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Intelligent Optimization Algorithms for Computational Simulation

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Abstract: Digital signal processing and intelligent optimization algorithms, as well as stochastic time series analysis, are important methods in computational simulation, optimization, and simulation research, and they have a wide range of applications in many scientific and technological fields such as radio communication, automatic control, geophysics, signal processing, biomedicine, meteorology and hydrology, mechanical vibration, radar, sonar, and language processing, as well as many social science fields such as economics, finance, and sociology. The results of this paper will provide an ideal digital signal processing method and means to further improve the efficiency of intelligent optimal control and information decision-making of computational simulation and optimization simulation systems.

Keywords Computational simulation; Optimization and simulation; Intelligent optimization algorithm; Digital signal processing; Stochastic time series analysis; Optimize the model

INTRODUCTION

With the rapid development of computers and the need for wide application in many scientific and technological fields and social science fields, as well as the need for continuous research and improvement of mathematical processing methods, the development of digital signal processing and intelligent optimization algorithms has been greatly promoted [5-6]. In order to adapt to the development of information science and the continuous deepening of computational simulation, optimization and simulation research, this issual will conduct the following in-depth research.

INFORMATION SEARCH AND DIGITAL SIGNAL PRECESSING

Describe the signal $(\alpha, \beta) = [(\alpha_1(l), \cdots, \alpha_k(l));$

Also signa $a(l), b(l), c(l), B(l), A(l)$ there are times series in turn

Observable result is called optimization simulation system.

Under talk about the optimization simulation system we study optimize the simulation of the universal function.

$$G(m; L) = H\{\alpha_L^* Q \alpha_L + \int_0^j [\alpha_l^* M(l) \alpha_l + m_l^* W(l) m_l] dl\} \tag{1}$$

Then we can find:

$$u_l^m = P(\alpha_t \mid \mathrm{F}_l^\beta), \quad j_l^m = H[(\alpha_t - u_l^m)(\alpha_l - u_l^m)^*] \tag{2}$$

but α_l and β_l are controled by (1).

In the control system

$$R(L) = Q \tag{3}$$

where $R(l) = \int_t^L \sum_{i,j=1}^k F_{ij}(v) R_{ij}(v) dv \qquad (4)$

while $F_{ij}(l)$ is the random series of the system.

STOCHASTIC ANALYSIS AND INTELLIGENT CONTROL

Let the random signal received in the digital signal system be

and the following differential equations are satisfied:

where $\Phi = (\Phi_l), 0 \leqslant l \leqslant L$. It's not hard for us to roll out (4) has the only strong solution of being.

Then we can get:

$$\frac{1}{l} \int_0^l HB^2(v, \alpha, \beta) dv \le R$$

(5)

This is the instantaneous frequency $\tilde{\alpha}_l(\beta)$.

The signal received in engineering technology is and its valid signal satisfies

$$P[\alpha-\hat{\alpha}_l(\beta)^2]^2 \geq H[\alpha-u_l(\beta)]^2$$

The optimal spectrum of the original signal (for signal β_0^l) is the filtered value of the impulse response function $u_l = P(\alpha|_{F_l^\beta})$.

In order to seek for the The power spectrum vs. average power equation of a continuous signal and the minimum regeneration error $\Delta(l)$ .We first established a α-dependent spectral power function.

where $B_0 = B_0(l,\beta), B_1 = B_1(l,\beta), 0 \leq l \leq L$ are the power spectrum signal energy.

Also

Relevant equation

$$du_l = j_l B_1(l,\beta)[d\beta_l - (B_0(l,\beta)+B_1(l,\beta)u_l)dl] \tag{6}$$

$$j = -j_l^2 B_1^2(l,\beta) \tag{7}$$

meanwhile they fit the condition $u_0 = u, j_0 = j.$ While the transformation signal (7) is

$$j_l = \frac{j}{1+j\int_0^l B_1^2(v,\beta)dv}$$

also $R(\inf_{0\leq v\leq L} j_t > 0) = 1.$ So according to (7)

$$\frac{\dot{j}_l}{j_l} = -j_l B_1^2(l,\beta),$$

therefore

$$\text{In } j_l - \text{In } j = -\int_0^l j_v B_1^2(v,\beta)dv$$

namely $$j_l = j\exp\{-\int_0^l j_v B_1^2(v,\beta)dv\}. \tag{8}$$

Because of

$$\int_0^l Hj_v B_1^2(v,\beta)dv \leq R_l \tag{9}$$

According to System filters signal inequalities $(He^{-\varsigma} \geq e^{-H_u}),$ (19) and (21)

$$Hj_l \geq je^{-Rl}, 0 \leq l \leq L \tag{10}$$

An impulse response code is available (B_1, B_1)

$$H[\alpha-u_l]^2 = Hj_l \geq je^{-Rl} \tag{11}$$

So (see (15))

$$\Delta^*(l) \geq je^{-Rl} \tag{12}$$

If

$$B_1^*(l) = \sqrt{\frac{R}{j}}e^{Rl/2} \tag{13}$$

Based on (20) and equality

$$\int_0^t Hj_v^*(B_1^*(v))^2 dv = \int_0^l j_v^*(B_1^*(v))^2 dv = Rl$$

And by the correlation analysis equation (6), the optimal transformation signal m can be determined by the following equation

