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Date 21-01-08  
Version 1.1

**flexfactory**  
creating efficiency

Documentation of FeedWareCX robot sample program for use with Universal Robots

# FeedWareCX-Robot Sample Program

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# 1 Introduction

## 1.1 DISCLAIMER

All information in this documentation are subject to change and could be updated at any time. The sample programs can have flaws or damage your robot or surroundings, if not working with caution. flexfactory can't be held responsible for any damages resulting of using the robot sample program. Use the robot sample program at own risk.

## 1.2 SAFETY NOTES

All safety conditions of the robot provided by the company UR must be kept at any time using this program.

Important messages in this documentation are highlighted with a yellow exclamation mark symbol. This is how the symbol looks like:



### ATTENTION:

Please be extra aware of the information next to this symbol.

## 1.3 DOCUMENTATION REMARKS

This documentation includes information about the structure and the setup of the robot sample programs. After adding individual costumer programming, this program can run the automated calibration between UR Robots & flexfactory vision and the pick & place production. The program can only be used with our "AnyfeedWareCx". The sample program should vastly reduce costumers programming effort.



### ATTENTION:

Please be aware that the sample program can't be started without any additional programming. The code must be extended with the help of this document and by a professional UR-Programmer, before running it the first time.



### ATTENTION:

All programs should be tested in slow speed, especially when running a modified program for the first time.

The sample program was specifically made for UR3-Controllers. When using other controllers, additional adaption may be required.



This sample program is the foundation of the programming of Anyfeed-systems working with UR Robots. If needed it can be extended with additional coding for external operations. The initial code is not plug and play, it must be extended by trained professionals, the programming and our "AnyfeedwareCX" must be understood in order to successfully work with it. We recommend training in UR robots and flexfactory "AnyfeedwareCX" before using this program.

## 1.4 DOCUMENT-HISTORY

Version	Date	Author	Comment
1.0	20.07.06	Thomas Vogel	Make up
1.1	20.07.29	Dirk Stauffacher	Check and approval



# 2 Basics

## 2.1 OVERVIEW

Bevor starting with programming, make sure you have met all the related UR safety-requirements and have created the system according to the flexfactory "Anyfeeder/Camera guidelines". You can find the "Anyfeeder/Camera Guidelines" at the following Link: [ClickHere](#)

You receive two programs, one for the automated Calibration (named: «**calibration.urp**») and another for the automated pick and place production (named: «**pick.urp**»). Those two programs can be loaded in the robot with an USB stick connected to the UR-Panel. Before loading, we recommend to setup your robot and gripper.

## 2.2 PREPARATION

Robot and camera must be in the same Network to successfully communicate with each other.

In the **robot** the IP-Address can be changed in the **settings/system/network**

In the **camera** the IP-Address can be changed with the Cognex In-Sight Explorer in the menu **Sensor/Network Settings**. Alternatively, you can scan for cameras in every network and change IP-Address in the menu **System/add Sensor Device to network**.

## 2.3 SAMPLE PROGRAM INFORMATION

In this chapter you can find information about what to change and/or add to the code.  
Please read carefully.

### 2.3.1 Installation file

The installation file is specific to every robot and gripper, so it is not included in our sample program. Please make sure to setup this file with your individual robot and gripper before working with our code.

After the setup is done, you must change the following settings in the Robot installation file:

- The '**pick signal**' must be set to a requested digital output. This can be done in the menu **Installation/general/IO-Settings**. Please set «pick\_sig» on requested **DO[x]**.



