KPA Motion Control

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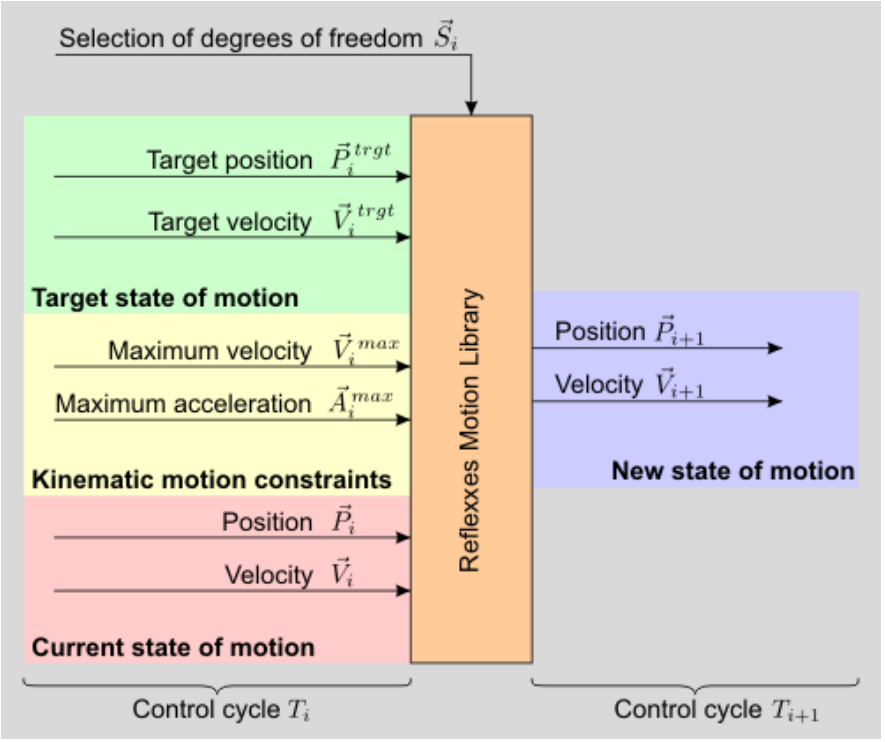
With the development of computer technology, the NC system has developed from the first hard-line NC system composed of digital logic circuit to Computer numerical control (computer numerical CONTROL,CNC) system. Compared with the hard-line NC system, the CNC system's control function is mainly implemented by software, and it can deal with the complicated information which the logic circuit is difficult to deal with, so it has high flexibility and higher performance.

