

Tools for Monitoring and Parameter Visualization in Computer Control Systems of Industrial Robots

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Abstract. The article describes basic principles of creating software tools for monitoring and parameter visualization in computer control system of industrial robots. Concept of creating extendable data monitoring subsystem with open modular software architecture purposed. Architectural models, algorithms and software implementation of control system components on key levels of hierarchy such as collecting diagnosis data in real-time subsystem, data exchange with HMI devices and data visualization with help of predefined and user configured dialog screens are discovered. Implementation aspects of tools for monitoring and parameter visualization explained in application to different types of HMI devices like hand control panel, commissioning and programming software or remote terminal software.

Keywords: HMI · Monitoring · Visualization · Mechatronic equipment · Open architecture · XML

1 Introduction

Analysis of evolution of modern computer control systems reveals the trend to combine the different purpose software and create a common information environment for industrial automation projects. In such a project common software tools for implementing monitoring and parameter visualization subsystems should be used to support integration of equipment from different vendors [1].

2 Prerequisites for Creating Tools for Monitoring and Parameter Visualization

Most of modern computer control systems are based on dual-computer architecture concept: one computer serves the real-time task, executes NC part-program, controls actuators and processes PLC signals, while the other computer provides user interface for configuration, control and diagnosis of this system [2, 3]. Interface computer commonly provides the indication of limited amount of basic system parameters for monitoring purposes, such as the state of part program execution or current axes

coordinates. All other system parameters are either not available for real-time monitoring at all, or displayed in table form which is not so much suitable for operator to interpret and evaluate parameter value. This issue raises the task of creating the concept for building extendable monitoring and parameter visualization subsystem with open modular software architecture [4, 5]. The requirements to the parameter monitoring and visualization subsystem are systematized in form of mind map displayed on Pic. 1.

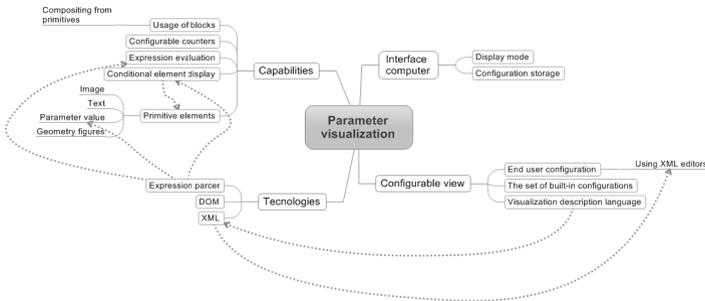


Fig. 1. Requirements to the parameter visualization subsystem

Parameter visualization subsystem should provide the following functionality:

- displaying of graphical elements (geometry figures, parameter values in text form, images, etc.);
- usage of block structure consists of primitive elements for creating visualization window content to make it easier to configure displaying of repeated elements and provide the possibility to reuse previously made visualization blocks;
- change the properties of visualization element (position, size, color, etc.) depending on certain conditions described in configuration file using the logical and numerical expressions;
- usage of counters with configurable intervals for creating of animation.

3 Architectural Model of Tools for Monitoring and Parameter Visualization

By the reason of control system separation into kernel and user interface parts monitoring and parameter visualization subsystem also consists of two parts: monitoring and parameter visualization agent acting in real-time part of system and user interface part (Fig. 2).

The basic function of monitoring agent is to interact with specific data sources inside the control system kernel [2, 6], such as configuration parameter sets, control system state parameters, internal operation data of motion or logic algorithms, or even directly communicate with executive devices. It also performs the initial data