

FUZZY TIME AND FUZZY INFORMATION IN ECONOMIC CONTROL

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There are many ways how to approach the concept of fuzzy time. One of them is mentioned below: it is a measurement of the fuzzy time by the quantity of fuzzy information. In this sense "fuzzy time" is heterogeneous, related to a certain economic, social or psychological content, and nonlinear. Practically it means a variable content in each quantum of common calendar time expressed by a membership function.

As fuzzy information we consider an organization, supplemented by a subjective measure of actuality (i.e. originality, surprise, usefulness, creativity etc.).

So, the fuzzy information I_F is a fuzzy set of elementary organizations, defined on the universal set of organizations:

$$I_F = \{ \langle u_F(x), x \rangle \} = \bigcup_{x \in X} u_F(x)/x, \quad x \in X,$$

where $u_F : X \rightarrow [0,1]$ is the membership function.

Practically, an expert assignation of membership function values to a chosen family of actual information portions is necessary. So the meaning of individual messages and other organizations is distinguished.

The fuzzy information can be also formalized by means of fuzzy variables and linguistic variables.

In literature we find numerous interpretations of the nonlinear, nonhomogeneous time - as atomic, physiological, biological, economic, social or

informational time. For example, economic time is interpreted as an abstraction of velocity of economic processes; informational time is a time measured by the volume of accelerated informational surplus etc.

The theory of heterogenous time is related with the relativity theory. During high motion velocities we can describe a dilatation of time by means of the Lorentz transformation from the Relativistic Mechanics.

Further, the fuzzy time T_F is a fuzzy set of elementary time intervals, defined on an universal set of intervals Y :

$$T_F = \{ \langle u_F(y), y \rangle \} = \bigcup_{y \in Y} u_F(y)/y, \quad y \in Y,$$

where $u_F : Y \longrightarrow [0,1]$ is the membership function.

Practically, the interpretation and assessment of membership function values can be again given by an expert procedure.

One way of measurement of fuzzy time is to determine the volume of fuzzy information in different time intervals.

In the case of accelerating growth of (normal) information in indefinite (normal) time

$$I = e^{at}, \quad a = \text{const},$$

we get

$$t = \frac{1}{a} \ln I,$$

i.e. time t is a function of information volume I .

After "fuzzification" for a fuzzy function of a fuzzy argument, we obtain

$$f(I_F) = \bigcup_{x \in X} u_F(x)/f(x) \quad .$$

Unsolved research problems lie in the operationalization of the volume of information I_F , where I is a measure of changes, events or experience in decision-making, I_F is this measure, expressed as a fuzzy set.

Our research in this direction is oriented on automatized systems of economic management.