Robot Programming System

Overview

The Trio Robot Programming System (RPS) is a sophisticated package of tools and software that can be adapted to different robot manufacturers requirements. The RPS allows users the choice of using a programming pendant for simple jobs or stepping up to use a laptop PC for more complex jobs. Many applications can use a mix of both to reduce programming time and optimise productivity.

The Robot Programming System components include:

✶ A high level robot programming language building on the fast effective multi-tasking TrioBASIC.

✶ Kinematics transformations package configurable for the majority of robot mechanism types.

✶ Robot visualization tool in *Motion* Perfect v4

✶ Pendant and teach programming system. This allows programs, robot tools and points to be built, edited and proven in an easy to use way.

✶ A special robot tool within “*Motion* Perfect v4” for robot configuration, editing points, frames and tools. Complex programs may also be edited inside MPv4.

The Robot Programming System can be run on a standard Trio *Motion Coordinator.*
Trio recommends:
MC4N, MC664, MC508 or PC-MCAT 64.

You make the ROBOT...

We make the
ROBOTIC PROGRAMMING SYSTEM

TrioBASIC-R

Trio’s flexible multi-tasking BASIC is widely used for rapid development of industrial motion applications. TrioBASIC-R (Robotics) adds:

- **TARGET** Position data types
- Programming in world, robot and user frames
- **MOVEJ**, **MOVEL** and **MOVEC** Robotic move types with definition of move, target, speed, precision, tool and object frame in a single instruction line
- **OBJECT _ FRAME** and **ROBOT _ FRAME** commands
- Supervisor mode programs definable by robot builder allow checking and flagging of singularities, incorrect robot configurations and paths during execution
- Up to 32 tools definable with **TOOL _ OFFSET** tools can be switched in real time to allow use of an auto tool exchanger

RPS Kinematics

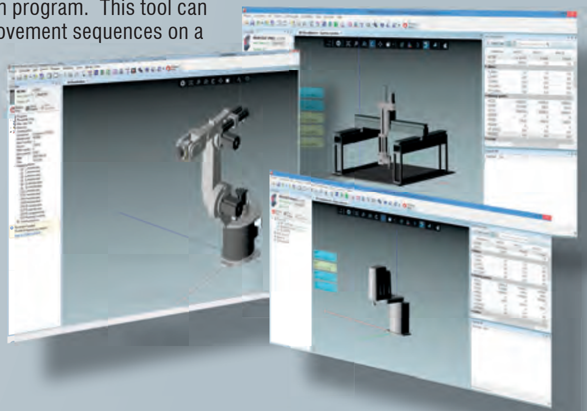
The RPS kinematics package covers most of the commonly used mechanism types and can easily be extended for new types. Delta, SCARA plus 5DOF and 6DOF anthropomorphic robots can effectively be programmed in XYZ world, tool and user coordinates. This allows users to focus on their application in a user friendly way and not be concerned with the algorithms being performed.

For robots with higher degrees of freedom, the kinematics package allows the orientation of tools to be defined and controlled during moves. This means that as well as placing a tool to a point in space, the direction can also be defined. The mathematics and joint angles are handled in the controller.

RPS 3D Visualisation

The 3D Visualization tool, available in *Motion* Perfect v4, enables simulation of robot and machine motion, using an externally generated 3D model which can be synchronized with the motion program. This tool can simulate and test realistic movement sequences on a PC in real time.

- Import 3D OBJ file into the 3D Visualisation Tool within *Motion* Perfect v4 and pan, zoom and rotate while the robot program is running.
- Interrogate each joint and link to find its position in 3D space.



