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The numerical solution for the systems of singular integro-differential equations in Hölder spaces

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We study the system of singular integro-differential equations in m-dimensional space of Hölder functions $[H_\beta(\Gamma)]_m$, $0 < \beta \leq 1$, (Γ is an arbitrary smooth closed contour)

$$M\varphi \equiv \sum_{r=0}^{q} \left[c_r(t)\varphi^{(r)}(t) + d_r(t)\frac{1}{\pi i}\int_\Gamma \frac{\varphi^{(r)}(\tau)}{\tau - t}d\tau + \right.$$

$$\left. + \frac{1}{2\pi i}\int_\Gamma h_r(t,\tau)\varphi^{(r)}(\tau)d\tau \right] = f(t), \quad t \in \Gamma, \tag{1}$$

where $c_r(t)$, $d_r(t)$, $h_r(t,\tau)$, $r = \overline{0,q}$ are given m by m matrix functions (m.f.). The elements of m.f. belong to $H_\beta(\Gamma)$ and $f(t)$ is a given m dimensional vector function (v.f.) on Γ from $[H_\beta(\Gamma)]_m$, $\varphi(t)$ is a m dimensional unknown v.f. The first integral from (1) we understand as the principal value of Cauchy. We wish to find the solution $\varphi(t)$ to equation (1) satisfying the condition on Γ

$$\frac{1}{2\pi i}\int_{\Gamma}\varphi(\tau)\tau^{-k-1}d\tau = 0, k = \overline{0, q-1},$$

so we search the solution of (1) in $[\dot{H}_{\beta}^{(q)}(\Gamma)]_m$. We received the numerical schemes of reduction method for the approximate solution of singular integro-differential equations on the arbitrary smooth closed contour. The reduction algorithms were based on the Faber-Laurent polynomials and the theoretical foundation was obtained in Holder spaces. The operator equation of reduction method is $S_nMS_n\varphi_n = S_nf$, where S_n is the operator of reduction method by Faber-Laurent polynomials on Γ.