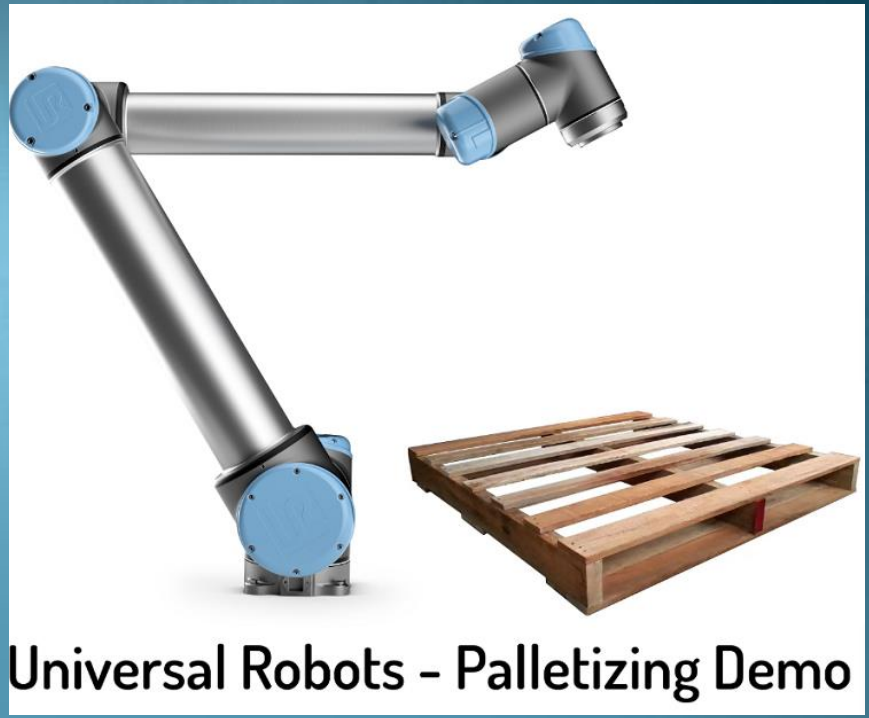
UNIVERSAL ROBOTS

Welcome to Universal Robots

Online Workshop on Palletizing



Trainer-
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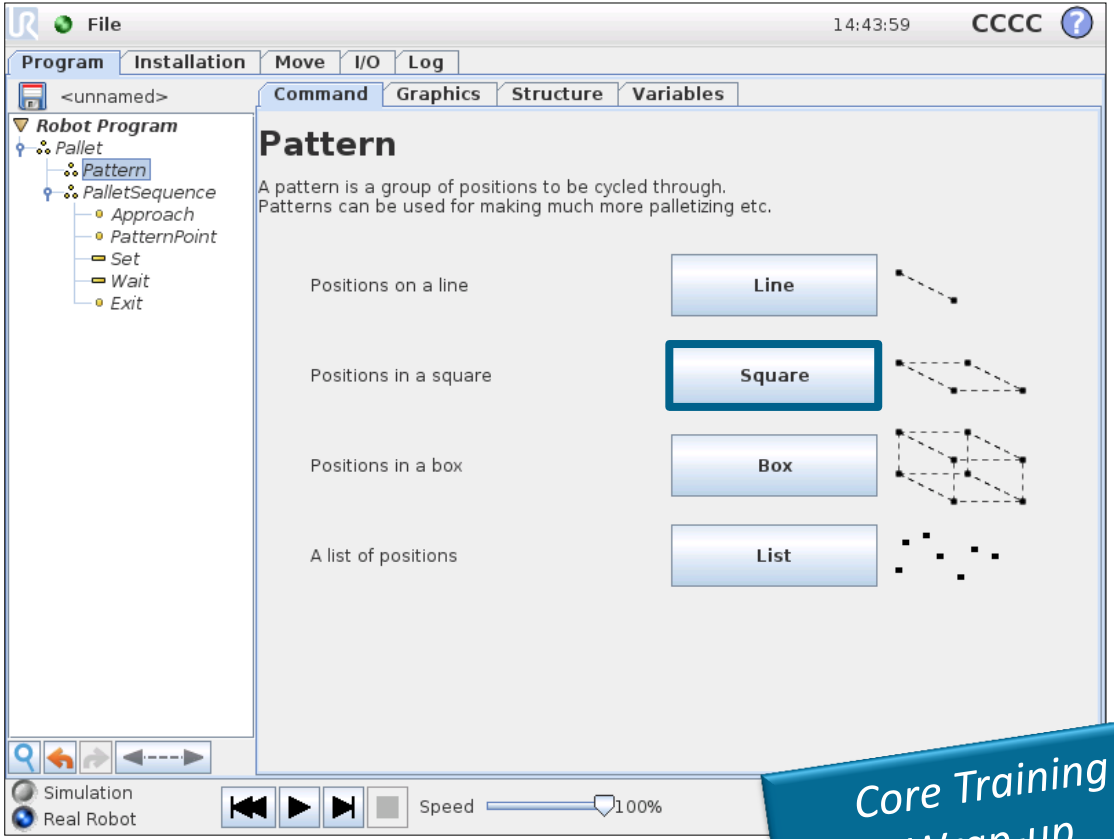
Simple Palletizing

