ABB IRB 14000
Lab 3: Real-world demonstration of programs

Moritz Hangen

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Contents

List of Figures

1 Task

1.1 Robot station

Composition of the real robotic station with an explanation of the function of each part.

1.2 Kinematic scheme

A kinematic scheme of the robot.

1.3 Rapid programs

Your executable RAPID modules with an explanation of corrections you made in the module Description section.

1.4 Conclusion

Conclusions on the program implementation and modification

2 Solution

2.1 Robot station

In **??** three parts of the station are recognizable.

A: ABB IRB 14000 robot
B: FlexPendant robot controller
C: Lab computer connected to FlexPendant. From there, the program is transferred to the robot.

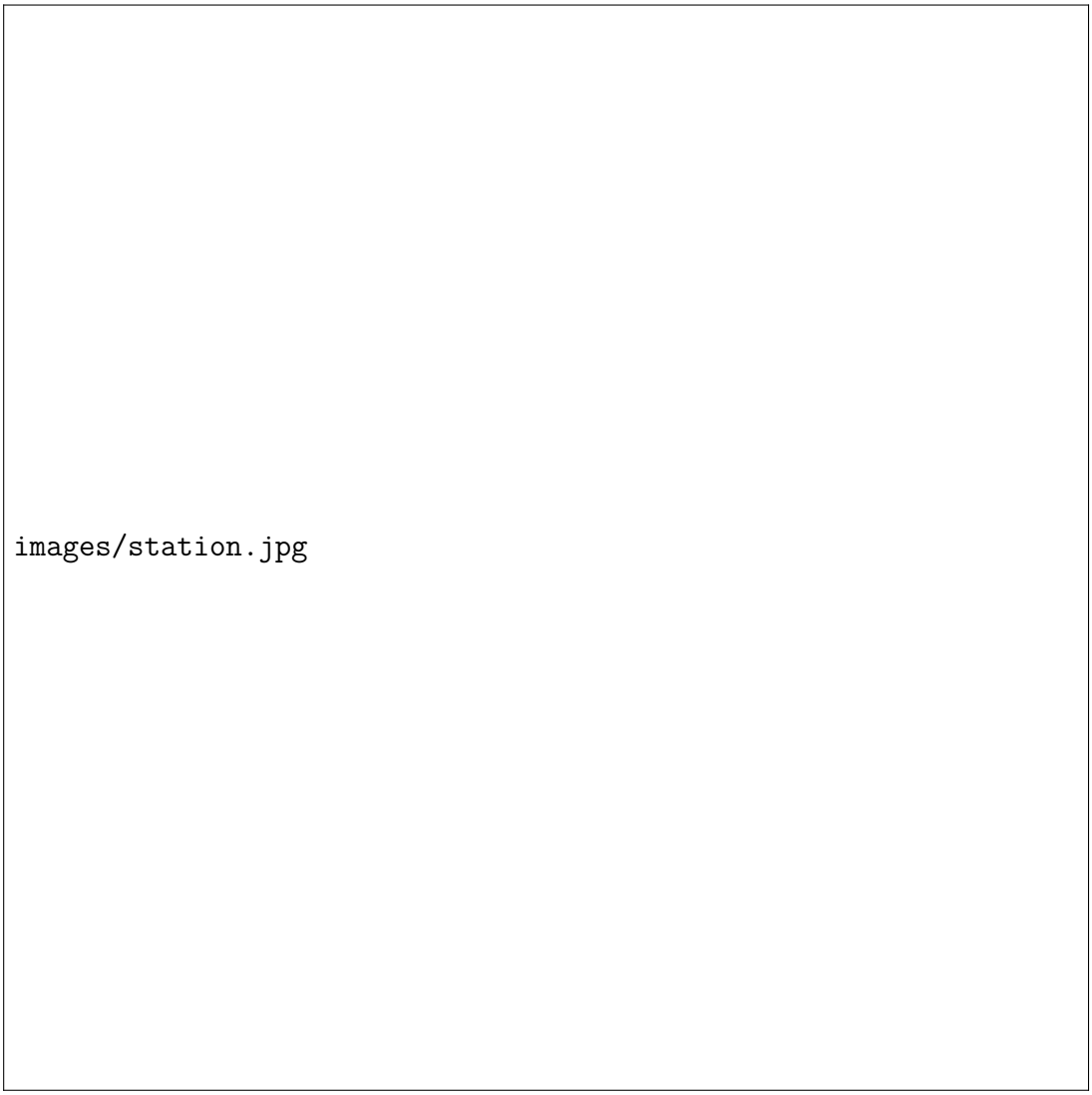

Figure 2.1: Robot station

2.2 Kinematic scheme

Figure 2.2: Kinematic scheme

2.3 Rapid programs

2.3.1 Lab 1

```
MODULE Module1
    CONST robtarget Target_10:=[
```

```
    [303.545214249,268.546383117,176.354764703],
    [0.248289114,0.071063484,-0.705346883,0.660142615],
    [-1,1,-1,4],
    [101.964431046,9E+09,9E+09,9E+09,9E+09,9E+09]];
    CONST robtarget Target_20:=[
    [21.36593139,268.546638743,176.354851894],
    [0.248289182,0.071063545,-0.705346956,0.660142505],
    [0,0,0,4],
    [101.964426452,9E+09,9E+09,9E+09,9E+09,9E+09]];
    CONST robtarget Target_30:=[
    [-190.054081581,268.546856338,176.355031984],
    [0.248289378,0.071063618,-0.70534694,0.66014244],
    [0,0,0,4],
    [101.964434885,9E+09,9E+09,9E+09,9E+09,9E+09]];
    !***********************************************************
    !
    ! Module:  Module1
    !
    ! Description:
    ! Changes to simulated program:
    ! - added for loop to repeat the program
    ! - move to home position in the end
    ! Author: Moritz Hangen
    !