### 2.3.2 Calibration file «anyfeed\_calibration.urp»

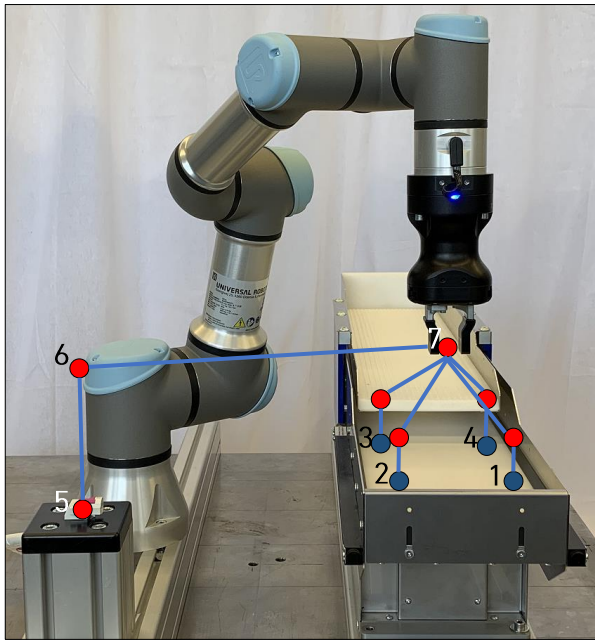
To use this program, it's required the Cognex camera has been set up, has a clear picture and the calibration part is taught-in.

The following lines must be changed/extended in the «anyfeed\_calibration.urp» code:  
(please be aware that this listing is sorted by the line number and not chronological.)

- Line 3 = implement individual gripper initialization
- Line 8 = change camera IP-Address, if needed
- Line 27 = type camera calibration job name in
- Line 81 = (FeedCenterPos) teach position in the center of the picking area  
⚠ This position must be higher (in Z) than the 4 positions «AboveCalPos»
- Line 82 = (AboveNestPos) teach position above the nest of the calibration part  
⚠ This position must be higher (in Z) than the edge of the feeders picking area.
- Line 83 = (NestPnPPos) teach nest Pick & Place position of the calibration part
- Line 216 = implement individual gripper open motion
- Line 218 = implement individual gripper close motion
- Line 224 = (AboveCalPos1) teach approach position directly above calibration position 1  
⚠ This position must be higher (in Z) than the edge of the feeders picking area.
- Line 226 = (CalPos1) at section «p[0,0,-0.0292,0,0,angle]» define gripper lowering distance (in Z) to calibration position 1 (all calibration points are usually on the feeder surface)  
⚠ This value is in meters!
- Line 231 = (AboveCalPos2) teach approach position directly above calibration position 2  
⚠ This position must be higher (in Z) than the edge of the feeders picking area.
- Line 233 = (CalPos2) at section «p[0,0,-0.0292,0,0,angle]» define gripper lowering distance (in Z) to calibration position 2 (all calibration points are usually on the feeder surface)  
⚠ This value is in meters!
- Line 240 = (AboveCalPos3) teach approach position directly above calibration position 3  
⚠ This position must be higher (in Z) than the edge of the feeders picking area.
- Line 242 = (CalPos3) at section «p[0,0,-0.0292,0,0,angle]» define gripper lowering distance (in Z) to calibration position 3 (all calibration points are usually on the feeder surface)  
⚠ This value is in meters!
- Line 249 = (AboveCalPos4) teach approach position directly above calibration position 4  
⚠ This position must be higher (in Z) than the edge of the feeders picking area.
- Line 251 = (CalPos4) at section «p[0,0,-0.0292,0,0,angle]» define gripper lowering distance (in Z) to calibration position 4 (all calibration points are usually on the feeder surface)  
⚠ This value is in meters!



