget Paint_90:=[[298.743285283,-249.999639638,-0.000355856],[0,0.000512373,0.999999869,0]
    ,[-1,1,-2,0],[9E+09,9E+09,9E+09,9E+09,9E+09,9E+09]];
    LOCAL CONST robtarget Paint_120:=[[300.075454607,1050.000097836,-0.000355856],[0,0.000512373,0.999999869,0]
    ,[0,0,0,0],[9E+09,9E+09,9E+09,9E+09,9E+09,9E+09]];
    LOCAL CONST robtarget Paint_130:=[[200.075349811,1050.000097836,-0.000355856],[0,0.000512373,0.999999869,0]
    ,[0,0,0,0],[9E+09,9E+09,9E+09,9E+09,9E+09,9E+09]];
    LOCAL CONST robtarget Paint_160:=[[198.743180487,-249.999639638,-0.000355856],[0,0.000512373,0.999999869,0]
    ,[-1,1,-2,0],[9E+09,9E+09,9E+09,9E+09,9E+09,9E+09]];
    LOCAL CONST robtarget Paint_170:=[[98.743075691,-249.999639638,-0.000355856],[0,0.000512373,0.999999869,0],
        [-1,1,-2,0],[9E+09,9E+09,9E+09,9E+09,9E+09,9E+09]];
    LOCAL CONST robtarget Paint_200:=[[100.075245015,1050.000097836,-0.000355856],[0,0.000512373,0.999999869,0
    ],[0,0,0,0],[9E+09,9E+09,9E+09,9E+09,9E+09,9E+09]];
```

```
    PROC mainm4()
    ENDPROC
    PROC Chapa_Panel_1()
        Loop:
        Reset DOPintou;
        IF TestDI (DIIniciar) THEN
            !WaitDI DIIniciar,1;
            PaintL Paint_10,v800,z100,ROBOBEL926_T_TD_150\WObj:=Workobject_Chapa;
            SetBrush 3\Y:=-100;
            SetBrush 1\Y:=900;
            PaintL Paint_40,v800,z100,ROBOBEL926_T_TD_150\WObj:=Workobject_Chapa;
            PaintL Paint_50,v800,z100,ROBOBEL926_T_TD_150\WObj:=Workobject_Chapa;
            SetBrush 3\Y:=900;
            SetBrush 1\Y:=-100;
            PaintL Paint_80,v800,z100,ROBOBEL926_T_TD_150\WObj:=Workobject_Chapa;
            PaintL Paint_90,v800,z100,ROBOBEL926_T_TD_150\WObj:=Workobject_Chapa;
            SetBrush 3\Y:=-100;
            SetBrush 1\Y:=900;
            PaintL Paint_120,v800,z100,ROBOBEL926_T_TD_150\WObj:=Workobject_Chapa;
            PaintL Paint_130,v800,z100,ROBOBEL926_T_TD_150\WObj:=Workobject_Chapa;
            SetBrush 3\Y:=900;
            SetBrush 1\Y:=-100;
            PaintL Paint_160,v800,z100,ROBOBEL926_T_TD_150\WObj:=Workobject_Chapa;
            PaintL Paint_170,v800,z100,ROBOBEL926_T_TD_150\WObj:=Workobject_Chapa;
            SetBrush 3\Y:=-100;
            SetBrush 1\Y:=900;
            PaintL Paint_200,v800,z100,ROBOBEL926_T_TD_150\WObj:=Workobject_Chapa;
            Set DOPintou;
            WaitTime 2;
        ENDIF
        GOTO Loop;
    ENDPROC
ENDMODULE
```