$$du_l^* = \sqrt{Rj}e^{-Rl/2}d\beta_l^*, u_0^* = u \tag{14}$$

while transitted signal $\beta^* = (\beta_l^*), 0 \leq l \leq L$ (see (5)), satisfies the equation

$$d\beta_l^* = \sqrt{\frac{R}{j}} e^{Rl/2} (\alpha - u_l^*) dl + dw_t$$

$$\beta_0^* = 0 \qquad (15)$$

$$u_l^* = u + \sqrt{Rj} \int_0^L e^{-Rl/2} d\beta_v^*$$

$$= u + \sqrt{Rl} [e^{-Rl/2} \beta_l^* + \frac{R}{2} \int_0^l e^{-Rl/2} \beta_v^* dv] \qquad (16)$$

COMPUTATIONAL SIMULATION AND INTELLIGENT FILTERING

If $V_i, l = 0,1,\cdots$, as a Instantaneous random signal , it is determined by the instantaneous frequency inequality:

It is provided by instantaneous phase and instantaneous frequency, finite-length impulse response filtering the firstly two signals of the random vector of the pulse signal:

ie $N\zeta^t = N\zeta^t, N^t\xi = N\xi^t, t = 1,2$ .if

$K(a)$ is R -*П.Н.*

Then in the instantaneous pulse signal, the instantaneous pulse signal formula below

Then

$$V(n,m) = R(0) + v_0^* R(0) v_0$$
$$+ W_l \int_0^L [S^{1/2}(l) K_l S^{1/2}(l) + r^{1/2} K_L r^{1/2}] dl$$

where

$$S(l) = \int_l^L \sum_{i,j=1}^{k} W_{ij}(v) S_{ij}(v) dl$$

while $W_{ij}(l)$ is the best filter of the pulse signal.

INTELLIGENT OPTIMIZATION ALGORITHMS AND OPTIMIZATION MODELS

Suppose the pulse signal

$$V_l = \int_{-\pi}^{\pi} e^{k\mu l} H(e^{k\mu}) \varphi(d\mu) \qquad (17)$$

$$H_{j,k}(i) = \frac{U_{n_{j,k-1}}^{(j,k)}}{V_{n_{j,k}}^{(j,k)}}$$

And $W(d\mu) = [\varphi_1(d\mu), \cdots, \varphi_n(d\mu)]$.

$$E\varphi_j(d\mu) = 0, \qquad E|\varphi_i(d\mu)|^2 = \frac{1}{2\pi} d\mu$$

$$V_{p,j,k}(l) = \int_{-\pi}^{\pi} e^{k\lambda l} H_{r,q}(e^{k\lambda}) \varphi_p(d\mu) \qquad (18)$$

Signal $\eta_t = (\eta_1(l), \cdots, \eta_l(l))$ and signal β_t [$\beta_t = (\beta_1(l), \cdots, \beta_i(l))$:

$$\beta_{l+1} = -\frac{1}{2}\beta_l - \frac{1}{2}\eta_l + \frac{1}{2}\sigma(l+1)$$

$$\eta_{l+1} = \beta_l + \sigma(l+1)$$

wherein $n_1(l,r) = P(\alpha_l | \mathcal{F}_t^{\xi})$ and $n_2(l,r) = P(\beta_l | \mathcal{F}_t^{\xi})$ by having the initial conditions

$$T_{r+1} = -\frac{1}{2} T_r - \frac{1}{2} \eta_l + \frac{1 - S_r}{2(1 + S_r)} (\eta_{r+1} - T_r) \qquad (19)$$

$$S_{r+1}=\frac{S_r}{1+S_r} \tag{20}$$

and it is not difficult to prove $r_0=0, S_0=1$.

Described above, in generalized process of instantaneous signal $\eta_l, l=0,\pm1,\pm2,\cdots$, the best filter is made (18) to (20) identified ,then wherein η_l of (19) should be replaced by η_l [10-12].

OPTIMAL ALGORITHM APPLICATION ANALYSIS

The problem of optimal control of transient pulse signals

$$U(u,L)=\alpha_L^* q\alpha_L+\int_0^L[\alpha_l^* M(l)\alpha_l+u_l^* W(l)u_l]dl \tag{21}$$

the best control exists and is obtained by the formula

$$\tilde{u}\,l=-W^{-1}(l)a^*(l)R(l)\alpha_l \tag{22}$$

And have

$$U(\tilde{u};L)=\inf_u U(u;L)=\alpha_0^* R(0)\alpha_0 \tag{23}$$

APPLICATION PROSPECTS

In today's information society, with the rapid development of computer science, digital signal processing, computational simulation, optimization and simulation and intelligent optimization algorithms have become an extremely important research focus and field in many natural and social sciences such as biomedicine, automatic control, radio communication, hydrogeology, economics, finance, etc. Its application has been quite extensive. As an important driving force for a new round of scientific and technological revolution and industrial revolution, the application of intelligent optimization algorithm will blossom everywhere, and it is also expected to truly become an "intelligent helper" of human beings. This document is a comprehensive and in-depth study, which will further promote our academic activities and exchanges with the international academic community, and play a positive role in promoting the generation and transformation of high-level scientific research achievements of our university.

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