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COMBINED SPLINES IN SMOOTHING HISTOPOLATION

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Our talk deals with space $S(T, A_1 \times A_2)$ of combined splines [1] defined by continuous linear operators $A_1 : X \to I\!R^n$, $A_2 : X \to I\!R^m$ and $T : X \to Y$ in Hilbert spaces X and Y. Such splines give us a possibility to take into account interpolation conditions of two different types described by A_1 and A_2 correspondingly.

For given vectors $\boldsymbol{u} \in I\!R^n, \boldsymbol{v} \in I\!R^m$ and parameters $\delta, \omega, \varepsilon_i > 0,\ i = 1, \ldots, n$, we consider the following conditional minimization problems:

$$||Tx||^2 + \frac{1}{\omega}||A_1x - \boldsymbol{u}||^2 \longrightarrow \min_{A_2x = \boldsymbol{v}}, \qquad ||Tx|| \longrightarrow \min_{||A_1x - \boldsymbol{u}|| \le \delta,\ \ A_2x = \boldsymbol{v}},$$

$$||Tx|| \longrightarrow \min_{|(A_1x)_i - u_i| \le \varepsilon_i,\ \ i = 1, \ldots, n,\ \ A_2x = \boldsymbol{v}}.$$

The aim of this talk is to present some results on solutions of these problems obtained under the assumptions:

$\mathrm{Ker}T \cap \mathrm{Ker}A_1 \cap \mathrm{Ker}A_2 = \{0\}, \quad A_1(X) = I\!R^n, \quad A_2(X) = I\!R^m, \quad T(\mathrm{Ker}A_1 \cap \mathrm{Ker}A_2)$ is closed.

In particular we consider the problem of approximation of a given histogram with boundary conditions by taking

$$Tx = x^{(r)}, \quad (A_1x)_i = \int_{t_{i-1}}^{t_i} x(t)dt,\ i = 1, \ldots, n, \quad (A_2x)_1 = x(a), \quad (A_2x)_2 = x(b), \quad x \in W_2^r[a, b].$$

This investigation is closely related to our previous works on smoothing histopolation [2], [3].

REFERENCES

[1] E. Rimša. Combined splines. In: *Continuous functions on topological spaces*, Riga, 1986, 155-158 .(in Russian)

[2] N. Budkina. On a method of construction of smoothing histosplines. *Proc. Estonian Acad. Sci. Phys. Math.* , **53** (3), 2004, 148-155.

[3] S. Asmuss, N. Budkina. Splines in convex sets under constraints of two-sided inequality type in a hiperplane. *Mathematical Modelling and Analysis*, **13** (4), 2008, 461 - 470.