- Pallet Wizard will help you when the orientation of Boxes are same through out the line, plane and Box.
- Some time many number of pallet wizards are required to teach the box positions depending upon their orientations/line or layer.

Pallet wizards

- Pattern
  - Determine palletizing pattern
  - Patterns
    - Line
    - Square
    - Box
    - List
- PalletSequence
  - What to do at each position in pattern

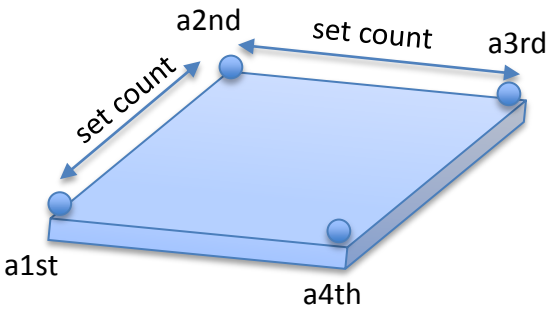


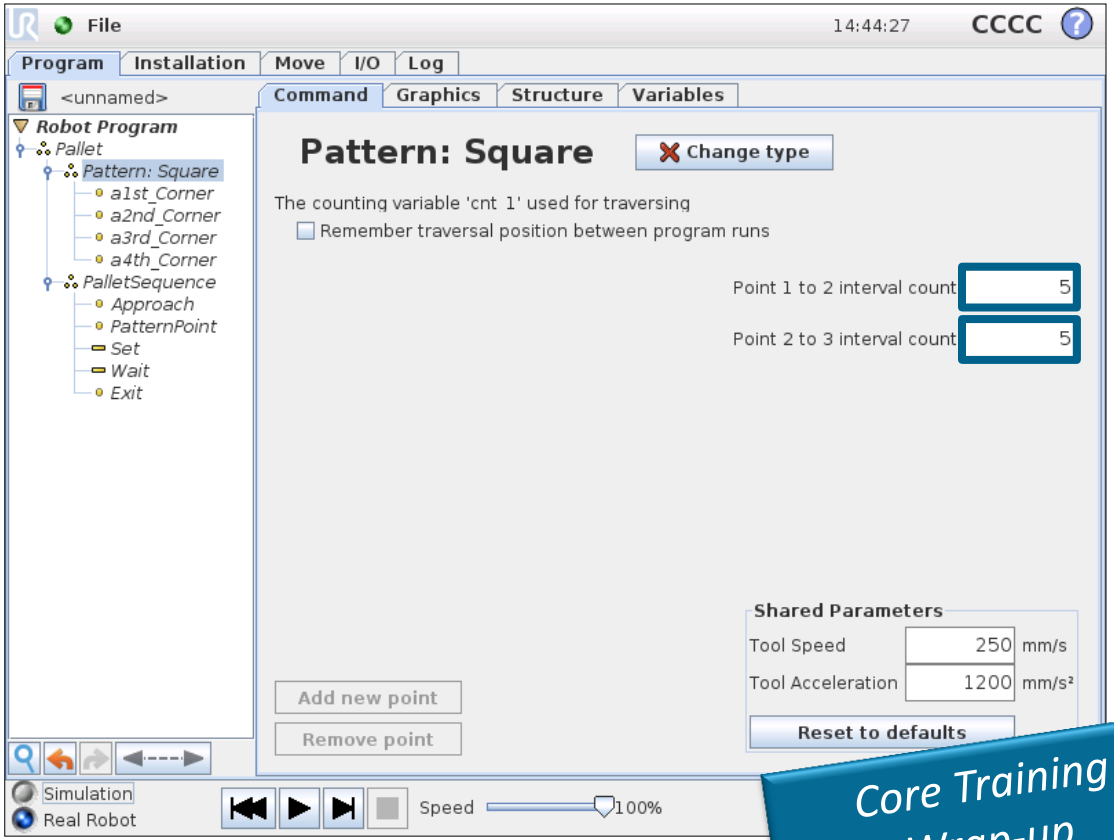
Core Training Wrap-up

Pattern: Square

- Pattern
  - Set pattern: Square
  - Set objects between
    - Point 1 to 2
    - Point 2 to 3
  - Teach the 4 corners

