VALtrack for your tracking applications

Stäubli's conveyor tracking library VALtrack is a powerful solution with all the functionalities required to implement any kind of tracking application, from a simple pick and place application with one robot and one conveyor, to a complex application with multiple robots and multiple conveyors.

This solution is an open source VAL 3 library which is easily customizable to your needs.

Main functionalities:

- Menu guided interface (Wizard) for setup and calibration:
  - Calibration wizard to teach the conveyor geometry.
  - Assignment and parametrization of encoder and detection devices.
- Detection of objects on the conveyor with any type of detection device, like a simple ON/OFF sensor or a 2D or 3D vision system.
- Communication with any vision system over TCP/IP sockets.
- Load sharing between robots by queuing functionalities through TCP/IP sockets communication between robots.

Integration possibilities:

- Compatible with all Stäubli robot systems.
- Linear and circular conveyor.
- Multiple consecutive pick or place while tracking.
- Multiple conveyors per robot.
- Multiple robots per conveyor.
- Trajectory execution during tracking.
- Identification of multiple objects per detection to work with any type of pallet.

Queuing functionalities

The following queuing functionalities are already integrated in standard, they allow transferring tracking tasks from one robot system to the next one downstream on the line:

- **Overflow**

Objects out of reach located downstream from the robot are transferred to the next one downstream on the line. Allows each robot to handle as many objects as possible.

- **Bypass**

Every umpteenth object is transferred to the next one downstream on the line. Allows to have a predefined distribution of objects between all robots.

- **Area Distribution**

The robot works only on a portion of the conveyor's width. Objects out of this zone are transferred to the next one downstream on the line. Allows for example installing robots on both sides of a conveyor.

- **ID selection**

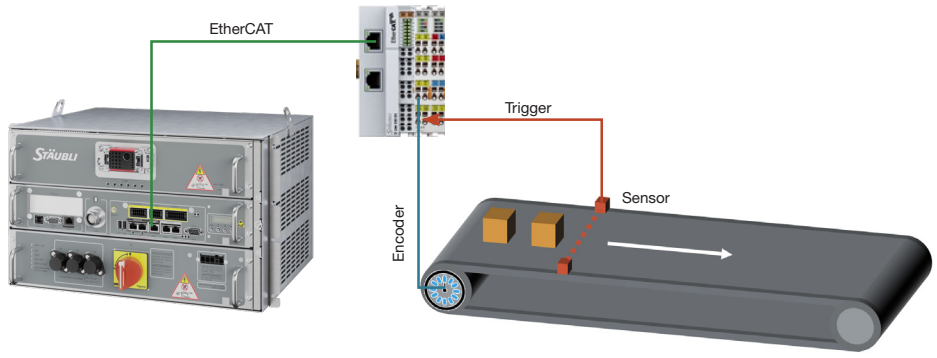
The robot works only with the selected object types (object ID), all other objects with different ID are transferred to the next one downstream on the line. Allows to share the load between robots depending on the object's type (object ID).

All queuing functionalities can also be combined with each other, distributing the load on the line(s) among several robots.

Hardware

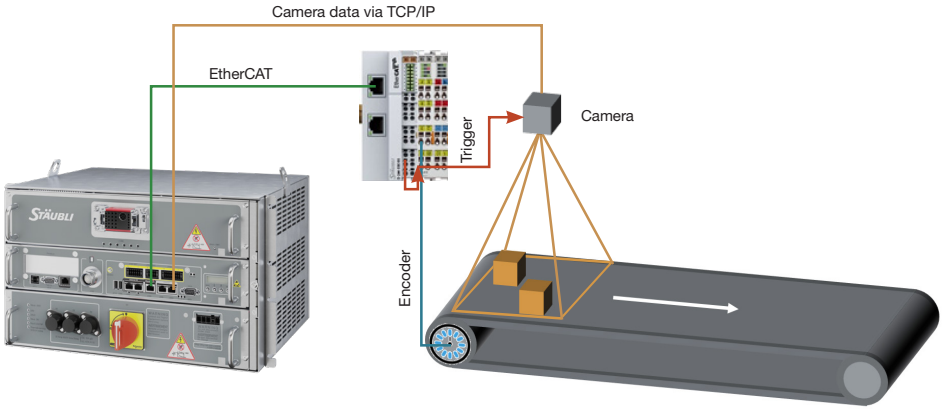
- Robot system = robot controller + robot arm.
- Encoder interface - for example using our Stäubli EtherCAT solution:
  - One EtherCAT coupler per robot controller with one encoder module per encoder.
  - Our encoder module interface is made for a 5 Volt incremental encoder with differential signals A, B and Z.
- VALtrack is ready to work with up to 4 conveyors (encoders) simultaneously, but the library could be customized to support more.

Tracking with sensor



- The objects have to be aligned on the conveyor.
- A simple ON/OFF sensor is used to trigger the encoder value on the encoder module.

Tracking with vision



- The objects can be spread out on the conveyor.
- Every x mm of conveyor motion (configurable) the CS9 is triggering the camera to take a picture and the encoder module to latch the current encoder value. One of the 4 digital outputs of the EtherCat coupler is used for that.
- Object data from camera is transfer by TCP/IP to CS9 controller.

Tracking quality

At any constant conveyor speed with a correct robot/conveyor calibration and encoder scale setup the precision of the pick and place is ±0.5 mm.

Speed (mm/s)	50	100	200	300	400	500
Precision (mm)	±0.5	±0.5	±0.5	±0.5	±0.5	±0.5

The resulting robot tracking precision during that speed changing phase for two different cases of conveyor acceleration or deceleration is written in the table below.

Conveyor speed (mm/s)	Conveyor acceleration (mm/s^2)	Convoyor deceleration (mm/s^2)	Resulting robot tracking precision (mm)
500	300		-2 / 0
500		300	0 / +2
500	150		-1,5 / 0
500		150	0 / +1,5