UDC: 681.516.7:004.312.021
Original Scientific Paper

FUNCTIONAL PARAMETERS AND PERFORMANCE REQUIREMENT IN THE INDUSTRIAL SYSTEM

Nderim Zeqiri[1*], Eip Rufati[2], Bestar Zeqiri [2]

[1] *Faculty of Applied Sciences, University of Tetova, RNM*
[2] *Faculty of Natural Sciences and Mathematics, University of Tetova, RNM*
[*] *Corresponding author e-mail: nderim.zeqiri@unite.edu.mk*

Abstract

The technical systems management and functional aspects of the industry require a concrete approach to certain system parameters (configured parameters), programmable parameters, and system parameters. Principally, how we can modify any parameters, as writable parameters, which can be modified and matched to other needs of the devices, for example, sensors, tach generators (etc.)? Why have the need to changes the parameter values? (etc.) The needs are simples, because, the same systems, is with better functionality, and will correspond to input and output values, with better performance and quality. The management of the industrial system requires a more professional approach in terms of building a corresponding algorithm, which will be available, to manage through the computer control system. This approach requires the recognition of digital conversion in analog and vice versa. However, there are currently systems that functionally support these approaches. This paper mainly and specifically addresses the construction of the technical system to manage a sequential part of the industrial system, with the support of control algorithms, computer systems, and related software, to facilitates the work and management from overall work within the technical system. Also, into the paper process of incorporation has been described and analyzed, applying a concrete model in terms of building an advanced interface. This system, in fact, represents a certain basis for creating a better approach to the modules, as an integrated part of the control system. So here, in fact, will be given, certain points as: computer system priorities, microprocessor-based systems and the interconnection and connectivity by application program.

Keywords: Technical systems, parameters, industry, algorithm, microprocessor, interface.

1. Introduction

The use of functional parameters within a given industrial process is of great importance in the computer management of a manufacturing process. All control systems have the task of regulating simpler or more complex processes. The process of adjusting system parameters to technological requirements is crucial for successful manufacturing and management work. These parameters must be functional because these parameters depend on the work being performed in a process or beyond. Current systems are of particular importance and perform well, precisely because of the flexibility and ease of changing these values.

This paper describes how to manage a system's parameters, while maintaining system robustness and at the same time providing direct access to the management of "Write" parameters, except for system parameters that can only be "Read". This paper also describes the possibility of transitioning from one state to another, while maintaining the continuity of work, while at the same time creating favorable and appropriate conditions for the regular chain, and creating suitable cycles for the performance of functions that are compatible with technological circumstances. Presenting some results through analysis and software applications. Also into this paper, are done some analysis, and some data are presented, through the results, and at the same time comparing these values, for some control systems, through relevant charts and graphs.

1.1 Technological process and management of functional parameter value

Technological processes can be of different patterns, all depending on the production requirements. Systems adaptability is a process that requires initial analysis in designing a suitable system, which will manage the performance of the system. The next important step is the definition of work tools, equipment, electrical connections, and computer aids. Then, defining systems that provide central communication capability, with connections to other smaller computers and certain tasks in computer-specific segments, microcontroller-level, programmable logic controllers, and so on.

1.2 Basic microcontroller architecture and implementation

In figure 1, is given an ADC to enable the microcontroller to receive analog- input data from the process.