Pattern





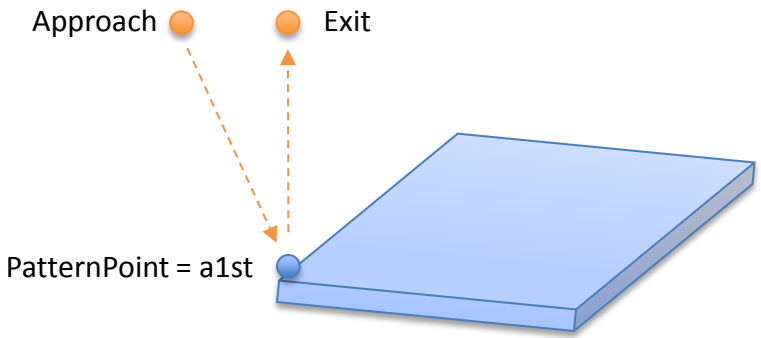
Core Training Wrap-up

PalletSequence

- PalletSequence
  - Teach points
    - PatternPoint
    - Approach
    - Exit
  - Define actions

```
Robot Program
   Pallet
      Pattern: Square
         a1st_Corner
         a2nd_Corner
         a3rd_Corner
         a4th_Corner
      PalletSequence
         Approach_1
         PatternPoint_1
         Set DO[0]  =True
         Wait 0.5
         Exit_1
```

PalletSequence



- Rule of thumb: teach PatternPoint as some points as a1st_Corner
- Save sample program as pallet.urp

Core Training Wrap-up

Cross Box Palletizing

- The way we generally follow to teach the boxes for a uneven pallet is all box teaching, which is tedious task and time consuming, even it will require frequent re-teachings in case of any change.
- The best way to teach this type of pallets is to use position offsets depending upon box dimensions.
- Benefit- No need to do teaching at Customer place, Very flexible, Universal program for all palletizing applications, Just do the mathematical changes and upload the working program.

In this Workshop we will use below programming features:

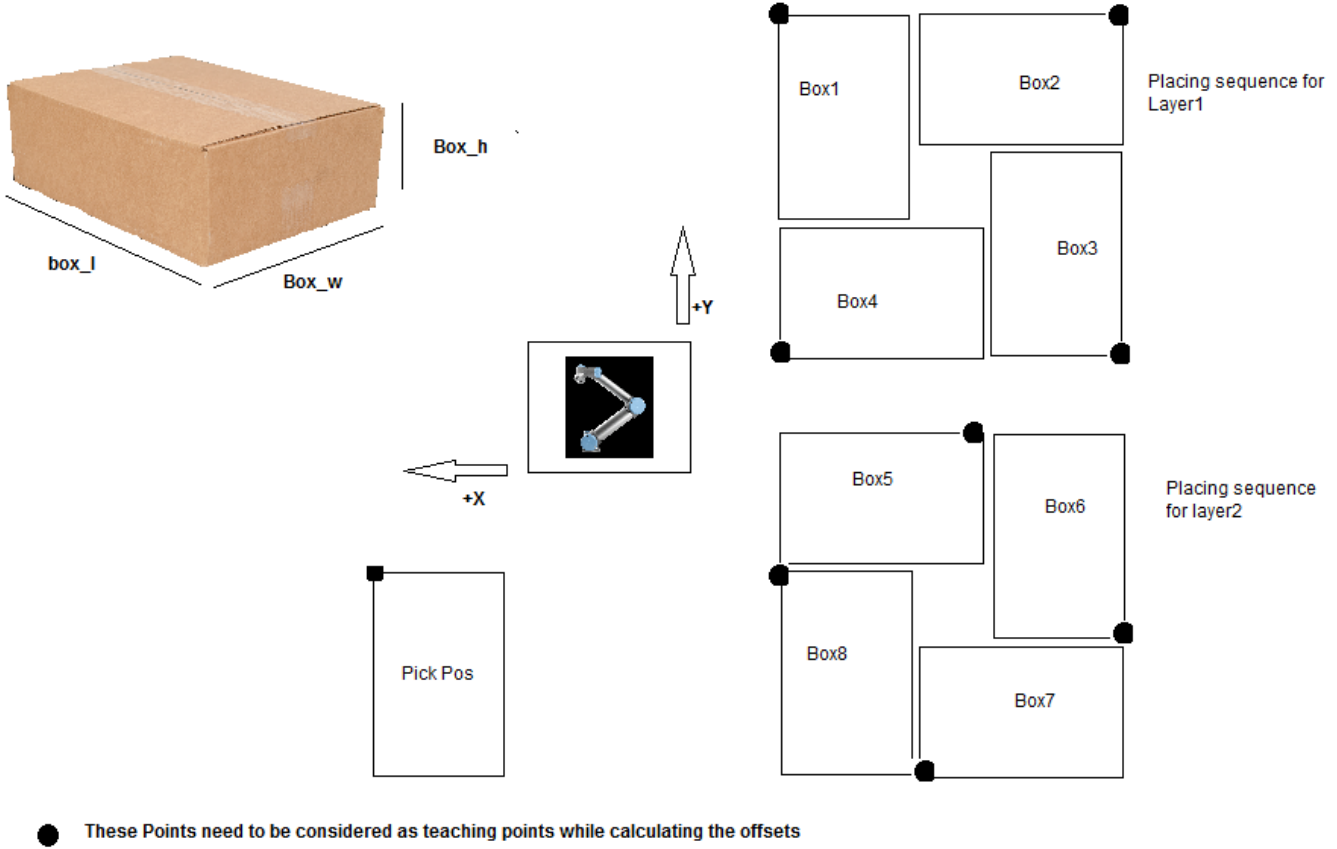
- Only 2 waypoints teaching is required
- Pick reference position
- Place reference position
- All other positions will be calculated in offsets.
- All offsets will be calculated in terms of box dimensions, if we change the box dimensions entire pallet will shift automatically and should be able to adjust all positions proportionally.
- No need to do teaching for Left & right pallet individually. Program itself should take care of both the pallets.

