

*180th Anniversary of the Taras Shevchenko
National University of Kyiv*

*Taras Shevchenko National University of Kyiv
(Faculty of Cybernetics)*

University of Defence, Brno, Czech Republic

International Institute for Applied Systems Analysis (Austria),

Glushkov Institute of Cybernetics of NAS of Ukraine

*System Analysis Committee of Presidium National Academy of
Sciences of Ukraine*

Academy of Sciences "Vyshcha Shkola" of Ukraine

Noosphere Ventures Corporation

Brno Local Chapter of Union of Czech Mathematicians and Physicists

XXIV International Conference
PROBLEMS OF DECISION
MAKING UNDER
UNCERTAINTIES
(PDMU-2014)



ABSTRACTS

*September 1-5, 2014
Cesky Rudolec, Czech Republic*

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ASYMPTOTIC DISSIPATIVITY OF THE RANDOM EVOLUTION WITH IMPULSE PERTURBATION

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Consider the stochastic system with impulse perturbation given by the stochastic differential equation [1]

$$du^\varepsilon(t) = C(u^\varepsilon(t); x(t/\varepsilon^4))dt + \varepsilon d\eta^\varepsilon(t), u^\varepsilon(t) \in \mathbf{R}, \quad (1)$$

with impulse perturbation process $\eta^\varepsilon(t) = \int_0^t \eta^\varepsilon(ds; x(s/\varepsilon^2))$, where family of processes with independent increments determined by generators $\Gamma_u^\varepsilon(x)\varphi(u, \omega, x)$ and $\Gamma_w^\varepsilon(x)\varphi(u, \omega, x)$ [2].

The limiting evolution for (1) is a solution of the following equation

$$du(t) = a(u)dt + \sigma(u)dW(t), \quad (2)$$

where $W(t)$ - Wiener process and $a(u)$ has the representation $a(u) = \int_x C(u; x)\pi(dx)$. Limiting diffusion $\sigma(u)\sigma^*(u) = B(u)$, where

$$B(u) = 2 \int_x b_1(x)R_0 b_1(x)\pi(dx) + \int_x b_2(x)\pi(dx) [2].$$

Let also satisfied the condition of balance $\int_x b_1(x)\pi(dx) \equiv 0$.

Definition. System (1) is called asymptotically dissipative if it is dissipative limiting evolution (2).

Theorem Let process $(u^\varepsilon(t), \eta^\varepsilon(t))$ satisfied weakly convergence conditions. In addition, for $c_1 > 0, c_2 > 0$ conditions $a(u)V'(u) < -c_1 V(u)$, $\sup \|\sigma(u)\| < c_2$ and condition of balance are satisfied.

Then the system (1) is asymptotically dissipative.

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THE NEW INVERSE BURGERS DYNAMICAL SYSTEM AND ITS INTEGRAL SUBMANIFOLD

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Recently the inverse Burgers dynamical system for the Burger's equation $u_t + uu_x = u_{xx}$ was introduced in [2] in the next form:

$$\begin{cases} u_t = v, \\ v_t = u_x + uv. \end{cases} \quad (1)$$

We have obtained different inverse Burgers system in next form:

$$\begin{cases} u_t = v + \frac{1}{2}u^2 \\ v_t = u_x. \end{cases} \quad (2)$$

The main goal of system (2) is ability to rewrite it as a set of differential forms generating the closed Cartane-integrable ideal [1].

Theorem. The set of first order equations (2) is equivalent to the set of second rank differential forms $\{\alpha^{(2)}\}$ constructing integral submanifold:

$$\begin{cases} \alpha_1^{(2)} := du \wedge dx + v dx \wedge dt + (u^2/2)(dx \wedge dt), \\ \alpha_2^{(2)} := du \wedge dt + dv \wedge dx, \end{cases} \quad (3)$$

Ideal is closed $dI(\alpha) \subset I(\alpha)$: $\begin{cases} d\alpha_1^{(2)} := (dx - dt) \wedge \alpha_2^{(2)}, \\ d\alpha_2^{(2)} := 0. \end{cases}$

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