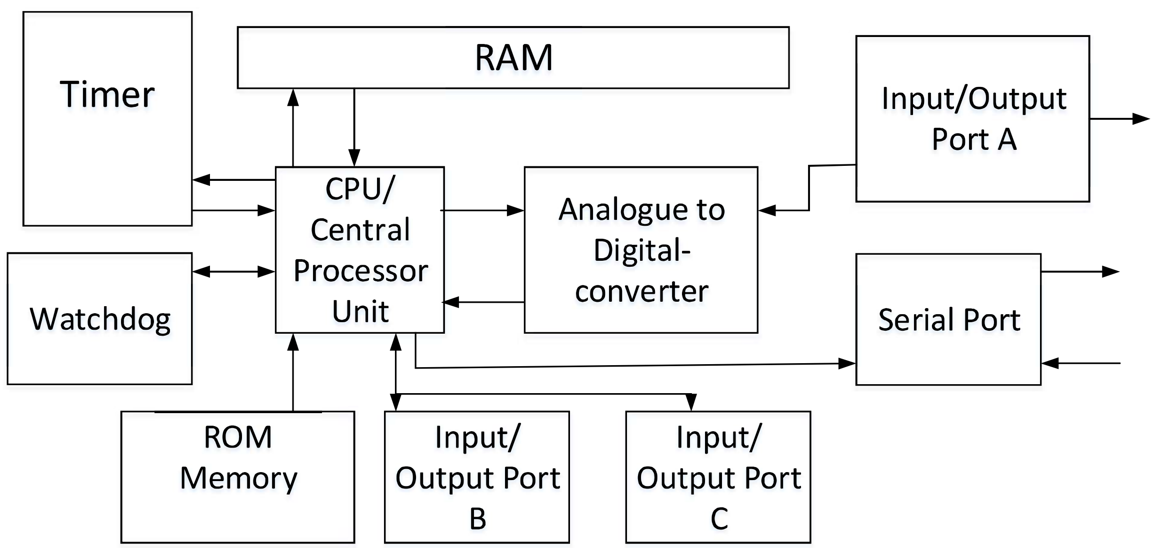

Figure 1. Microcontroller architecture

The process of grouping the particular elements, into an electronic component is a necessary step because it can open access to the blocks - through external pins. Advanced motion controls, design and manufacture servo drives and amplifiers for use in servo systems. Servo drives and amplifiers are widely used in motion control systems, where precision and speed control is the primary requirement. Drive/Amplifier - drive/amplifier, converts the low energy of the reference signals into the high energy of the reference signals, to provide voltage and corresponding motor current.

The controller is the "brain" of the servo system and is responsible for generating the path of movement and change of a state. The controller can sometimes be a simple ON/OFF switch, or command field from an operator. Also, the controller can be a multi-axis controller that actively serves some drives such as I/O monitoring.

Typically, the controller sends the signal to the drive; the drive provides the power to the motor, and with the motor feedback loop returns to the controller and drive. The load-to-load connection also rotates on the controller. The controller analyzes the returned signal and sends a new signal to the amplifier to correct the errors. The controller is considered as an intelligent part of the servo system.

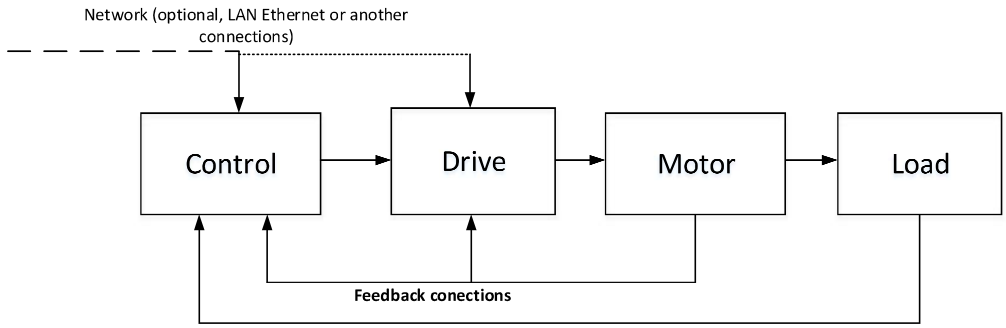

Figure 2. Network and control system (Control drive, motor and load)

1.3 Motion Controllers and practical implementation

Motion Controllers are specifically built for motion control (hence the name). Whereas, commands and I / O are specific to the needs of the servo industry. Unlike others, motion controllers are based on PCs, allowing for a graphical user interface. Usually, these are advanced features that allow tuning (sensing), sensing switching and other functions.