Description of Variables used:

1. dd: drop distance- distance between actual placing position and ppre placing position.
2. Box_l, Box_w, Box_h: Dimensions of Box in meter
3. Gap: distance to be maintained between two consecutive boxes in meter
4. Box1,2,3,4,5,6,7,8: Variable positions of Boxes pre offsetted with required position and orientation.
5. Box Number: Number of boxes placed

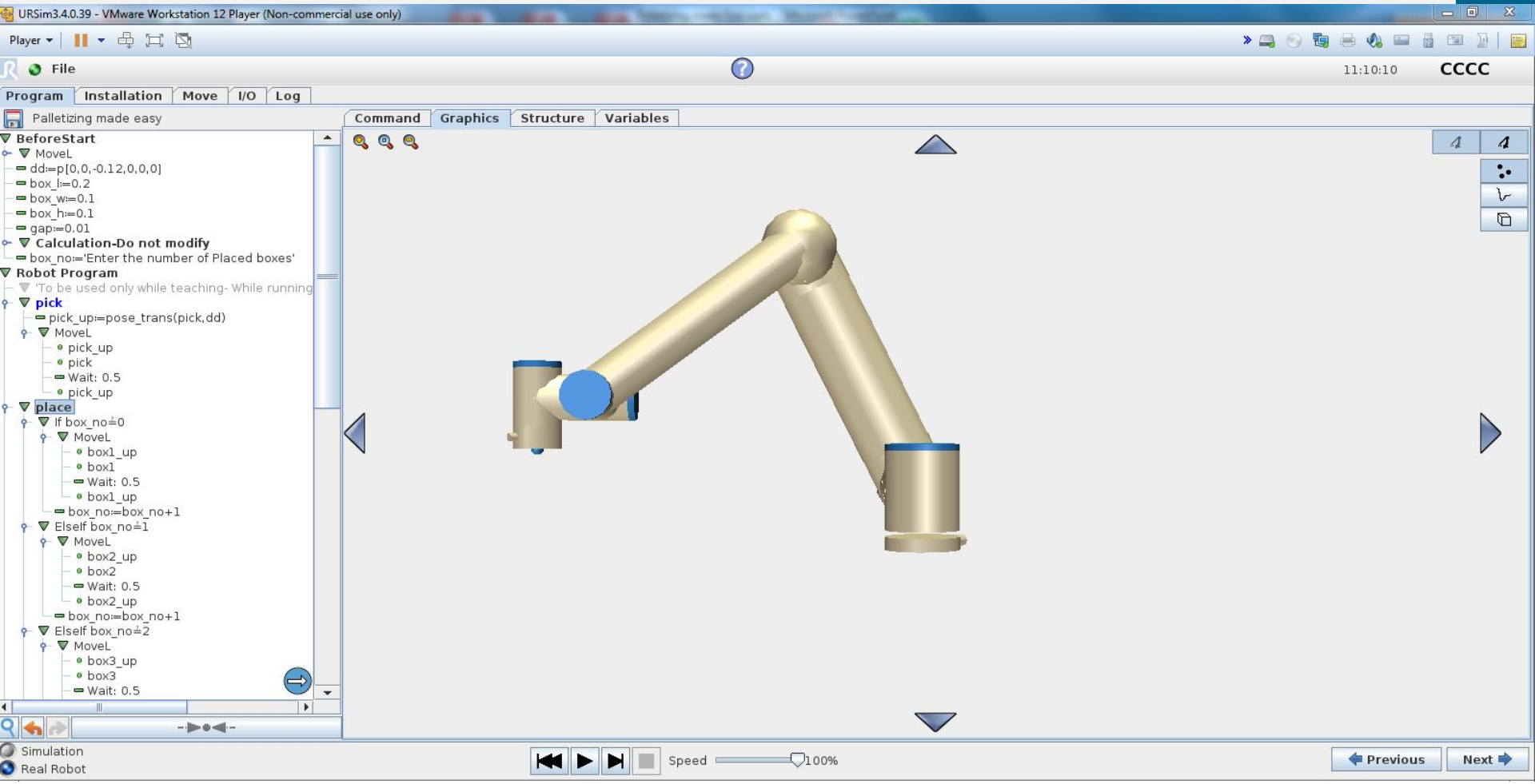
In next slide we will take an example of cross orientation of Pallet for 2 different layers and do the calculations for positioning.