    ! Version: 1.0
    !
    !***********************************************************

    PROC main()
        Path_50;
    ENDPROC
    PROC Path_50()
        VAR num a1;
        FOR a1 FROM 1 TO 10 do
        MoveJ Target_10,v800,z0,Camera\WObj:=wobj0;
        MoveJ Target_20,v800,z0,Camera\WObj:=wobj0;
        MoveJ Target_30,v800,z0,Camera\WObj:=wobj0;
        ENDFOR
        MoveAbsJ Left_homing, v100, z0, tool0;
```

```
    ENDPROC
ENDMODULE
```

```
MODULE Module1
    CONST robtarget Target_10:=[
    [-192.744347052,-344.762328588,176.645220079],
    [0.071063437,0.248289099,-0.66014254,0.705346963],
    [0,0,0,4],
    [-101.964428741,9E+09,9E+09,9E+09,9E+09,9E+09]];
    CONST robtarget Target_20:=[
    [22.12533699,-344.762515467,176.645274956],
    [0.071063524,0.248289281,-0.660142448,0.705346977],
    [0,0,0,4],
    [-101.964433448,9E+09,9E+09,9E+09,9E+09,9E+09]];
    CONST robtarget Target_30:=[
    [198.587315564,-344.762689927,176.645294354],
    [0.071063631,0.248289428,-0.660142371,0.705346986],
    [0,0,1,4],
    [-101.964427477,9E+09,9E+09,9E+09,9E+09,9E+09]];
    !***********************************************************
    !
    ! Module:  Module1
    !
    ! Description:
    ! Changes to simulated program:
    ! - added for loop to repeat the program
    ! - move to home position in the end
    ! Author: Moritz Hangen
    !
    ! Version: 1.0
    !
    !***********************************************************

    PROC main()
        Path_20;
    ENDPROC
    PROC Path_20()
        VAR num a1;
        FOR a1 FROM 1 TO 10 do
        MoveJ Target_10,v800,z0,Camera\WObj:=wobj0;
```

```
        MoveJ Target_20,v800,z0,Camera\WObj:=wobj0;
        MoveJ Target_30,v800,z0,Camera\WObj:=wobj0;
        ENDFOR
        MoveAbsJ Right_homing, v100, z0, tool0;
        Stop;
    ENDPROC
ENDMODULE
```