The servo drive is the link between the controller and the engine. It also refers to servo amplifiers, their job is to convert the low energy of the reference signals from the controller into the power and motor power signals. Today drives can also be introduced with feedback systems including coders, resolvers, tachometers, switches, and sensors. The drives are also suitable for torque, load speed, load position and the responsibility for generating the path.

1.4 Creation of generalized algorithm for preparation of functional parameters

In the following, we will present the generalized algorithm, to meet the system requirements, and for normal operation. If such industrial equipment meets the requirements of this generalized algorithm, then the stage of final preparation of the respective modules for the given system has passed. Practically, the modules are prepared in terms of functional parameters for the relevance of technological objectives. Technological requirements may vary, therefore, modification is appropriate because it can directly affect the parameters of the controller, the computer with the application concerned, and so on.

Once the algorithm is verified that it is operational and passes the testing phase, then practical implementation is achieved by deploying the appropriate equipment, modules, and applications. Changing the parameters further will be the routine work of certain equipment, selected as most appropriate in the control system command process. In this paper, the verified and fulfilling requirement algorithm is presented. In other stages, there is a need to define applications, if the command and control is a computer, for example, building computer networks for industrial control and interconnection of central system, terminal equipment, compute nodes and defined parameters.

The parameters can be changed by the central computer application, or the functionl parameters can be changed directly to the equipment where the communication is direct with the equipment that is associated with the specific technological process.