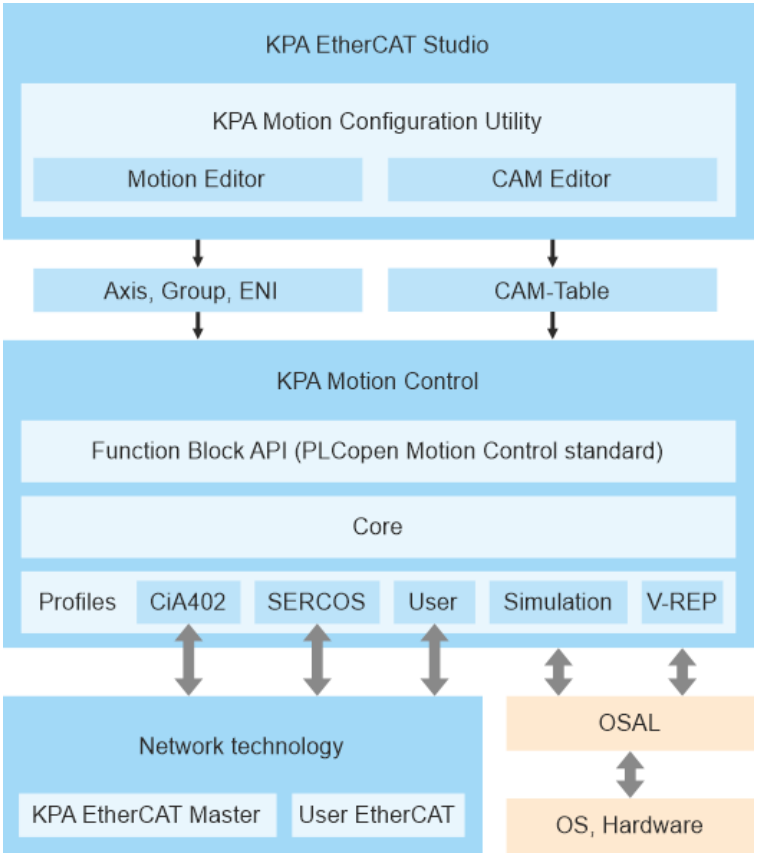


KPA Motion Control • Development Kit

KPA Motion Development Kit (MoDK) provides:

PLCopen compliant C/C++ functionality

- Administrative function blocks
- Single and multi-axis functional blocks for
  - point to point movement
  - synchronized multi-axis movement
  - touch probe, homing, …
- Integrated path optimization
- Unlimited command sequence to blend
- Single- and multi-tasking
- OSAL (Operating System Abstraction Layer):
  - INtime 6, Windows,
  - QNX 6.5/6.6, Linux, Xenomai…
- BUSAL (Fieldbus Abstraction Layer):
  - Ds402 (CiA402) drives
  - Sercos drives
  - …

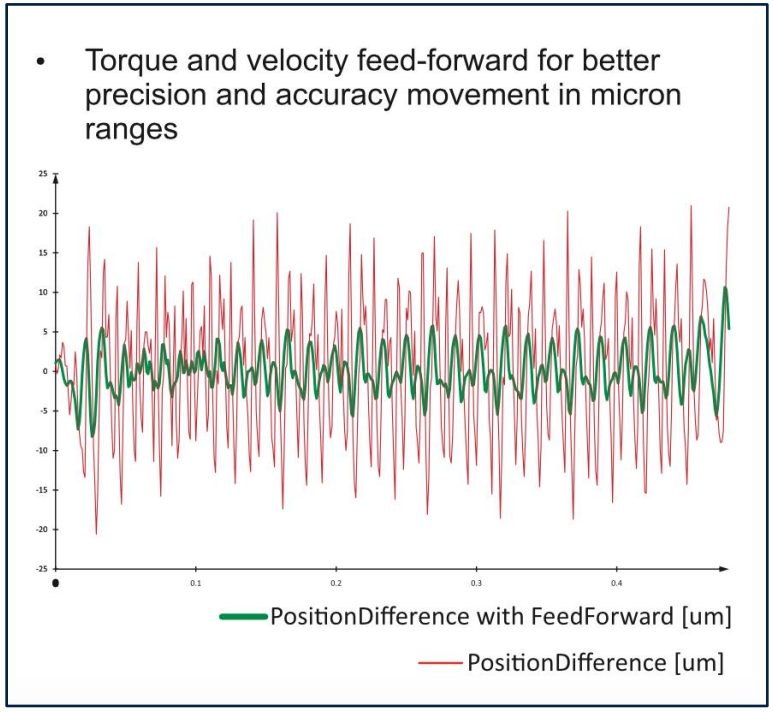


KPA Motion Control

KPA Motion Control generates optimized motion trajectory profile, so that systems can react instantaneously and deterministically to unforeseen sensor signals and events.

All motions are:

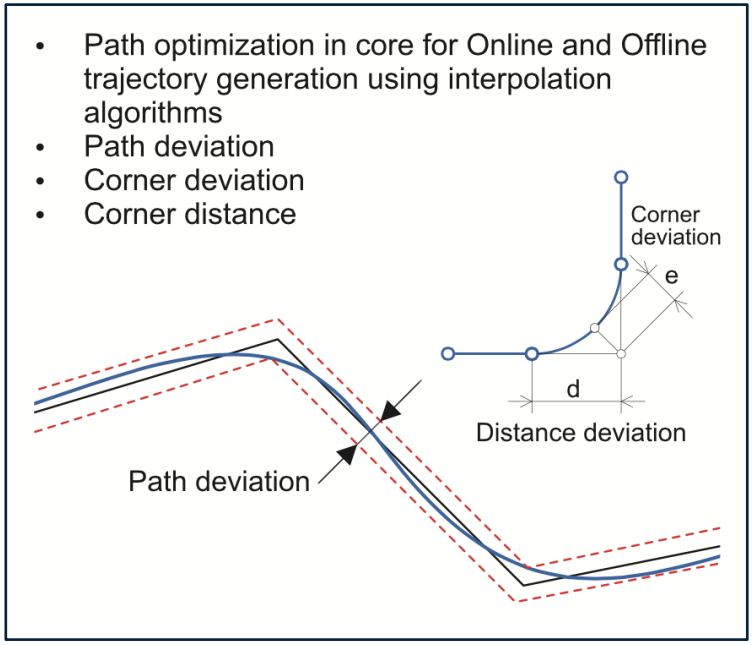
- Synchronized
- Time optimal and jerk-limited
- Instantaneous reactions are possible at any time
- Dynamics adjustments at any time for
  - limits and constraints
  - position, velocity and torque
- Feed forward for more precise movement
- Online trajectory and states monitoring
- Fault reactions and error handling



KPA Motion Control

KPA Motion Control supports:

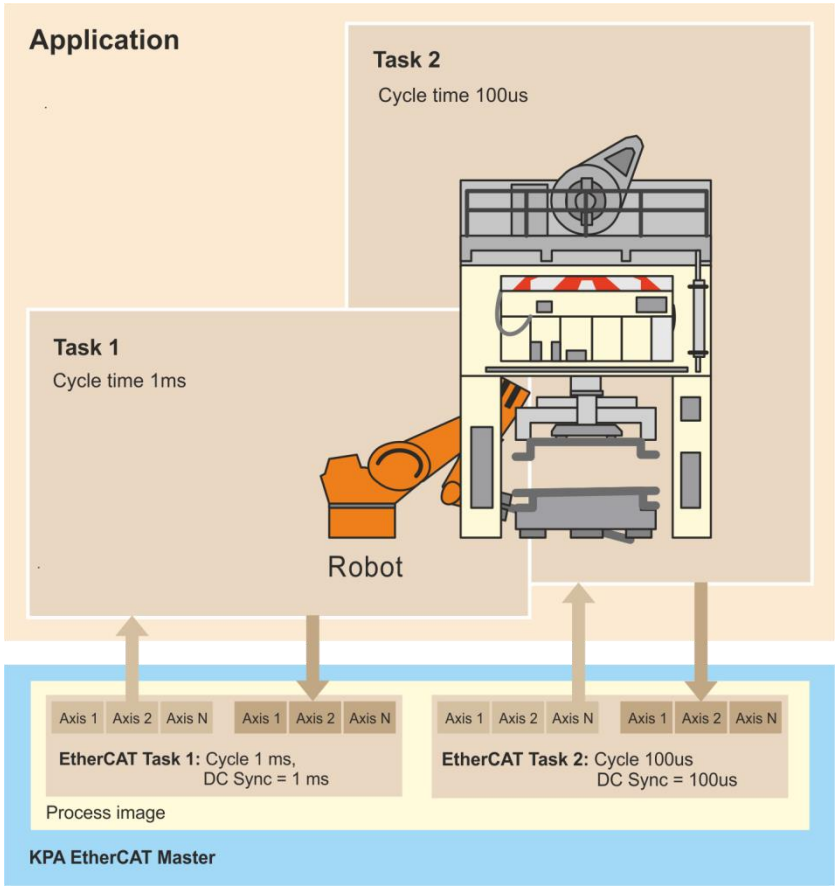
- Different control modes
  - Position Control, Velocity Control, Torque Control
- Various types of primitive interpolations
  - Linear, Circular, Helical
- Advanced capabilities of continuous command processing
- All blending modes according to PLCopen part 1/4
  - High, Low, Prev, Next, Buffered, Aborted
- All Corner Transitions according to PLCopen part 4



KPA Motion Control

KPA Motion Control supports:

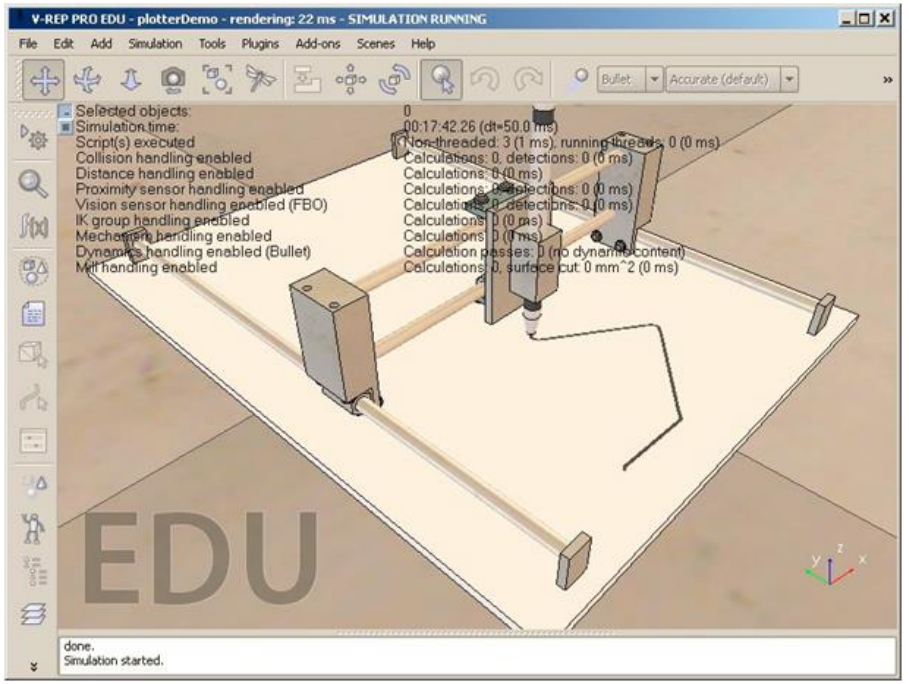
- Single-tasking
- Multi-tasking
  (several threads executed concurrently)
  - PI handling
  - path profile generation thread
  - updating thread
  - several (motion) threads



KPA Motion Control

KPA Motion Control supports:

- Different homing methods
- Gantry and gearing relations
- Modulo movement
- Touch probe
- Coordinate systems and transformations
- The robot simulator V-REP



KPA Motion Control

KPA Motion Control QA:

- What is the licensing model?
  - demo licenses, hardware bound runtime licenses, OEM Licenses
- Packages?
  - Point to point (P2P) → KPA LiM feature
  - Interpolation → KPA CoM feature (up to 3 axis coordinated motion:CoM2 and CoM3)
  - Kinematics → KPA KiM feature (4+ axis)
- Which Required Development packages?
  - MDK – EtherCAT **M**aster **D**evelopment **K**it
  - MoDK → **Mo**tion **D**evelopment **K**it
- Evaluation versions?
  - MoDK Trial Windows / Xenomai / Linux / QNX / …
- Extensions?
  - Through open interface SDK:
    - OSAL → Operation System abstraction layer – INtime, Linux, Xenomai, QNX…
    - BUSAL → Field Bus abstraction layer -- EtherCAT, Profinet, ..
    - Profiles → Ds402, Sercos, Vrep, Own
- Price?
  - quantity == how many machines per year ?
  - functionality == LiM ?, CoM ?

KPA Motion Control • Customers

KPA Motion Control Customers:

- Italy: ESA,
- Brasilia: VetorCNC
- France: BIO-RAD, Mecaoctet, Mecanumeric, STEPHANIX,..
- Germany: Liebherr, Schmoll, Atotech
- Switzerland: First EIE SA, Posalux
- India: Wisdomtech, Yantra Harvest, Precise automation, Tata Motors, ..
- Malaysia: Vitrox
- Korea: Genesem, Samsung
- Israel: Unitronics
- USA: WTC

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Thank you for your attention