2.3.2 Lab 2

```
MODULE Module1
    CONST robtarget Target_10:=[
    [82.500049925,27.500150805,199.99990182],
    [0.11577319,0.99150356,-0.058906249,-0.006878385],
    [-1,2,-3,4],
    [108.949984802,9E+09,9E+09,9E+09,9E+09,9E+09]];
    CONST robtarget Target_20:=[
    [82.500038549,27.500203243,29.999906438],
    [0.115773155,0.991503566,-0.058906221,-0.006878329],
    [-1,2,-2,4],
    [108.949988939,9E+09,9E+09,9E+09,9E+09,9E+09]];
    CONST robtarget Target_30:=[
    [82.500049925,27.500150805,199.99990182],
    [0.11577319,0.99150356,-0.058906249,-0.006878385],
    [-1,2,-3,4],
    [108.949984802,9E+09,9E+09,9E+09,9E+09,9E+09]];
    CONST robtarget Target_40:=[
    [192.500087119,82.500184655,199.999854372],
    [0.115773105,0.991503575,-0.058906174,-0.006878377],
    [-1,2,-2,4],
    [108.949987701,9E+09,9E+09,9E+09,9E+09,9E+09]];
    CONST robtarget Target_50:=[
    [192.500042059,82.500237163,29.999867372],
    [0.115773057,0.991503578,-0.058906219,-0.006878363],
    [-1,2,-2,4],
    [108.949987316,9E+09,9E+09,9E+09,9E+09,9E+09]];
    CONST robtarget Target_60:=[
    [192.499932212,82.500276953,199.999726301],
    [0.115773277,0.991503513,-0.058906844,-0.006878673],
    [-1,2,-2,4],
```

```
31      [108.950009518,9E+09,9E+09,9E+09,9E+09,9E+09]];^
32
33      !***********************************************************
34      !
35      ! Module:  Module1
36      !
37      ! Description:
38      !   Variant Nr. 5
39      ! Changes to simulation:
40      ! - removed commented out gripper control
41      ! - stop in home position
42      ! Author: Moritz Hangen
43      !
44      ! Version: 1.0
45      !
46      !***********************************************************
47      PROC main()
48          g_Init;
49          g_Calibrate\Grip;
50          Path_10;
51          MoveAbsJ Left_homing, v100, z0, tool0;
52          stop;
53          ENDPROC
54          PROC Path_10()
55          MoveJ Target_10, v400, fine, Servo\WObj:=UCS;
56          WaitTime \InPos,0;
57          g_MoveTo 25;
58          MoveJ Target_20, v400, fine, Servo\WObj:=UCS;
59          WaitTime \InPos,0;
60          g_GripIn;
61          MoveJ Target_30, v400, fine, Servo\WObj:=UCS;
62          MoveJ Target_40, v400, fine, Servo\WObj:=UCS;
63          MoveJ Target_50, v400, fine, Servo\WObj:=UCS;
64          WaitTime \InPos,0;
65          g_MoveTo 25;
66          MoveJ Target_60, v400, fine, Servo\WObj:=UCS;
67          WaitTime \InPos,0;
68          g_MoveTo 0;
69      ENDPROC
```

```
70 ENDMODULE
```

2.4 Conclusion

To adapt the simulated programs to the real robot, the main change that has been made was ensuring a similar starting position between runs. For that, the robot is always returned to its home position after each program.

After that, the simulated programs had to be tested with slow speed to make sure the gripper does not hit the table and the preconfigured targets were correct.
Finally, it was a very rewarding experience to see the simulated programs working on the real robot.