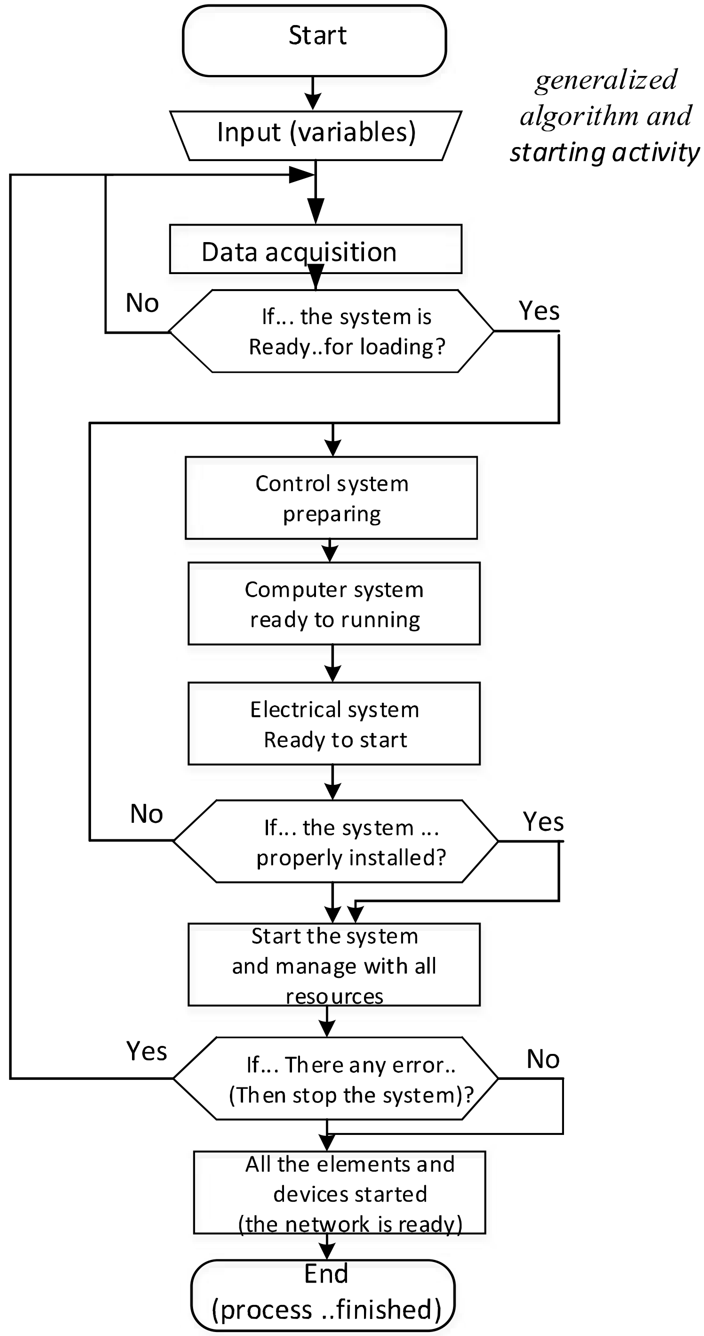

Figure 3. Generalized programming algorithm and starting activity (control, computer and electrical systems)

2. Relative Feedback (incremental) and devices for practical implementation

This device provides incremental positioning with periodic updates as needed (updates). This incremental feedback connection needs to be used with some types of absolute feedback connection (for limited connection etc). Moving the profile (load). All servo systems consist of several types of movements and loads. The method of moving the load is known as moving the profile. Moving the profile can be simple from point A to point B on a single axis, or it can be a complex motion during which multiple axes need to be moved in a precise and coordinated form. Several types of profile movements that are used by servo systems. Most commonly used - Constant Velocity, Trapezoidal, and S-curve of profile movement. This profile has constant velocity (constant velocity) between points. This is a basic profile move because only the speed command is used. Ta and Td represent the time required to rush or slow down. These times may vary with demand fluctuation.

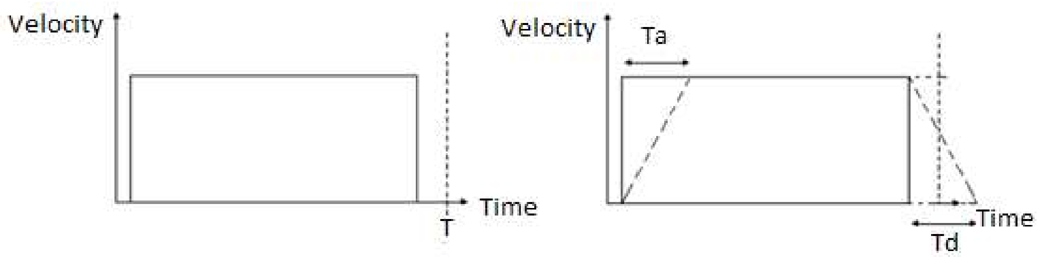

Figure 4. Velocity, Ta and Td

The trapezoidal motion of the profile inclines the curvature of the spine to create anticipated acceleration and deceleration. The time for acceleration and deceleration is precise and repetitive. Ta and Td exist, but they are already specified values rather than random values.

$$D = V \cdot \left(T - \frac{t_a}{2} - \frac{t_d}{2}\right),\ acceleration = \frac{V}{t_a}, deceleration = \frac{V}{t_d} \tag{1}$$