Illustration of all positions:



- relative positions:

- (1) calibration position 1 = CalPos1
- (2) calibration position 2 = CalPos2
- (3) calibration position 3 = CalPos3
- (4) calibration position 4 = CalPos4

- real positions:

- (5) calibration part nest position = NestPos
- (6) Above c. part nest position = AboveNestPos
- (7) feeder center position = FeedCenterPos
- Above calibration position 1 = AboveCalPos1
- Above calibration position 2 = AboveCalPos2
- Above calibration position 3 = AboveCalPos3
- Above calibration position 4 = AboveCalPos4

INFO: These positions are visible in our UR calibration process example video  
This video can be downloaded with the following Link: [ClickHere](#)

Note for the calibration:





There are 4 different calibration position on the feeder. These positions should be as much as possible in every corner of the field of view. Where to set the first calibration position doesn't matter, as long as the positions get processed clock- or counterclockwise. For more details to our calibration, please refer to our Cognex-Robot communication & calibration manual. Link: [ClickHere](#)



### 2.3.3 Pick and place file «anyfeed\_pick.urp»

This program will only work, if the calibration process is correctly done. Furthermore, there must be a production part taught-in the camera for this program to work.

The following lines must be changed/extended in the «anyfeed\_pick.urp» code:  
(please be aware that this listing is sorted by the line number and not chronological.)

- Line 1: at «Init Variablen»: define "pickheight" (Picking height Z of the part on the feeder)  
 This value is in meters!
- Line 3: implement individual gripper initialization
- Line 5: teach robot home position  
 This position must be higher (in Z) than the edge of the feeders picking area.
- Line 11: change camera IP-Address, if needed
- Line 30: select camera job number or job name\*
- Line 128: at section ...,pick\_pos[2]+0.035,... define, **how much above the pick position** (in Z) a pickable part should be approached (in meters)  
(pick\_pos[2] is equivalent to "pickheight")  
 This value added with «pickheight» must be higher (in Z) than the edge of the feeders picking area.
- Line 134: define value "AbovePicPos". This is the relative height above the pick position when moving away from the feeder (relative to the pick position on the feeder surface, in Z)  
 This value added with «pickheight» must be higher (in Z) than the edge of the feeders picking area.
- Line 136: teach "OutOfFOV". A position where Robot arm and gripper are outside of the cameras field of view (see picture on next page)
- Line 184: implement individual gripper open motion
- Line 187: implement individual gripper close motion

\*The robot can open camera jobs with the command **SJ[ID]** (SJ = Set Job / ID = Number) or with the command **LF[Jobname]** (LF = Load File / Jobname = exact name of the job on the camera - string).  
When using command **SJ** all job names on the camera must begin with an individual number between 0...999 (see below example). Both methods are possible and can be used.

#### Example:

Camera Job name: 6\_connector.job

possible calls:  
- SJ6  
- LF6\_connector

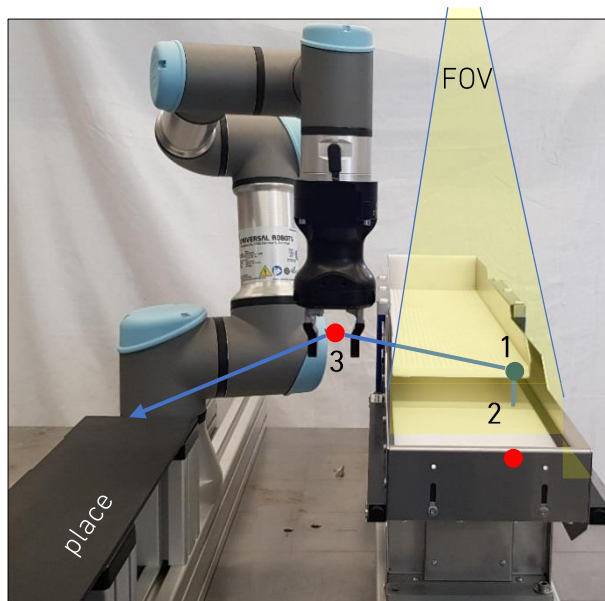
connector.job

possible call:  
- LFconnector





Example:



- relative position  
(1) AbovePicPos

- real positions  
(2) pick position: X/Y/Angle received from the camera. Z is always the same and is set in "pickheight"  
(3) OutOfFOV (outside of the field of view)

The place positions must be added machine specific.  
FOV = Field of view (camera)