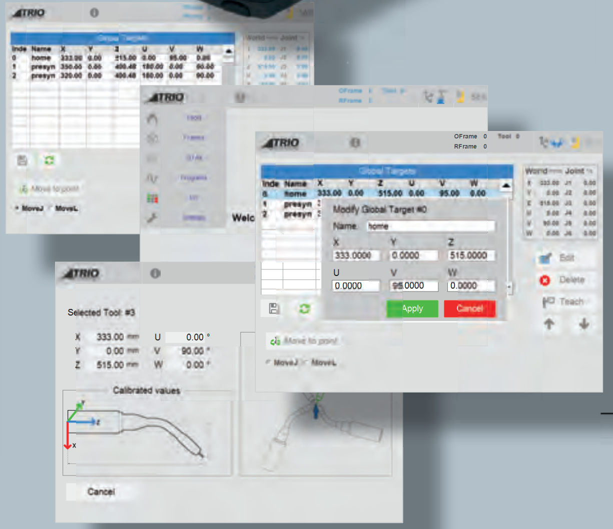
Pendant + Teach Programming System

The Teach Programming System allows programming the robot in a managed and safe environment, using a real or virtual system.

The pendant is based around Trio’s UNIPLAY HMI and can be used as a “real” or “virtual” on-screen pendant. The system includes extensive software and preconfigured motion control functions, which permit the controlling of all standard types of robot with reduced development time.

The system allows the user to:

- Configure the robot and drives
- Insert tools and calibrate them
- Insert robot frames and object frames
- Create and edit robot programs
- Debug robot programs adding break points and running it step by step
- Run the robot program in a repeat cycle



Inde	Name	X	Y	Z	U	V	W
0	home	333.00	0.00	515.00	0.00	95.00	0.00
1	presyn	350.00	0.00	400.48	180.00	0.00	90.00
2	presyn	320.00	0.00	400.48	180.00	0.00	90.00

Modify Global Target #0

Name: home

X: 333.0000 Y: 0.0000 Z: 515.0000

U: 0.0000 V: 95.0000 W: 0.0000

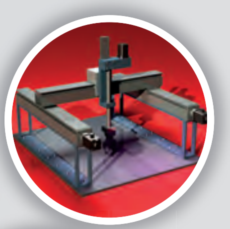
Selected Tool: #3

X	333.00 mm	U	0.00 °
Y	0.00 mm	V	90.00 °
Z	515.00 mm	W	0.00 °

Types of Robot

Cartesian with wrist

A standard Cartesian robot does not require a transformation but a wrist can be added to expand the system up to 6 degrees of freedom. This type of robot is typically used in welding, milling and drawing applications where the tool head translates across an x-y plane while a tool is raised and lowered onto the surface.



Linear parallel robot

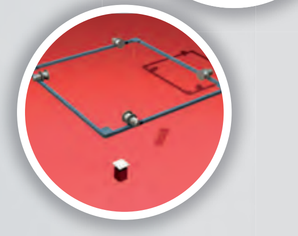
Linear parallel robots use a mechanical configuration so that two of the axes move directly in Cartesian directions. With a large reach and high payload they are often used in palletising applications.

XY single belt

The XY single belt configuration has advantages over a typical XY system of even load sharing between the motors, reduced cable management and often a smaller footprint. The ability to handle a large payload makes them ideal for palletising applications

Wire positioning

This application uses from 3 to 6 wires to position the tool in Cartesian X, Y and Z space. Typically this is used in stadiums to position cameras for “fly-overs”.



Delta 3 arm

Three arm parallel link robots commonly called delta robots are typically used for high speed pick and place applications.

Parallel arm

The two arm robot can be used for high speed pick and place or assembly as most of the weight is in the base. Mounted horizontally or vertically gives many options for working area and space saving configurations.

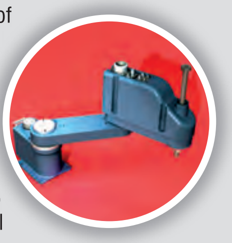
Articulated robot

Articulated robots can found in 3 to 6 axes formats which enable them to reach the widest range of positions and orientations. These are commonly seen in welding and paint spraying applications as well as material handling and machine tending.

SCARA

SCARA robots are one of the most flexible designs of robot and are found in many sizes and applications. They can be used in pick and place or assembly applications, but are equally at home in path following applications such as welding or gluing.

The Trio implementation of the SCARA robot allows from 2 axes to a full 6 axes with a 3 degrees of freedom wrist. There are also options to compensate for mechanical parasitic motion as well as different motor configurations.



Supported Features

- Programming in different coordinate systems
- Multiple end effectors
- Vision systems
- Conveyor Synchronisation
- Teach systems