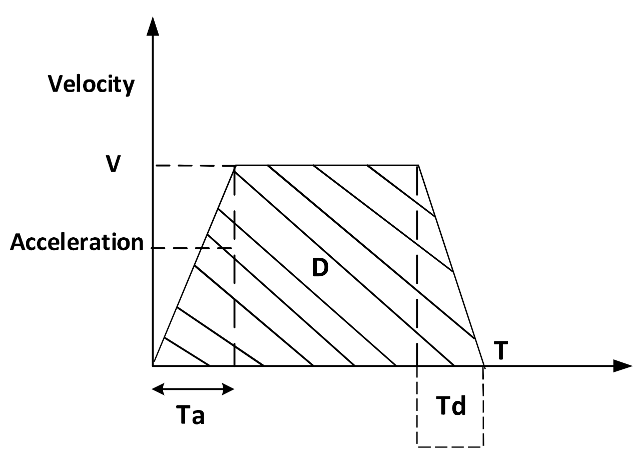

Figure 5. Velocity and trapezoidal motion shapes

Table 1. Accelaration and deceleration, TA, TD, TX and D and calculations

	V const.	TA	TX const.	TD	D	Acceleration	Deceleration
1	10	0.5	15	10.1	44	**20.00**	**0.99**
2	10	0.6	15	10.2	42	**16.67**	**0.98**
3	10	0.7	15	10.3	40	**14.29**	**0.97**
4	10	0.8	15	10.4	38	**12.50**	**0.96**
5	10	0.9	15	10.5	36	**11.11**	**0.95**
6	10	1	15	10.6	34	**10.00**	**0.94**
7	10	1.1	15	10.7	32	**9.09**	**0.93**
8	10	1.2	15	10.8	30	**8.33**	**0.93**
9	10	1.3	15	10.9	28	**7.69**	**0.92**
10	10	1.4	15	11	26	**7.14**	**0.91**
11	10	1.5	15	11.1	24	**6.67**	**0.90**
12	..	..	..	..	..	..	..

The S-curve for profile movement allows for a gradual change of acceleration. This helps to reduce or eliminate the problems caused by crossing the tolerant border. The minimum acceleration points occur at the beginning and end of the acceleration period, while the maximum acceleration occurs between these two points.

$$V = \int_0^{ta} a(t)dt = a_{avg} \cdot t_a \tag{2}$$

$$a_{avg} = \frac{1}{t_a}\int_0^{ta} a(t)dt \tag{3}$$

$$a_{avg} \leq a_{peak} \leq 2a_{avg} \tag{4}$$

Table.2-Aavg, Ta and V

	Aavg	Ta	V
1	1.12	1.5	1.68
2	1.13	2	2.26
3	1.14	2.5	2.85
4	1.15	3	3.45
5	1.16	3.5	4.06
6	1.17	4	4.68
7	1.18	4.5	5.31
8	1.19	5	5.95
9	1.2	5.5	6.6
10	1.21	6	7.26
11	1.22	6.5	7.93
12	1.23	7	8.61
…	…	…	…

2.1 The general viewpoint for microcomputers and microcontrollers

The microprocessor is a complex electronic circuit in a chip, containing subsystems for the performance of arithmetic, logic, communication and control functions and constitutes a functional whole. When a microprocessor interconnects with other modules within a board along with memory units and associated interfaces, a circuit or computer device is formed which is called a single board computer. While the microprocessor itself represents a complex integrated electronic circuit.

- In the application and technical aspect there are two branches of microprocessor development:
- Specialized microprocessors for applications in personal computers and workstations (graphics workstations, industrial computers, NC control systems, etc.). While the basic requirements are to increase the speed and width of buses that are 32, 64, 128 - bit word length.
- Integrated microcomputer systems such as microcomputers.

Microcomputer is contained by: microprocessor, bus, memory, input-output units with the environment. The microprocessor consists of: arithmetic-logic units, log fields where the user program is stored, and log fields where system and work data are stored. The control unit supports the work of the arithmetic-logic unit, from the field of the registry, where the user program is located, and retrieves the instructions (instructions for instruction) and transfers them to the instruction decoding module.

3. Conclusions

This paper aims to analyze the work and functioning of a system directly through functional parameters. Every computer, microcontroller, etc., have parameters and set values, which is matched with technological production. When the values parameters are not corresponding with environments condition, then the technological reality, must be a part of the modification, so, these required values paste the condition and adaptation criterion which is dependent on the respective requirements. This adjustment of parameter values must be compared and synchronized with the capabilities of the equipment itself. For this question and reasons, the case for that is the need to develop appropriate algorithms that enable properly function. Another part of the paper is the work and attempt to verify the destination of this algorithm and the phase of implementation of the respective condition, to accomplish, the secured task, procedures, and functions. Also in the focus of the work analysis is the analysis of some equipment and adapting techniques and measurers, such are: velocity, mean values, and certain geometric shapes, such as trapezoidal, S-curve, etc. The parameters of the equipment are always changed in the respective place, because its accuracy is verified, and the modification of these values will be adequate and functional. This modification will take place while it needs to last. So these values are changed and applied to new situations created in the technological process.

