

Exercise 2 - Using Offsets

Objectives:

- Create basic robot programs using offsets in simulation.
- Using routines.










Materials;

- Workspace LT[®] simulation software.
- Workspace LT[®] project file "Exercise 2 - Offsets.WSLT"
- Manual "Workspace LT[®] User Guide.pdf".



Helpful Hint; Before starting this exercise, review the User Guide sections;

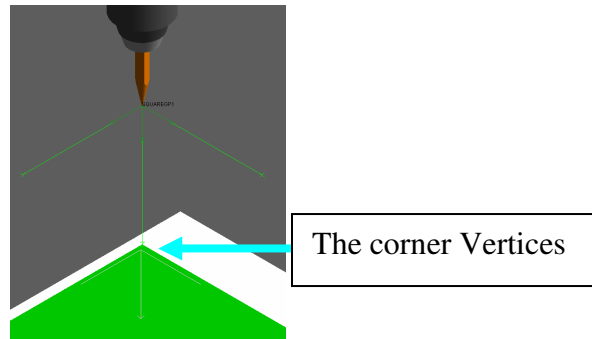
- 6.2 - Program structure
- 6.4 - Variable types and constants
- 7.1 - Move To.
- 7.2 - Move Away.
- 7.3 - Move Near.
- 7.5 - Move Relative.













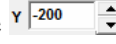












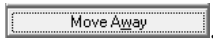


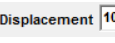




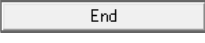
1) Procedure: Create a track using offsets



- Open Workspace LT simulation software. 
- Open  the project file "Exercise 2 - Offsets.WSLT".
- Visually determine where the tool frame or TCP is located. Activate the "Tool Frame Display". On the tool bar and using the mouse  select **Options**, from the drop down menu using the mouse  select **Robot Utilities** , from the slide out menu using the mouse  select **Robot options...**, Set the **Tool frame display** and accept .
- Place the U-Tool at the end of the pencil being held by gripper.
 - Place the mouse  over the pencil and press the left button twice, this will select the pencil and is now considered active.
 - The "Current Position" (CP) will be displayed at the end of the pencil with the Z direction of the CP pointing downward away from the face plate.
 - Located on the tool bar, Select  placing a tool frame at the end of the pencil.
 - The U-Tool is now located at the end of the pencil and in the same orientation as the CP.
- Test the tool frame by moving the robot using the follow CP Function.

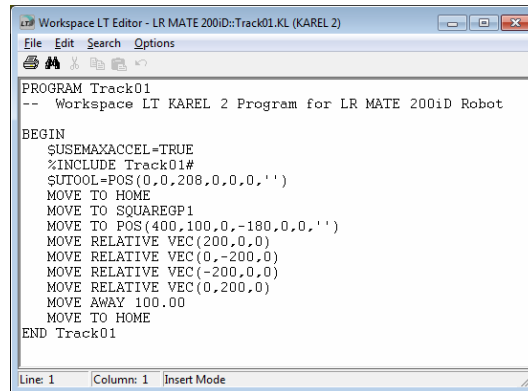
- i) Open the pendant by selecting the function **Pendant** located on the tool bar. The Pendant menu will appear.
 - ii) Using the mouse select the check box labeled **FollowCP**.
 - iii) Move the robot by placing the CP in front of the robot. Do this by placing the mouse near the EOAT gripper and clicking the left mouse button.
 - iv) The CP will move to this position and the Robot will follow placing the U-Tool at the new CP position.
- f) Add a track (Robot program) using the default "Track Name" and "Language".
- i) Hover the mouse over the **Tracks** folder below the robot name **LR MATE 200iD** in the **Simulation** window. Press the right mouse key.
 - ii) A user menu will appear, using the mouse select **Add Track**.
 - iii) A user menu will appear **Add Track**. Use the default values for "Track Name", "Track01" and "Language", "KAREL 2".
 - iv) Using the mouse select **OK**.
 - v) A new track **Track01.KL** will appear.
- g) Using the mouse select the GP labeled "HOME". Move the robot tool frame to this GP using **GP** icon located on the tool bar.
- h) Record a track.
- i) Using the mouse select the newly created track and press the right mouse button to open the track edit dialogue box. Select **Active** to activate **Track01.KL**.
 - ii) Repeat the mouse actions again to open the dialogue box a second time.
 - iii) Using the mouse select **Record Track**.
 - iv) When the menu box appears presenting the question "Are you sure you want to record over Track01.KL?", select "OK"
 - v) A warning message will open suggesting you save your model, select **Yes**, the project model and progress will be saved.
 - vi) The **Action** menu will appear, select **Begin**. The **Action** menu box will change to include more options.
- i) Using the mouse, Select the Pencil at the end of the robot to begin the procedure of record the U-Tool previously created.
- i) Select **Variables** to open the **Variables** Menu box.
 - ii) Select **Place \$UT00L at CP**. The tool frame will be recorded into your track and will be used to calculate robot positioning going forward.
- j) From the **Action** Menu box, select **Robot Move Commands**. Once selected the **Robot Move Commands** menu appears. This Exercise focuses on the **Move Away**, **Move Near**, **Move Relative** and **CP Move** (Move To) Instructions.
- k) Using the mouse, select the GP labeled "HOME". From the **Robot Move Commands** menu, select **GP Move**. The robot EOAT position at GP HOME is now recorded in the track file.

