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ABSTRACTS OF CSc. (Candidatus Scientiarum) THESES IN MATHEMATICS defended recently at Charles University, Prague.

CONTRIBUTIONS TO THE RENEWAL THEORY OF THE THINGS IN OPERATION

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The thesis deals with the preventive replacement of machine parts in the case, when the distribution function F(x) of their failure times is specified excepting an unknown parameter $\boldsymbol{\omega}$. Optimality of the policy consists of minimalization of the average cost $t^{-1}C_{+}.$

In the first part the quasi-variational inequalities for the average cost (I)-(III) are investigated (I) w'(x) + g(x)(c₁-w(x)) - 0 \succeq 0

(II)
$$c_2 - w(x) \ge 0$$

(III) $(c_2 - w(x)) \cdot (w'(x) + g(x)(c_1 - w(x)) - \theta) = 0$, where w(x) is the cost potential, w(0) = 0, g(x) the failure rate, $c_1(c_2)$ the cost of service (preventive) replacement and $\theta = \theta(d)$ the average cost per unit time corresponding to the policy with constant critical age $d = d(x_0)$.

There are proved theorems of existence and uniqueness of the solution $\mathbf{w}(\mathbf{x})$

$$w(x) = \begin{cases} (-c_1 F(x) + \theta \int_0^x F(y) dy) / F(x), & x \in [0, d] \\ c_2, & x \ge d. \end{cases}$$

In the further part the asymptotic behavior of the average cost is investigated. We find the assumptions under which the maximum likelihood estimation of the parameter, $\hat{\boldsymbol{\mathcal{L}}}_t$ converges to the true value of parameter $\boldsymbol{\mathcal{L}}_n$ almost surely by $t \longrightarrow \boldsymbol{\infty}$.

In the last part a more precise statement about the convergence of $\hat{\boldsymbol{x}}_t$ to \boldsymbol{x}_0 is presented (by the law of iterated logarithm). The given conditions guarantee the best attainable convergence of the average cost $t^{-1}C_+$ to the optimum $\boldsymbol{\theta}$.

Corollary. In parametric situation it holds

$$\lim_{t\to\infty} \pm (c_t - \theta, t) / \sqrt{2t \log \log t} = 6 \quad \text{a.s.},$$

where $\mathbf{6}^2 = \int_0^d (\mathbf{c_1} - \mathbf{w})^2 \mathbf{f_0} d\mathbf{y} / \int_0^d \overline{\mathbf{F}_0} d\mathbf{y}$ and $\mathbf{w}(\mathbf{y})$ is the solution of quasi-variational inequalities (I)-(III).

THRESHOLD MOVING AVERAGE MODEL

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