

Help sheet 7

Using CARTESIAN mode in 2-D planes.

Use of ALIGN mode.

1. Put the robot in a suitable starting position for this demonstration. Type HOME and CARTESIAN then in ROBWIN click robot, Cartesian absolute move. Send robot to, say X=0, Y=250mm, Z=-100mm, wrist pitch=90 degrees, wrist rotation=0 as in fig.1. Click MOVE. The robot should look something like fig. 2:

fig. 1

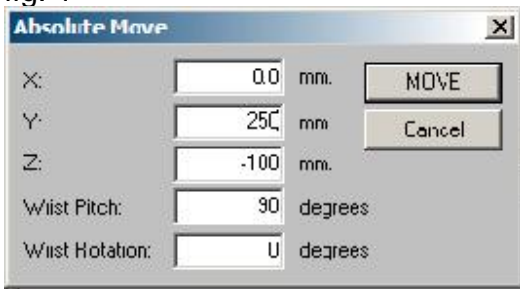


fig. 2



2. Now move the robot sideways using the communication window. Enter 2000 2500 -1000 MOVETO

You'll notice that as the waist rotates the shoulder, elbow and hand have all had to adjust to keep the gripper at the same Y distance. You'll also notice that the wrist has rotated with the waist as in fig.3.

3. The angle of the wrist is still zero but to the arm not to the real world. To make it zero to the X axis enter

ALIGN

as in fig 4.

fig.3



fig.4



Help sheet 7

4. Now move the robot to the other side. Enter
`-2000 2500 -1000 MOVETO`

The wrist rotates the other way to hold zero angle to the X axis as in fig. 5

5. Try moving the robot down 50mm, enter
`0 0 -500 MOVE`

The hand remains vertical and the wrist remains at the same angle to the X axis as in fig. 6
fig.5

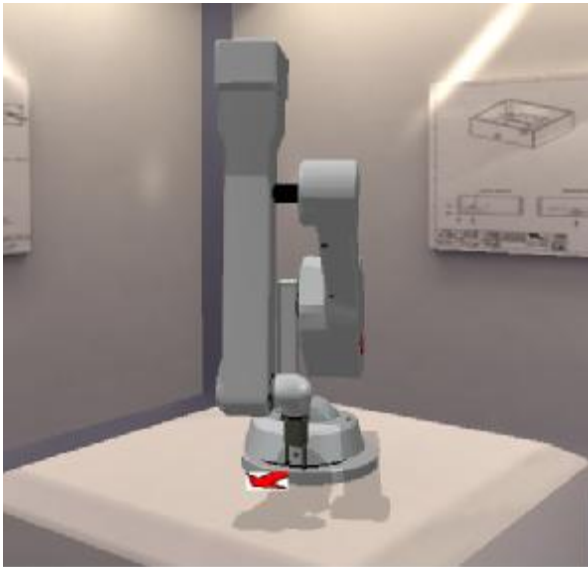


fig.5



fig.6

From this you can see that moving the robot left or right, up or down, the wrist will hold a constant attitude to the X-Y and Z axes.

Help sheet 7

Using TOOL-LENGTH

1. Return to starting position as in fig.1. In ROBWIN click robot, Cartesian absolute move. Send robot to, say X=0, Y=250mm, Z=-100mm, wrist pitch=90 degrees, wrist rotation=0. Click MOVE.
2. Bring the hand up to level. In ROBWIN click robot, Cartesian absolute move. Change wrist pitch to 0 degrees. The hand is now level but the gripper or your end effector is no longer at the chosen Y distance (fig. 7).



Fig. 7

3. Measure the distance from the center of the wrist/hand joint and the tip of the gripper or centerline of your end effector. Suppose this is, say 100mm. Enter 1000 TOOL-LENGTH !

4. Now click robot, Cartesian abs. Move, and just click ok
The robot should pull back so that the gripper is over the chosen position, as in fig.8.



fig. 8



fig. 9

5. Move the robot sideways with
`2000 2500 -1000 MOVETO`

Even though the hand has to point in a different direction the gripper (or your end effector) will still be on the same Y-distance line. The robot should look as in fig. 9:

How to create a 2-D matrix

1. Restore the robot to a suitable starting position for the demonstration as in fig.1
2. Click the J (jog) button and use the teach pad in Z axis only to move the gripper down to bench level as in fig. 6.
3. Mark out or visualize a 3 x 2 matrix as in fig. 10



fig. 10

4. Find the routes box (assuming you have the project open) and click New. Create a new route called, say TRAY as a Cartesian Grid, 3 columns and 2 rows as in fig.11. Click OK and you should see a further box as in fig. 12

