SUPERVISER MECHATRONIC SYSTEM, BY IMAGE PROCESSING, FOR AIR FLOWS CIRCULATING THROUGH THE ARTIFICIAL MUSCLE IN A MECHATRONIC DEVICE

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Abstract. *Through this paper the authors propose an image processing system which, through a dynamic approach, check the flow values derived by calculation, compared with some maximum values imposed. The system warns via digital code, transmitted by a superior level computer which it is notified of the achievement of improper working parameters. Conception of system is presented in a comprehensive graphical format, with the map of the main details.*

Keywords: ***pneumatic muscles, pressure, flow, software variables, process variable***

1. INTRODUCTION

In work “Mechatronic system for pneumatic actuation, using as execution element, an artificial muscle and for control loop, using a camera”, to address the issue of a closed-loop control with image processing, technical situation for static [2].
In this paper, the problems will refer to a dynamic technical situation, the parameter is a pneumatic flow. Completion of previous work involves determining the correlation between parameter values of pressure, longitudinal muscle movements and artificial matrices associated personnel captured photo. If this first part, emphasis was on establishing correspondences mentioned in this second part of technical design, will detail how that can shape a dynamic correlation between size and associated matrices.
In terms of software and hardware is required minimum working capacity, ie a data processing speed sufficient mathematical determinations of association between parameters.

2. PRESENTATION EXPERIMENTAL STAND

The experimental work is the same as the preceding, introducing, however, an additional element, namely a flow controller. This last element is designed to limit the current pneumatic flow values to sustainable levels in terms of speed imagery data processing. To assign accurate values of flow Q, will use a digital meter in parallel with an electronic interface that can capture and electronic data files îmagazina values recorded. In Figure 1, is shown working scheme of the system.
Human operator will serve to regulate the flow and switch to enable / disable officials artificial muscle.
Flows resulting from the adjustment made will be automatically recorded in the files on the PC, so the combination makes precise flow values.
Digital flow transducer will be presented in detail in the next chapter.

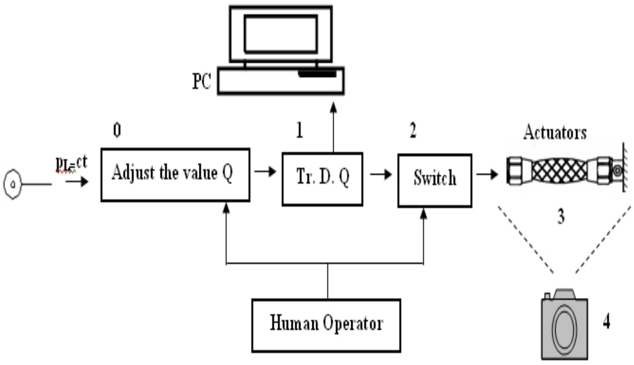

Figure 1. The principle scheme

Legend
0. One-way flow control valve = Q
1. Flow sensor
2. Mechanical Distributor 3/2-way
3. Pneumatic muscle
4. Web cam
a. Adjustment
b. Switch

3. FLOW SENSOR

The flow sensor is used to measure and monitor flow rate and air consumption values. Measurement is carried out by means of a thermal procedure, whereby the amount of heat drawn from a heated surface of the sensor by the medium flowing past it is calculated. The flow rate or the accumulated air consumption is based on the amount of heat drawn. Connection to higher-order systems is established via two switching outputs (Out A/B) and an analogue output (Out C). Switching points can be defined for both binary outputs.

Switching points are possible for both switching outputs for measuring the flow rate; a consumption switching pulse for output A (Out A) is possible for measuring the accumulated air consumption. The flow rate value is

output via the analogue output. The flow rate or air consumption is shown on the display.
The flow rate is shown in the selected unit (l/h, l/min). The air consumption is shown in the selected unit (m3, l) [5].

Technical characteristics of digital flow transducer:

Analogue output: 0 – 10 V;
Switching output: 2 x PNP / 2 x NPN, adjustable ;
Switching element function: N/O sau N/C contact, adjustable ;
Display type: 4 1/2- character alphanumeric ;
Flow measuring range: 0.1 – 10 l/min ;
Full scale accuracy: 3 %;
Operating pressure: 0 – 10 bar (0 – 1,000 kPa);
Operating medium: Filtered, unlubricated compressed air, grade of filtration 40 µm
Temperature of medium: 0 – 50 °C;
Pneumatic connection: For plastic tubing with 4 mm

4. THE CONCEPT UNDERLYING THE DATA PROCESSING

In terms of the parameters of pneumatic pressure will be set at a constant work throughout the measurements and flow adjustable parameter will be working at different levels. Suppose we have a value set Q_1 to flow measurements is a series of photographic frames, successive time, between time $t_0 = 0$ and time t_1 expression whose value gives the final association Q_1 - Q_1 determination.
What is t_1? T_1 is in units of time, mere seconds, the duration of “maximum filling” bellows the muscle of state “completely relaxed”.
In fact, the matrices resulting from the processing hardware imagery at a fixed reference element, a_{11}, will report an associated dynamic element a_{ij}.
The distance between the two elements, namely da_{11}-aij, will change simultaneously with the real movement of a benchmark designed specifically with a particular color on the mobile end of the bellows, for an accurate picture catchments. Value of this distance is not important, as string values.
The working hypothesis is that if $d_k \neq d_{k+1}$, muscle movement is in the process, and when $d_k = d_{k+1}$, meaning that movement is over, bellows became state “maximum filling”.
The idea of dynamic emerging association with the time sequence of values $(da_{11}\text{-}a_{ij})$k. Each is assigned a specific distance $(t_1)_k$ and $(t_1)_n$, $d_k = d_{k+1}$ the associated moment, is the value determined by the duration of filling the flow Q_1.
Final correspondence unique real flow Q_1 and Q_1 imagery data processing, mathematical argument is the function of association, will be closed-loop position control system working with artificial muscles.

5. CONCLUSIONS

The development and implementation of the concept presented in this paper opens a series of scientific concern is within the last trends in automated control systems by image processing.
The next step, which will be presented in the following paper will address the shift in technical details of specific image processing methods, urnând as later stage to place concrete experimental measurements.
The idea of control by artificial vision, operation of artificial muscles, can be extended by another element of technical performance, its universality is indisputable and real technical value approach.

6. REFERENCES:

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