CAN WE UTILIZE THE QUALITY MANAGEMENT IN HCE (HIGHER CONTINUOUS EDUCATION) LIKE A DISCREET COMMAND SYSTEM?

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Abstract

The paper presents some aspects concerning the quality management in higher continuous education and the most important principles adopted in the European Parliament connected with the efficiency and the equity of the European Education Systems in the higher and continuous forms (HCE). We study the increase of the quality management in the HCE modeling by the discreet command systems with equations of state representation and finish with the transfer matrix of the discreet systems.

In conclusion the discreet command systems give dependability and a good quality management to HCE.

1. Premise of quality management in HCE (Higher Continuous Education).

The major changes which are taking place in European Higher Education increase the attractiveness of the Higher Education Universities on the market and profile them much more significantly. Curricula need to be reformed with the Bologna Process and the research has become very strategic [1]. A more pregnant importance has the HCE (Higher Continuous Education.

The quality must be a strategy policy for Excellence.

The Excellence is interdependent of a Strategic Management applied with Responsibility, Motivation and European Visibility for getting a huge volume of knowledge. The knowledge is good for the implementation of an Entrepreneurial Culture in the labor market, to improve the social status for maintaining the HCE.

We place the accent on a higher Quality Standard, to accomplish the mission of the University to offer services of Education and Research, in a stimulating intellectual environment for the students and the professors.

The main points of the Quality policy are given by Bologna Declaration concerning the implementation of the integrated system first cycle –second cycle –third cycle and the modernization of the process of the education and the research in accordance with the society based on the knowledge [2].

The proposal for a European Parliament resolution on efficiency and equity in European education and training (2007/2113 (INI)), appears as a natural reaction to the reduction of public budgets, challenges to the global financial crisis, demographic changes and technological innovation.

The focus is on increasing efficiency in education and training at higher level (HCE). The allocation of a quality management system in the HCE is due to the following causes:

1. the majority of higher education systems and continuing professional training reproduce and deepen existing inequities;
2. the inequity existing in education and training triggers substantial non-transparent costs;
3. the investments in superior education and training generates long term benefits and require a long-term planning;
4. in these education systems there must be created a culture of evaluation that allows efficient tracking of long-term development of these systems;
5. the education and training policies should relate to occupational, economic and social integration policies.

2. Efficiency and equity in the process of higher continuous education (HCE).

It is a known fact that investment in a particular level of education allows the development of competencies and skills and also forms a basis for acquiring new skills and qualifications.

HCE system requires a culture of evaluation, so that long-term policies should be based on reliable measures.

Efficiency and equity in education leads to development of indicators and references for tracking progress towards achieving the Lisbon objectives.

It is also admitted that investments in higher continuous education (HCE), which aim to improve access and equity enhance social cohesion and allow finding solutions to problems of crisis, an easy adaptation to economic and social changing.

3. Discreet command systems

A control system Σ has a finite number of input terminals, a finite number of output terminals and a finite number of primitive components. It may be represented by a black box (Figure 1) [3]

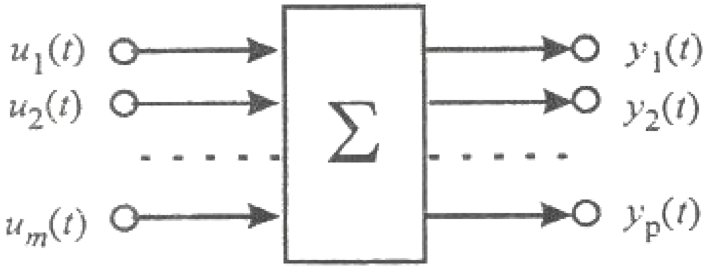

Fig. 1

The time mass is T = $\mathbb{Z}$, so t $\in$ $\mathbb{Z}$.
The masses $u_j(t),\ j=\overline{1,n}$ *and* $y_i(t), i=\overline{1,\ p},$ called *input or output variables* , belong to a commutative body K.
Typically, K is one of the bodies $\mathbb{R}$, $\mathbb{C}$ or GF (p), where the body Galois of characteristic p, with p $\in$ $\mathbb{N}$ prime number is the body of GF (p) = {0,1, ..., p-1} with the assembly and multiplying modulo p
The system Σ is called *linear* if it has primitive linear components: these components are: 1 **summative**. A summative has *m* inputs and one output (fig. 2).