fig.11

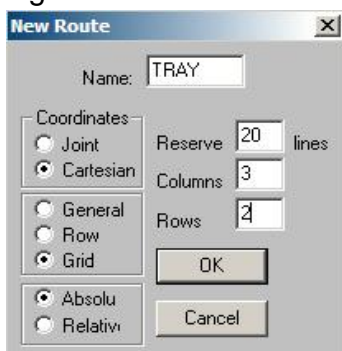
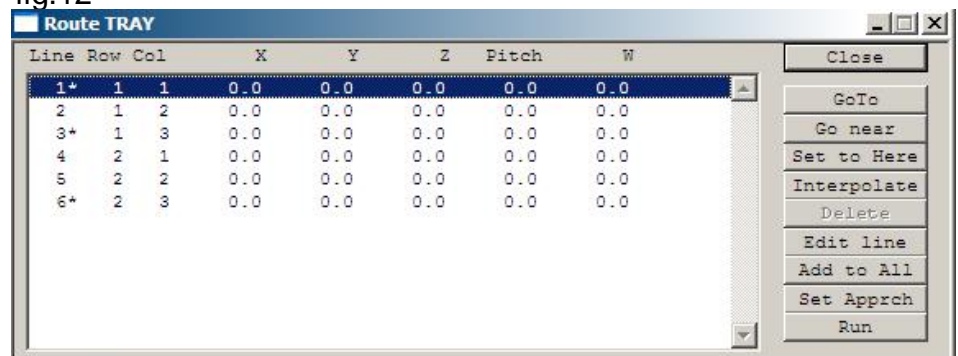


fig.12



5. Assuming the robot is in the correct position (if not use Jog to adjust it) and with line 1 highlighted click 'set to here'.

Help sheet 7

6. Move the robot to the next position as indicated on fig 10, position 3, using MOVETO commands or Jog. If using Jog press esc to exit the teachpad. Highlight line 3 and click 'set to here'.

7. Move the robot to position 6 as indicated in fig. 10. Highlight line 6 and click 'set to here'.

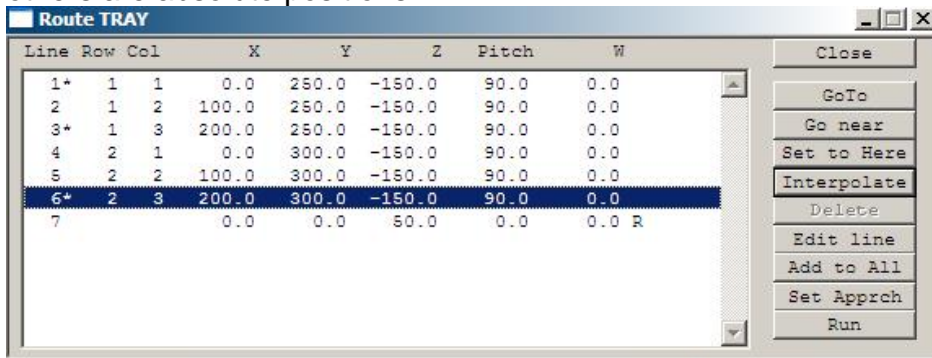
8. Click 'interpolate' and the remaining positions will be calculated.

9. You can optionally set an approach position which is common to all the other positions.

Move the robot vertically using Jog or for example using

```
0 0 500 MOVE
```

10. Click 'set approach'. You will now see an additional line as in fig.13, line 7 which shows the 50.0 move in Z and is marked with an R which means this is a relative position. All the others are absolute positions.



Line	Row	Col	X	Y	Z	Pitch	W
1*	1	1	0.0	250.0	-150.0	90.0	0.0
2	1	2	100.0	250.0	-150.0	90.0	0.0
3*	1	3	200.0	250.0	-150.0	90.0	0.0
4	2	1	0.0	300.0	-150.0	90.0	0.0
5	2	2	100.0	300.0	-150.0	90.0	0.0
6*	2	3	200.0	300.0	-150.0	90.0	0.0
7			0.0	0.0	50.0	0.0	0.0 R

Control panel buttons: Close, GoTo, Go near, Set to Here, Interpolate, Delete, Edit line, Add to All, Set Approach, Run

fig.13

11. A relative position may be added to an absolute position to create another absolute position. In this case the controller can add line 7 to any of the other 6 positions to achieve 6 new positions 50mm above the originals. You can go to any of these new positions with

```
n NEAR
```

where n is the line number or position number. The robot ends up 50mm higher than position n.

```
n INTO
```

The robot moves via the approach (NEAR) position into the target position.

```
N GOTO
```

The robot goes directly to the target position, could be unsafe to do this.

```
UP
```

The robot moves up from the target position to the approach position.

A typical routine to access all positions in a matrix:

The robot gets a tube from the tray, takes it to a filling station and replaces it in the tray:

```
: FILLTRAY
TRAY
7 1 DO
  I INTO ( go to each tray position in turn
  GRIP   ( and grip the tube
  UP     ( remove the tube
  FILLSTN ( go to where a dispenser is located )
  FILLUPTUBE ( hypothetical command to the dispenser )
  WITHDRAW ( away from the dispenser
  I INTO ( back to the tray, same position
  UNGRIP ( put the tube back in the tray
  UP
LOOP
;
```