Example :


Box_h
box_l
Box_w
+Y
+X
Pick Pos
Box1
Box2
Box3
Box4
Placing sequence for Layer1
Box5
Box6
Box7
Box8
Placing sequence for layer2
These Points need to be considered as teaching points while calculating the offsets

Calculation of variable position for all the boxes:

```
box1:=Place_ref
box1_up:=pose_trans(box1,dd)
box2:=pose_trans(box1,p[-(box_l+box_w+gap),0,0,0,0,d2r(90)])
box2_up:=pose_trans(box2,dd)
box3:=pose_trans(box2,p[0,-(box_l+box_w+gap),0,0,0,d2r(90)])
box3_up:=pose_trans(box3,dd)
box4:=pose_trans(box3,p[(box_l+box_w+gap),0,0,0,0,d2r(90)])
box4_up:=pose_trans(box4,dd)
box5:=pose_trans(box1,p[-(box_l-box_w),0,-box_h,0,0,d2r(90)])
box5_up:=pose_trans(box5,dd)
box6:=pose_trans(box2,p[0,-(box_l-box_w),-box_h,0,0,d2r(90)])
box6_up:=pose_trans(box6,dd)
box7:=pose_trans(box3,p[(box_l-box_w),0,-box_h,0,0,d2r(90)])
box7_up:=pose_trans(box7,dd)
box8:=pose_trans(box4,p[0,(box_l-box_w),-box_h,0,0,d2r(90)])
box8_up:=pose_trans(box8,dd)
```


URSim3.4.0.39 - VMware Workstation 12 Player (Non-commercial use only)
Player
File
11:10:10
CCCC
Program
Installation
Move
I/O
Log
Palletizing made easy
Command
Graphics
Structure
Variables
BeforeStart
MoveL
dd:=p[0,0,-0.12,0,0,0]
box_l:=0.2
box_w:=0.1
box_h:=0.1
gap:=0.01
Calculation-Do not modify
box_no:='Enter the number of Placed boxes'
Robot Program
'To be used only while teaching- While running
pick
pick_up:=pose_trans(pick,dd)
MoveL
pick_up
pick
Wait: 0.5
pick_up
place
If box_no≟0
MoveL
box1_up
box1
Wait: 0.5
box1_up
box_no:=box_no+1
Elseif box_no≟1
MoveL
box2_up
box2
Wait: 0.5
box2_up
box_no:=box_no+1
Elseif box_no≟2
MoveL
box3_up
box3
Wait: 0.5
Simulation
Real Robot
Speed
100%
Previous
Next

- **Sample Program is attached.**

Lab Exercise:

Create the modifications in the attached program to teach different matrix & different box sizes.

Thank You