```
MODULE m4
    LOCAL CONST robtarget
Paint_10:=[[498.743494875,-249.999639638,-0.000355856],[0,0.000512373,0.999999869,0],[-1,1,-2,0],[9E+09
,9E+09,9E+09,9E+09,9E+09,9E+09]];
    LOCAL CONST robtarget
Paint_40:=[[500.075664199,1050.000097836,-0.000355856],[0,0.000512373,0.999999869,0],[0,0,-1,0],[9E+09
,9E+09,9E+09,9E+09,9E+09,9E+09]];
    LOCAL CONST robtarget
Paint_50:=[[400.075559403,1050.000097836,-0.000355856],[0,0.000512373,0.999999869,0],[0,0,-1,0],[9E+09
,9E+09,9E+09,9E+09,9E+09,9E+09]];
    LOCAL CONST robtarget
Paint_80:=[[398.743390079,-249.999639638,-0.000355856],[0,0.000512373,0.999999869,0],[-1,1,-2,0],[9E+09
,9E+09,9E+09,9E+09,9E+09,9E+09]];
    LOCAL CONST robtarget
Paint_90:=[[298.743285283,-249.999639638,-0.000355856],[0,0.000512373,0.999999869,0],[-1,1,-2,0],[9E+09
,9E+09,9E+09,9E+09,9E+09,9E+09]];
    LOCAL CONST robtarget
Paint_120:=[[300.075454607,1050.000097836,-0.000355856],[0,0.000512373,0.999999869,0],[0,0,0,0],[9E+09
,9E+09,9E+09,9E+09,9E+09,9E+09]];
    LOCAL CONST robtarget
Paint_130:=[[200.075349811,1050.000097836,-0.000355856],[0,0.000512373,0.999999869,0],[0,0,0,0],[9E+09
,9E+09,9E+09,9E+09,9E+09,9E+09]];
    LOCAL CONST robtarget
Paint_160:=[[198.743180487,-249.999639638,-0.000355856],[0,0.000512373,0.999999869,0],[-1,1,-2,0],[9E+0
9,9E+09,9E+09,9E+09,9E+09,9E+09]];
    LOCAL CONST robtarget
Paint_170:=[[98.743075691,-249.999639638,-0.000355856],[0,0.000512373,0.999999869,0],[-1,1,-2,0],[9E+09
,9E+09,9E+09,9E+09,9E+09,9E+09]];
    LOCAL CONST robtarget
Paint_200:=[[100.075245015,1050.000097836,-0.000355856],[0,0.000512373,0.999999869,0],[0,0,0,0],[9E+09
,9E+09,9E+09,9E+09,9E+09,9E+09]];
    PROC mainm4()

    ENDPROC
    PROC Chapa_Panel_1()
        Loop:
        Reset DOPintou;
        IF TestDI (DIIniciar) THEN
            !WaitDI DIIniciar,1;
            PaintL Paint_10,v800,z100,ROBOBEL926_T_TD_150\WObj:=Workobject_Chapa;
```

```
        SetBrush 3\Y:=-100;
        SetBrush 1\Y:=900;
        PaintL Paint_40,v800,z100,ROBOBEL926_T_TD_150\WObj:=Workobject_Chapa;
        PaintL Paint_50,v800,z100,ROBOBEL926_T_TD_150\WObj:=Workobject_Chapa;
        SetBrush 3\Y:=900;
        SetBrush 1\Y:=-100;
        PaintL Paint_80,v800,z100,ROBOBEL926_T_TD_150\WObj:=Workobject_Chapa;
        PaintL Paint_90,v800,z100,ROBOBEL926_T_TD_150\WObj:=Workobject_Chapa;
        SetBrush 3\Y:=-100;
        SetBrush 1\Y:=900;
        PaintL Paint_120,v800,z100,ROBOBEL926_T_TD_150\WObj:=Workobject_Chapa;
        PaintL Paint_130,v800,z100,ROBOBEL926_T_TD_150\WObj:=Workobject_Chapa;
        SetBrush 3\Y:=900;
        SetBrush 1\Y:=-100;
        PaintL Paint_160,v800,z100,ROBOBEL926_T_TD_150\WObj:=Workobject_Chapa;
        PaintL Paint_170,v800,z100,ROBOBEL926_T_TD_150\WObj:=Workobject_Chapa;
        SetBrush 3\Y:=-100;
        SetBrush 1\Y:=900;
        PaintL Paint_200,v800,z100,ROBOBEL926_T_TD_150\WObj:=Workobject_Chapa;
        Set DOPintou;
        WaitTime 2;
      ENDIF
      GOTO Loop;
   ENDPROC
ENDMODULE
```

9. Apresentação no simulador RobotStudio.

https://drive.google.com/file/d/1zstOEHBIQAUVkL-Bgukgm8H2yTmXNBz0/view?usp=sharing