PROGRAM CONTROL WITH PROBABILITY ONE FOR STOCHACTIC SYSTEMS

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Usually, a program moving is considered as moving on a given manifold. The term "stochastic optimization" was actual for stochastic system. Terms "program moving" and "program control" for stochastic system didn't exist there. There exists a function, which conserves with probability one a constant value for all solutions of stochastic differential equations system, and it is called a first integral of SDE system [1, 2, 3]. Then we can set a program control problem with probability one and solve it [3, 4].

`Definition 1.` Let us call *a Program Control with Probability One* (PCP1) as a control in stochastic system, which with probability one provides an insensitivity of this system to random perturbations.

`Definition 2.` Let us $\boldsymbol{x}(t;\boldsymbol{x}_o,\boldsymbol{s};\omega)$ be a solution of a SDE system:

$$d\boldsymbol{x}(t)=\Big[P(t;\boldsymbol{x}(t))+Q(t;\boldsymbol{x}(t))\cdot\boldsymbol{s}(t;\boldsymbol{x}(t))\Big]dt+B(t;\boldsymbol{x}(t))d\boldsymbol{w}(t)+\int G(t;\boldsymbol{x}(t);\gamma)\nu(dt;d\gamma), \tag{1}$$

where $\boldsymbol{w}(t)$ is a m-dimensional Wiener process; $\nu(t;\triangle\gamma)$ is a non-centered Poisson measure. A non-random function is a first integral of SDE system (1) with initial condition $\boldsymbol{x}(t;\boldsymbol{x}_o)\big|_{t=0}=\boldsymbol{x}_o$. *A Program Moving of a stochastic system* we will call a solution $\boldsymbol{x}(t;\boldsymbol{x}_o,\boldsymbol{s};\omega)$, which with a some PCP1 $\boldsymbol{s}(t;\boldsymbol{x})$ allows this system to remain on the given integral manifold $u\big(t;\boldsymbol{x}(t;\boldsymbol{x}_o)\big)=u(0;\boldsymbol{x}_o)$ with probability one for any t.

References.

1. *Doobko V. A.* A first integral for a stochastic differential equations system (Preprint / Inst. Math. Ac.Sci. USSR) – Kiev, 1978. 22 p.
2. *Doobko V. A. Open evolving systems* // I inter. sci.-appl. conf. "Open evolving systems" (2002), Kiev, 2002. P. 14–31.
3. *Karachanskaya E. V.* Construction of program control with probability one for a dynamical system with poisson perturbations // *Bulletin of PNU* No 2 (21), 2011. P. 51-60.
4. *Chalykh E.* Constructing the set of program controls with probability 1 for one class of stochastic systems // *Automation and Remote Control* **70**, No 8, 2009. P. 1364–1375.