References

[1]. Astrom, K..1. (1990). Regulation of a ship's heading. In E. J. Davison (Ed.), *Benchmark Problems for Control System Design*. Theory Committee, IFAC.

[2]. Jaimoukha, I. M. and D. J. N. Limebeer (1991). *State-space algorithm for the solution of the two-block super-optimal distance problem*. Preprints 30th IEEE.

[3]. H. Kopetz, "*The temporal specification of interfaces in distributed real-time systems*," in Lecture Notes in Computer Science, Embedded Software. Heidelberg, Germany: Springer-Verlag, vol. 2211, pp. 223–236 (2001).

[4]. Freudenberg, J. S. and D. J. Looze (1988). *Frequency domain properties of scalar and multivariable feedback systems*. Lecture Notes in Control and Information Sciences, 1114. Springer-Verlag, Berlin.

[5]. N. Zeqiri, A. Luma. *Control systems, smart sensors, controller, elements in a control loop, Java Card and Security*, - WSEAS Transactions on Systems and Control, 2008.

[6]. Cook, J.E. and Dage, J.A., *Highly Reliable Upgrading of Components,* Proceedings 21st International Conference on Software Engineering, Los Angeles, USA, (1999).

[7]. N. Zeqiri. *Managing a computer system and interface, performance and applications*, Journal of Advanced Computer Science & Technology, 2016.

[8]. G. Chindris, M. Muresan, *Deploying Simulink Models into System-On-Chip Structures,* 29th International Spring Seminar on Electronics Technology, ISSE 2006, pp. 313–317 (2006).

[9]. W. Yuan and K. Nahrstedt, *Energy-efficient soft real-time CPU scheduling for mobile multimedia systems*, In: ACM Symposium on Operating Systems Principles, pp. 149-163, (2003).

[10]. N. Zeqiri, A. Luma. *Intelligent communication system, Automation Control, Java Card and Security*, 2008. WSEAS International Conference. Proceedings. Mathematics and Computers in Science and Engineering.

[11]. G. S. Virk*, Digital Computer Control Systems*, pp. 122-135, Real-Time Computer Control Systems. Macmillan New Electronic Series. Palgrave, London. Online ISBN: 978-1-349-21490-7 (1991).

[12]. N. Zeqiri*, Managing a computer system and interface, performance and applications*. Journal of Advanced Computer Science and Technology; Science Publishing Corporation, Greifswalder platz, Bremen, Germany, pp: 23-27, ISSN: 2227-4332, (2016).

[13]. N. Zeqiri. *Adaptation and research development in the spectrum of methods with advanced access in the area of communication and computer system*, Journal of Advanced Computer Science & Technology, 2013.

[14]. J. Maki-Turja, M. Nolin, "*Efficient implementation of tight response times for tasks with offsets*", Real-Time Systems, vol. 40, no. 1, pp. 77–116, (2008).

[15]. N. Zeqiri, F. Idrizi, B. Zeqiri, *The scheduling applications and real time systems communications*. Journal of Applied Sciences-JAS-SUT 3, 102-107.

[16]. Hahn, R.; Kühnen, M. *Determinants of sustainability reporting*: A review of results, trends, theory, and opportunities in an expanding field of research. J. Clean. Prod. 2013, 59, 5–21.

[17]. D. B. Stewart, R. A. Volpe, P. K. Khosla, *Design of Dynamically Reconfigurable Real Time software Using Port-Based Objects,* IEEE Transactions on Software Engineering, Volume 23, Nr. 12, (1997).