- l) Repeat the previous procedure to move the robot tool frame to the GP position labeled "SQUAREGP1" recording this position to the track file.
- m) Place the mouse  close to the corner of the green square directly below the pencil's current position and press the  key of the key board. This action selects the corner vertices positioning the CP at that location.



- n) From the **Robot Move Commands**  menu box select . A Confirm menu box will appear, select  to confirm this position. This position is now recorded in the track as a "Move To" command.
- o) From the **Robot Move Commands**  menu box select . The **RELATIVE**   dialog box will appear, enter the value  in the X field and select  to accept. This position is now recorded in the track as a "Relative VEC" move command.
- p) From the "Robot Move Commands" menu box select . The **RELATIVE**   dialog box will appear, enter the value  in the Y field and select  to accept. This position is now recorded in the track as a "Relative VEC" move command.
- q) From the "Robot Move Commands" menu box select . The **RELATIVE**   dialog box will appear, enter the value  in the X field and select  to accept. This position is now recorded in the track as a "Relative VEC" move command.
- r) From the "Robot Move Commands" menu box select . The **RELATIVE**   dialog box will appear, enter the value  in the Y field and select  to accept. This position is now recorded in the track as a "Relative VEC" move command. The first green square has now been traced by the robot's pencil.
- s) From the **Robot Move Commands**  menu box select . The **MOVE AWAY**   dialog box appears, enter  in the Displacement field and select  to accept. This position is now recorded in the track as a "MOVE AWAY" move command.
- t) Using the mouse , select the GP labeled "HOME". From the "Robot Move Commands" menu, select . The robot EOAT position at GP HOME is now recorded in the track file.
- u) From the **Action**  menu box select  to end recording.



- v) View the track "Track01.KL in the program editor, use the mouse , select the  **Track01.KL** twice in rapid successions. this will open the program editor. From the instructions above, the track program will list as below;







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Workspace LT Editor - LR MATE 200iD:Track01.KL (KAREL 2)
File Edit Search Options
PROGRAM Track01
-- Workspace LT KAREL 2 Program for LR MATE 200iD Robot
BEGIN
  $USEMAXACCEL=TRUE
  %INCLUDE Track01#
  $UTOOL=POS(0,0,208,0,0,0,')
  MOVE TO HOME
  MOVE TO SQUAREGP1
  MOVE TO POS(400,100,0,-180,0,0,')
  MOVE RELATIVE VEC(200,0,0)
  MOVE RELATIVE VEC(0,-200,0)
  MOVE RELATIVE VEC(-200,0,0)
  MOVE RELATIVE VEC(0,200,0)
  MOVE AWAY 100.00
  MOVE TO HOME
END Track01
Line: 1 Column: 1 Insert Mode

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- w) After reviewing the track, exit the program editor.
 x) Run the Track in simulation. Using the mouse , select the  "Run Simulation" menu button located on the tool bar at the top of the screen.

2) Procedure: Edit the robot track using offsets and a routine

- a) View the track "Track01.KL in the program editor. Use the mouse , select the  **Track01.KL** twice in rapid successions to open the track in the program editor.
 b) Edit Track01.KL as shown to include a routine.
 i) Note, the "MOVE TO POS(400,100,0,-180,0,0, ')" command has been replaced with "MOVE AWAY -100.00".
 ii) Add the "MOVE TO SQUAREGP2" command in the main program to add the tracing of the second green square.
 c) Run the Track in simulation to understand the routine and the value of using offsets. Using the mouse , select the  "Run Simulation" menu button located on the tool bar at the top of the screen.

