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On the Observation of a System Governed By Differential Equations.

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ABSTRACT: Property is analyzed and lack of observability of independently controlled systems and the differential-differences case is revealed.

KEYWORDS: Observation, differential equations, mathematics, information technology, systems, equation

I. INTRODUCTION

If all of the variables of a dynamic system are linked to a coordinate system and its condition can be determined at a finite time, then the system is observable. Depending on the deterministic or stochastic state of the system under consideration, the observation is different.

If the color of the matrix of coefficients characterizing the state of linearly determined systems is equal to the space measure of the system under consideration, it is possible to determine its controllability and observability.

In stochastic systems, the notion of observation is related to the asymptotic state of probability aposterior distributions or correlation matrices of estimation.

In the observation of the stochastic system, as the number of observations for discrete processes increases, and the length of time for continuous processes increases, the probability error vector error approaches zero or final value.

It is well known that a system of linearly determined differential equations related to the control function can only be observed if its spatial position satisfies the property of full control. In some cases, however, the system is divided into two controlled and unmanaged parts. In [1], the number of control parameters for autonomous control systems is optimized,ie the control space of the system is compressed.

II. MAIN PART

The resulting system satisfies the full control feature, but its appearance in relation to the original system changes. In this case the question is whether the overall state of the system can be monitored. To answer this question, the observational nature of autonomous controlled systems is analyzed.

Let the system of linearly determined autonomous controllable equations be summarized as follows:

$$\begin{aligned} \dot{x}(t) &= Ax(t) + Bu(t) \\ y(t) &= Hx(t) \end{aligned} \qquad (1)$$

Here $x = x(t) - n -$ of a dimensional system $t\ (t_0 \le t \le T)$ time state vector;

$A -$ representing the spatial state of the system $(n \times n) -$ a dimensional invariant matrix;

$B\ (n \times m) -$ matrix unchanged matrix;

$u\ (1 \times n) -$ dimensional control function;

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y x depending on the vector state $(1\times n)-$ dimensional vector;

H $(r\times n)-$ dimensional matrix change.

If (1) the system of equations fully represents the input and output parameters at a finite time, then (1) the autonomous system is called the observer.If (1) in the system of equations $H=0$ a system that is not fully observable. As mentioned earlier, controlled systems can be divided into managed and unmanaged parts. But it is not possible to divide the system into two. According to the theorem in [2], if (1) the system has a specific number of matrices, that is, without multiplication, then (1) the system is observable. It follows that if (1) the system is controlled, as shown in [1], it cannot be fully monitored.

In this sentence, let's look at both sides.

Assume that (1) is the original number of the matrix. Then, based on the lemma presented in [2], the linear system (1) is not fully controlled. As a result, (1) the appearance of the system is as follows:

$$\begin{aligned}\dot{x}(t)&=Ax(t)\\ y(t)&=Hx(t)\end{aligned} \qquad (2)$$

(2) Scale for the system k $(0\le k\le n)$ equal to that of line U There is a space, first - U The invariant partition, and the second (2) system, is not fully observable in the phase space. (2) the system must be in order to be fully observant. The coordinate system accordingly $\bar{x}=\begin{pmatrix}\bar{x}_1\\ \bar{x}_2\end{pmatrix}$ and the space $\bar{x}_2=0$ the equation. The system of equations (2) is expressed in [2]:

$$\begin{cases}\bar{x}_1=\bar{A}_{11}\bar{x}_1+\bar{A}_{12}\bar{x}_2\\ \bar{x}_2=\bar{A}_{22}\bar{x}_2\end{cases},\ y=\bar{H}_2\bar{x}_2. \qquad (3)$$

(3) If the system of equations $\bar{x}_1=0$ If so $k=n$ and (3) the appearance of (2) is the same as the system. As a result, according to [2], the system is fully monitored.

III. THEORETICAL ANALYSES

It is well known that in order for a system to be monitored, it must first be controlled. This is contrary to the assumption in the above (1) that the number of matrices is irreversible unless the number is unique.

Theorem in [1] on the other hand

$$\dot{x}=Ax(t)+(BC)v,\ \ x(t)\subset R^n, v(t)\subset R^k \qquad (4)$$

system (1) is similar to system.

According to the theorem in [2], a system similar to that of (4) must be fully controlled in order to (1) be an observational system.

In order for the system to be fully controlled, the Kalman criteria must be met. The performance of the Kalman criterion for (4) is shown in [1]. This contradicts the idea that the system of equations above (1) should not have multiple matrix specific numbers to be fully observable. These contradictions make it necessary to carry out additional research on the control of controlled systems.

Another example of an autonomous controlled system is the system of differential-differential equations depending on the control function.