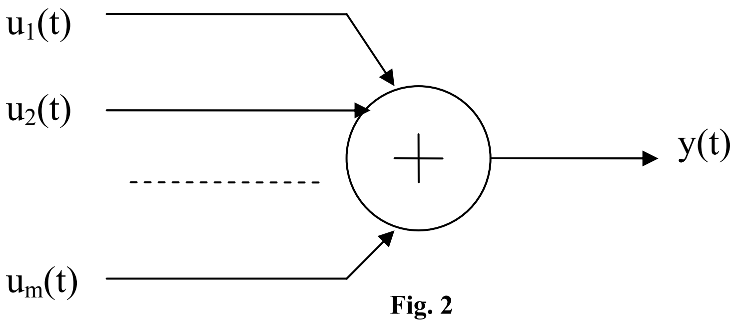

Fig. 2

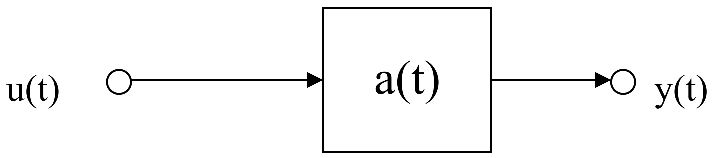

Fig. 3

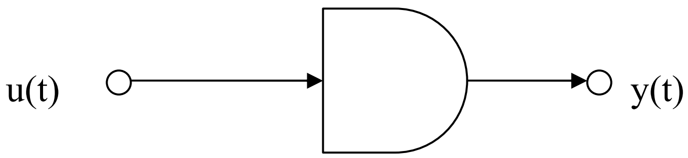

Fig.4

and the respective variables check the relationship $y(t) = u_1(t) + u_2(t) + \ldots\ldots + u_m(t)$.
2° **amplifiers or scalars**Un amplificatory, represented in Figure 3, has an entry and an exit and works according to the relationship y (t) = a (t) u (t). The size of a (t) $\in K$ is called *amplification factor*.
The system Σ is called *stationary* if all the amplification factors are constant: $a(t) = a \in K, \forall t \in \mathbb{Z}$.
3° **delay elements**, represented in Figure 4, all with an input and an output .The input-output application is
$y(t+1) = u(t)$.
If the system Σ has *n* elements of delay, it is associated with *n state variables* $x_i(t)$, where $x_i(t)$ is the output variable of the delay element *i* at the moment *t*.
We denote by $a_{ij}(t)$, $b_{ij}(t)$, $c_{ij}(t)$, $d_{ij}(t)$, the amplification factors of the following connections:
$a_{ij}(t)$-the connection between the delay element *j* , respectively $i, i,\ j = \overline{1, n}$;
$b_{ij}(t)$- between entry *j* and the delay element $i,\ j, = \overline{1, m}, i = \overline{1, n}$;
$c_{ij}(t)$- between the delay element *j* and output $i,\ j, = \overline{1, n}, i = \overline{1, p}$;
$d_{ij}(t)$-between the entry *j* and exit $i,\ j = \overline{1, m}, i = \overline{1, p}$.

Schedule of a linear system Σ is represented in **Fig. 5**.

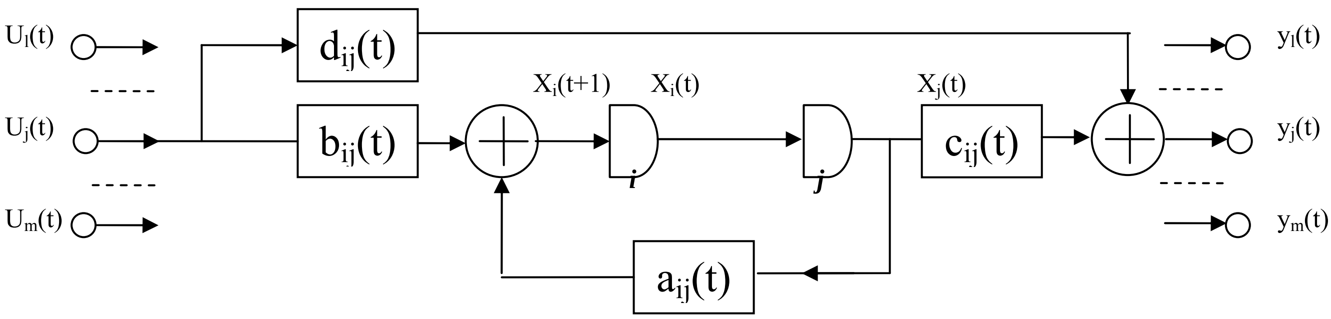

Fig.5

At time *t*, the signal from the summator output preceding the delay element *i* is $x_i(t+1)$ (signal which will be at the exit of the delay element *i* at time *t* + 1), it is the sum of signals coming from entries j and from the delay elements *j* ; equations of state of the system Σ are obtained:

$$x_i(t+1) = \sum_{j=1}^{n} a_{ij}(t) x_j(t) + \sum_{j=1}^{m} b_{ij}(t) u_j(t), \quad i = \overline{1, n} \qquad (1)$$