Recently, a system of late arguments or differential-difference equations is represented by a large number of objects in a number of fields of mechanical engineering, chemical technology, biology, economics, science and technology [3]. Such equations represent the movement of a group or single-element objects denoting delayed links.

Generally, the delay time can be an unchanging, variable or random function.

It is well-known that process and phenomenon research are inextricably linked to the construction of mathematical models that represent them in mathematical language. Each mathematical model describes a number of parameters: input variables, output variables, intermediate variables (status variables).

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These objects should be classified into classes to determine the latency and responsiveness of the delayed objects.

The general view of mathematical models of delay objects is as follows:

$$F(y(t),x(t),u(t)f(t),\tau_i,\theta_j)=0,\ \ i,j=1,2,...,n. \quad (5)$$

here $y(t)-$ object input variables vector;

$x(t)-$ the vector of intermediate variables;

$u(t)-$ management function;

$f(t)-$ vector of deviation;

$\tau,\theta-$ $0<\tau_1<\tau_2<...<\tau_n,\ \ 0<\theta_1<\theta_2<...<\theta_n$ characterize the time delays that meet the conditions and the variables.

(5) Because expression refers to objects that change over time, ie dynamic objects, it can be viewed in the form of differential, integral and differential-integral equations.

The equation of the object (5) in the form of operator has the following properties [3]:

1. At the given moment of time the output signal is determined by the value of the input signal and the condition at that moment.

2. The position at consecutive moments of time $u(t_0,t)$ input signal $[t_0,t)$ time duration $u(t_0,t_0-\theta_r)$ in condition $[t_0-\theta_r,t)$ over time as well $x(t_0,t_0-\tau_l)$ condition $[t_0-\tau_l,t)$ is determined by a single value over time.

The following two conditions indicate that the condition equation can be formed by the following two equations:

$$y(t)=g_1(x(t),u(t));$$
$$x(t)=g_2(x(t_0,t_0-\tau_i),u(t_0,t_0-\theta_j)),\ \ i,j=1,2,...,n$$

here g_1,g_2 $-$ single value functions.

Equation (5) has different views on the position of the object.

1. Appearance of the external environment without taking into account the effect of isolation $y(t)=Hx(t)+Du(t);$

$$x(t)=\sum_{i=0}^{l}A_i x(t-\tau_i)+\sum_{i=0}^{r}B_i u(t-\theta_i); \quad (6)$$
$$x(t)=\phi x(t),\ \ t_0-\tau_l\le t\le t_0;$$
$$u(t)=\phi u(t),\ \ t_0-\theta_r\le t\le t_0,$$

here $\phi x(t),\phi u(t)-$ initial functions;

matched matrices of appropriate size.

This is another view of the class. The continuous form of equation (6) is as follows:

$$\dot{x}(t)=Ax(t-\tau)+Bu(t),$$
$$y(t)=Hx(t). \quad (7)$$

2. One of the important classes of delay objects is the delays in the control signals, and the mathematical representation of (5) $A_i=0$ will be As a class of this class, there is a concept of "pure" delay, in equation (6) $A_i=0,\ \ B_i=0$ will be Such cases are more typical of a continuous production system (conveyor method).

3. Delay in coordinates of another class of delay objects. Its mathematical representation is in Equation (6) $B_i=0$ will be This is particularly true for non-cyclical processes and smaller aggregate processes.

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IV.CONCLUSION

In [3] the concepts of complete observation and relative observation for the system of differential-difference equations (7), which represent objects in the coordinate latency classification of delay objects, are included.

Basically if $\phi(x)$ If the input and output parameters are sufficient for the initial function to determine the initial function, then the dynamic object represented by the system of equations (7) is called a complete observer.

(7) In order for the system of equations to be relatively observable, the following conditions must be met for the time and matrices: $rang[(HT), A(HT),..., A^{n-1}(HT)] = n$.

Theoretical developments in the control of dynamical systems and their observations, such as those of delay, which are represented by the system of differential equations, in particular, chemistry, petrochemical, biotechnical, mechanical engineering, etc. process management and monitoring of the state of the art industry.

REFERENCES

1. Onorboev B.O. Development and application of the “K-controllability” method for optimal control of complex technological tizimmi. Abstract. Doct. thesis Specialist. 01/13/01. Tashkent, 2005.37 page.
2. Lee E.B, Marcus L. Fundamentals of the theory of optimal control. M .: Science. - 1976 - 576 page.
3. Automatic control systems with delay: textbook. allowance / Yu.Yu. Gromov, N.A. Zemsky, A.V. Lagutin, O.G. Ivanova, V.M. Tyutyunnik. - Tambov: Publishing house of Tamb. state tech. Univ., 2007. –76 p.