Similarly, analysing the input and output signals from the output summator I , we obtain *the output equations* of the system Σ:

$$y_i(t) = \sum_{j=1}^{n} c_{ij}(t) x_j(t) + \sum_{j=1}^{m} d_{ij}(t) u_j(t), \quad i = \overline{1, p}. \qquad (2)$$

We call the vectors $x(t)=(x_1(t),\ ...,\ x_n(t))^T$, $u(t)=(u_1(t),\ ...,\ u_m(t))^T$, $y(t)=(y_1(t),\ ...,\ y_p(t))^T$ the *state, the entry (or command)* respectively *the exit* of the system Σ at time *t.*
*De*note by *A* (*t*), *B* (*t*), *C* (*t*), *D* (*t*) matrices *n* x *n*, *n* x *m*, *p* x *n*, *p* x *m*, with elements a_{ij} (*t*), b_{ij} (*t*), c_{ij} (*t*), respectively d_{ij} (*t*).
The equations (1) and (2) can be written as :

$$\Sigma\begin{cases} x(t+1) & = A(t)x(t)+B(t)u(t), \\ y(t) & = C(t)x(t)+D(t)u(t). \end{cases} \qquad (3),\ (4)$$

Equation (3) and (4) form *the representation of status* of discreet system Σ. Such discreet systems are also the result of the continuous system discretization, which is represented by the equation of state
x (*t*) = *A* (*t*) *x* (*t*) + B (*t*) *u* (*t*).
They have various applications in technique (analysis and processing of signals, theory of codes, etc.), in economics, ecology and in the Humanities

4. Matrix of transfer

Now, let's consider the stationary systems, namely those with all the amplification factors constant.
In this case, matrices A, B, C and D are constant matrices (with elements of commutative K body) and the initial moment is considered t = 0.
The *Z* transformation of a vector is defined naturally as the Z transformation vector of the components:

$$\mathrm{Z}[x(t)]=(\mathrm{Z}[x_1(t)],\ ...,\ \mathrm{Z}[x_n(t)])^T$$

Noting

$$X^*(z)=\mathrm{Z}[x(t)],\quad U^*(z)=\mathrm{Z}[u(t)],\quad Y^*(z)=\mathrm{Z}[y(t)]$$

and taking into account the theorem 1.1 (of linearity) and the theorem 1.4 (the second theorem of delay), by applying the *Z* transformation to the equations (3) and (4), we obtain

$$\begin{cases} z(X^*(z)-x(0))=AX^*(z)+BU^*(z), \\ \qquad Y^*(z)=CX^*(z)+DU^*(z). \end{cases} \qquad (5),\ (6)$$

The equation (5) can be written $(zI-A)X^*(z)=BU^*(z)+zx(0)$ and multiplying to the left with $(zI-A)^{-1}$ for $z\in C\setminus\ \sigma(A)$ we get $X^*(z)=(zI-A)^{-1}BU^*(z)+z(zI-A)^{-1}x(0).$
Replacing in (6) $X^*(z)$ we obtain *the application input output* of the system Σ:
$Y^*(z)=\left[C(zI-A)^{-1}B+D\right]\ U^*(z)+zC(zI-A)^{-1}x(0).$
For initial state $x(o)=o$, this relationship has the form:
$Y^*(z)=T(z)U^*(z)$, where $T(z)=C(zI-A)^{-1}B+D.$
Matrix T (z) is called *the transfer matrix* of system (Σ) and has a very important role in the study of systems.

5. Conclusions

We can compare the higher continuous education (HCE) with the discreet control systems. Primitive components are made up of students, teachers, etc. and appear with delayed items due to the complex process of continuous learning throughout life.

The condition of entry is the given by students, in the first learning cycle, and the final state is given by the final cycle of learning, at a certain time. Representation of the discreet state, in our case HCE is given by the final equations of relations [3] and [4] .

Transfer matrix of the system (HCE), has an important role in its study because at one time amplification factors are considered constant, in the sense that the HCE is studied in a fixed period, e.g. one year of study when the component of quality evaluation becomes preponderant in the static and not the dynamic form.

6. References

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